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**SOURCEBOOK**  
**APPENDICES**

**FOR THE REENTRY/RESTORATION PLAN WORKBOOK**

WORKING DRAFT (JUNE 1994)

Prepared and maintained by the  
CSEPP Recovery Work Group

## SOURCEBOOK

### APPENDICES

## INTRODUCTION

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NOTE: The information contained in the following Appendices has been provided as reference source material for individuals establishing Reentry/Restoration (R&R) Plans using the accompanying Workbook.

As reentry/restoration guidance is still a developing area, material contained in these Appendices will be continuously updated. Updated information will be sent out to individuals who are identified as being holders of this set of documents. Key changes or additions will be noted so the responsible parties can check their specific R&R Plans for necessary changes.

The proponent for the technical information within this document and future updates is the CSEPP Recovery Work Group. Members of the Work Group are listed after the Table of Contents. These individuals may be contacted individually for specific technical assistance.

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## APPENDIX A

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October 14, 1993

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*\*The Mini-Library is a selected set of documents that contain pertinent technical information on reentry and restoration issues. The Mini-Library is maintained and distributed by the Recovery Work Group. A copy of the Mini-Library may be obtained by contacting Dr. Annetta Watson, Oak Ridge National Laboratories, (615) 576-2125.*

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# APPENDIX B

## GLOSSARY

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### I. TERMS

Every affected county and state jurisdiction should have an acronym list attached to its chemical agent recovery plan that explains all abbreviations used in the plan.<sup>1</sup> Following is a list of acronyms that may be included, as appropriate, in such an attachment.

μg	microgram, 1 x 10 <sup>-6</sup> gram
2 PAM Cl	pralidoxime chloride
ACAM	Automatic Continuous Air Monitor
ACAMS	automated chemical Agent Monitoring System
ACh	acetylcholine; a naturally occurring chemical neurotransmitter
AChE	acetylcholinesterase; a naturally occurring enzyme that breaks down ACh
ACL	Agent Control Limits
ACP	access control point
AEL	allowable exposure level
AMC	U.S. Army Material Command
AMC-FAST	U.S. Army Material Command Field Assistance in Science and Technology
AMC-R	U.S. Army Material Command Regulation
AMCCOM	U.S. Army Armament, Munitions and Chemical Command
AMCSFA	U.S. Army Material Command Surety Field Activity
ANAD	Anniston Army Depot (Alabama)
ANL	Argonne National Laboratory, Argonne, Ill
AOC	Army Operations Center
APG	Aberdeen Proving Ground
AR	army regulation
ARAR	applicable or relevant and appropriate requirement
ARC	American Red Cross
ARNG	Army National Guard
ATSDR	Agency for Toxic Substances and Disease Registry (of HHS)
BGAD	Blue Grass Army Depot
BEA	Bureau of Economic Analysis

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<sup>1</sup> *Planning Guidance for the Chemical Stockpile Emergency Preparedness Program*, Final Interim Draft, Rev. 1, U.S. Department of the Army and the Federal Emergency Management Agency (Oct. 30, 1991).

CAI chemical accident or incident  
 CAICO chemical accident or incident control officer  
 CAIRA Chemical Accident or Incident Response and Assistance  
 CAM chemical agent monitor  
 CAMDS Chemical Agent Munitions Disposal System  
 CAMT Chemical Advisory Medical Team  
 CARCL chemical accident response capabilities listing  
 CDC Centers for Disease Control (DHHS)  
 CEM comprehensive emergency management  
 CERCLA Comprehensive Environmental Response, Compensation, and Liability Act  
 CERP Chemical Event Restoration Plan  
 CFR Code of Federal Regulations  
 CHEMTREC Chemical Transportation Emergency Center  
 CRDEC U.S. Army Chemical Research, Development, and Engineering Center (APG, Md) Now ERDEC.  
 CSDP Chemical Stockpile Disposal Program  
 CSEP Chemical Stockpile Emergency Preparedness  
 CSEPP Chemical Stockpile Emergency Preparedness Program  
 CSRFCERP Chemical Service Response Force Commander's Emergency Response  
 CW chemical warfare  
 CWA Clean Water Act  
  
 D2PC An Army computer dispersion model for hazard estimation  
 DA Department of the Army  
 DA Pam U.S. Department of the Army Pamphlet 50-6  
 DAAMS Depot Area Air Monitoring System  
 DAC Disaster Application Center  
 DCSOPS Deputy Chief of Staff for Operations and Plans  
 DECON decontaminate, decontamination  
 DERP Defense Environmental Restoration Program  
 DESCOM U.S. Army Depot Systems Command  
 DHHS/CDC U.S. Department of Health and Human Services/Centers for Disease  
 DHHS U.S. Department of Health and Human Services  
 DOC U.S. Department of Commerce  
 DOD U.S. Department of Defense  
 DOE U.S. Department of Energy  
 DOI U.S. Department of the Interior  
 DOIM director of information management  
 DOJ U.S. Department of Justice  
 DOL U.S. Department of Labor  
 DOS U.S. Department of State  
 DOSC deputy on-scene commander  
 DOT U.S. Department of Transportation  
 DRMO Defense Reutilization Marketing Office  
 DS decontaminating solution  
 DS2 corrosive decontaminating solution  
 DSR damage survey report  
 DSRFC deputy service response force commander

EBS	emergency broadcast system
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
ELISA	enzyme-linked immunosorbent assay
EMA	Emergency Management Agency
EMD	Emergency Management Division
EMI	Emergency Management Institute
EMIS	Emergency Management Information System
EMS	Emergency Medical Services
EMT	Emergency Medical Team
EOC	Emergency Operations Center
EOD	explosive ordnance disposal
EOP	emergency operations plan
EPA	U.S. Environmental Protection Agency
EPIC	Emergency Preparedness Information Coordination (system)
EPPP	Emergency Planning and Preparedness Program
EPZ	emergency planning zone
ERDEC	U.S. Army Edgewood Research, Development, and Engineering Center (APG, Md). Formerly CRDEC.
ERP	Emergency Response Plan
ERT	Environmental Response Team
FDA	U.S. Food and Drug Administration
FEMA	Federal Emergency Management Agency
FM	field manual
FORSCOM	U.S. Forces Command
FPEIS	Final Programmatic Environmental Impact Statement
FR	Federal Register
FRERP	Federal Radiological Emergency Response Plan
FS	feasibility study
FSIS	Food Safety and Inspection Service (USDA)
GA	Tabun, $C_5H_{11}N_2O_2P$ (a nonpersistent organophosphate nerve agent)
GAO	General Accounting Office
GB	Sarin, $C_4H_{10}FO_2P$ (a nonpersistent nerve agent)
GCMS	gas chromatograph/mass spectrometer
GOCO	Government-owned, contractor-operated
GPL	General Population Limits
H/HD/HT	various formulations of sulfur mustard [ $C_4H_8Cl_2S$ ; bis(2-chloroethyl) sulfide], a
HAZMAT	hazardous materials
HD	distilled sulfur mustard, $C_4H_8Cl_2S$ (a blister agent)
HHS	U.S. Department of Health and Human Services
HMIX	Hazardous Materials Information Exchange
HMTA	Hazardous Materials Transportation Act
HN-#	nitrogen mustards, non-stockpile blister agents present at some locations

## Acronyms

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HRS	hazard ranking system
HT	mustard-T mixture (a blister agent)
HTH	high-test hypochlorite
HTW	hazardous and toxic waste
I-O	input-output
IC	installation commander
ICS	incident command system
IEMIS	Integrated Emergency Management Information System
IPE	individual protective equipment
IRF	initial response force
IRFC	initial response force commander
IRP	Installation Restoration Program
IRZ	immediate response zone
JACADS	Johnston Atoll Chemical Agent Disposal System
JHEC	Joint Hazard Evaluation Center
JIC	Joint Information Center
L	Lewisite, $C_2H_2AsCl_3$ (a blister agent)
LBAD	Lexington-Blue Grass Army Depot (Kentucky)
LBDA	Lexington-Blue Grass Depot Activity (Kentucky) (a branch of LBAD)
LD <sub>50</sub>	median lethal dose
LEPC	Local Emergency Planning Committee
MACOM	Major Command
MAT	Medical Advisory Team
MCE	maximum credible event
MEDCEN	medical center
MOPP	mission-oriented protective posture
MOU	Memorandum of Understanding
MPE	most probable event
MRICD	Medical Research Institute for Chemical Defense
MRT	Medical Response Team
MSDS	Material Safety Data Sheets
MTF	medical treatment facility
NA	nerve agent
NAAK	Nerve Agent Antidote Kit, Mark I
NAAP	Newport Army Ammunition Plant (Indiana)
NCDC	National Centers for Disease Control (CDC)
NCEH	National Center for Environmental Health (CDC)
NCP	National Contingency Plan
NDA	national defense area
NDMS	National Disaster Medical System
NEMS	National Emergency Management System
NEPA	National Environmental Policy Act
NIOSH	National Institute of Occupational Safety and Health
NOAEL	no adverse effect level

NOEL	no observed effect level
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	U.S. Nuclear Regulatory Commission
NRC	National Response Center
NRT	National Response Team
NSEC	National System for Emergency Coordination
OASA	Office of the Assistant Secretary of the Army
OASA(IL&E)	Office of the Assistant Secretary of the Army for Installations, Logistics
OES	Office of Emergency Services
OHM-TADS	Oil and Hazardous Materials Technical Assistance Data System
OP	organophosphorus
OPCC	Off-Post Command Center
ORNL	Oak Ridge National Laboratory, Oak Ridge, Tennessee
OSC	on-scene coordinator
OSC/RPM	on-scene coordinator/remedial project manager
OSHA	U.S. Occupational Safety and Health Administration
OTSG	Office of the Surgeon General (Army)
OVT	operational verification testing
PAO	Public Affairs Office(r)
PAR	protective action recommendation
PARDOS	Army computer dispersion model
PAZ	protective action zone
PBA	Pine Bluff Arsenal (Arkansas)
PDS	Personal Decontamination Station
PIO	public information officer
PIRP	Public Involvement and Response Plan
PL	Public Law
PMCD	Program Manager for Chemical Demilitarization
POC	Point Of Contact
PPE	personal protection (protective) equipment
PPP	personnel processing point
PUDA	Pueblo Army Depot Activity (Colorado)
PZ	precautionary zone
QA	quality assurance
QC	quality control
RA	remedial action
RBC-ChE	red blood cell cholinesterase
RCP	Regional Contingency Plan
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RI/FS	remedial investigation and feasibility study
RIMS	Regional Input-Output Modeling System
ROD	Record of Decision
RPM	remedial project manager

## Acronyms

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RRC	Regional Response Center
RRT	Regional Response Team
RTAL	Real-Time Analytical Laboratory
SARA	Superfund Amendment and Reauthorization Act
SCBA	self-contained breathing apparatus
SERC	State Emergency Response Commission
SI	site inspection
SOP	standard operating procedure
SPOCC	SRFX-91 pilot off-post CSEPP capability
SRF	Service Response Force; a DA-level emergency response organization
SRFC	service response force commander
SRFX	Service Response Force Exercise
STB	super tropical bleach
SUPLECAM	surveillance program, lethal chemical agents, and munitions
T	$C_8H_{16}Cl_2OS_2$ (a blister agent)
TAP	toxicological agent protective clothing
TAPES	toxicological agent protective ensemble self-contained
TC	ton container
TCM	toxic chemical munition
TCP	traffic control point
TEAD	Tooele Army Depot (Utah)
TECOM	U.S. Army Test and Evaluation Command
TEU	Technical Escort Unit
TLV	threshold limit value (maximum permitted exposure)
TM	technical manual
TSD	Treatment, Storage, and Disposal Facility
TWA	Time-Weighted Average
UMDA	Umatilla Army Depot Activity (Oregon)
USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USAISC	U.S. Army Information Systems Command
USANCA	U.S. Army Nuclear and Chemical Agency
USARCS	U.S. Army Claims Service
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USC	U.S. Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USPHS	U.S. Public Health Service
VX	$C_{11}H_{26}NO_2PS$ (a persistent nerve agent)

## II. TERMS

Every affected county and state jurisdiction should have a glossary attached to its chemical agent recovery plan that explains all program-specific terms given in the plan.<sup>2</sup> Following is a compendium of terms that may be included, as appropriate, in such a glossary.

**Access control:**

The prevention of unauthorized entry into a specific area. Road barriers and traffic control are used to assist access control. The access-controlled area may be established to control and monitor a restricted area that may have undergone agent contamination.

**Aqueous media:**

Environmental media that contain a large proportion of water, such as storm water runoff from agricultural fields, animal and plant fluids, etc.

**Binary chemical munitions:**

Munitions designed to use two less toxic precursors that react during firing of the weapon system to produce a chemical agent for release on a target.

**Buffer zone:**

As used by the Federal Emergency Management Agency and the U.S. Environmental Protection Agency, an area adjacent to a restricted zone, to which residents may return, but for which protective measures are recommended to reduce dose or exposure.

**Chemical agent:**

A chemical compound used in military operations to kill, seriously injure, or incapacitate persons through its chemical properties. Excluded are riot control agents, chemical defoliants and herbicides, smoke, flame, incendiaries, and industrial chemicals.

**Chemical surety material:**

All lethal and incapacitating chemical agents and their related weapon systems, including binary munitions and their critical components, that are either adopted or being considered for military use. Excluded are riot control agents, defoliants, incendiaries, smoke, and flame.

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<sup>2</sup> *Planning Guidance for the Chemical Stockpile Emergency Preparedness Program*, Final Interim Draft, Rev. 1, U.S. Department of the Army and the Federal Emergency Management Agency (Oct. 30, 1991).

**Contamination:**

The deposit and/or absorption of chemical agents or hazardous materials on, and by, structures, areas, personnel, or objects.

**Decontamination:**

The reduction or removal of contaminating agent from an area, structure, object, or person.

**Dermal exposure:**

Exposure to or by absorption through the skin.

**Dry deposition:**

Deposition onto surfaces by settling out of particles, as opposed to droplets (liquid). Also by adsorption from the vapor phase.

**Emergency phase:**

As used by the Federal Emergency Management Agency and the U.S. Environmental Protection Agency, the initial phase of response actions, during which actions are taken in response to a threat of release or a release in progress. Short-term protective actions such as sheltering and evacuation may be taken during this phase to mitigate the hazard from immediate exposure to the passing plume.

**GA, GB:**

Nerve agents. See Tabun and Sarin, respectively.

**H, HD, HN, HT:**

Forms of mustard. HN-1, HN-2, and HN-3 are nitrogen mustards; they are not in the stockpile but may be present at some older installations.

**Hydrolyzed:**

Refers to a compound which has undergone chemical reaction with water; hydrolysis is the reaction of a particular compound (such as a chemical warfare agent) with water to form new chemical compounds ("reaction products").

**Igloo:**

A reinforced concrete, earth-covered shelter used for storing explosives and munitions.

**Initial response force:**

The installation commander and staff who, during the initial period of the emergency, will take emergency response actions necessary to maintain command and control on-site pending arrival of the service response force.

**L, or Lewisite:**

Dichloro 2-chlorovinylarsine, a blister agent. Its chemical formula is  $C_2H_2AsCl_3$ .

**M18A2 kit:**

A kit consisting of portable tests capable of detecting nerve agents and blister agents.

**M23:**

A land mine that contains a chemical agent.

**M55:**

An aerial rocket weapon that contains a chemical agent.

**MC1 MK94:**

An aerial bomb that contains a chemical agent.

**Metabolic products:**

The breakdown products of the chemical processes in living organisms that convert food into new tissues and energy; also products of reactions which tend to detoxify non-food chemicals.

**mg:**

milligram,  $1 \times 10^{-3}$  gram

**mini-CAM:**

Miniature Chemical Agent Monitor.

**μg:**

microgram,  $1 \times 10^{-6}$  gram

**Mustard:**

See sulfur mustard.

**National Contingency Plan (NCP):**

The set of regulations that implement CERCLA and direct responsibility and procedures for cleanup of hazardous material spills. The regulations are codified at 40 CFR §300 et seq.

**On-scene coordinator:**

The person designated to direct cleanup efforts under the National Contingency Plan.

**Readiness:**

Phase of preparations to deal with an accident or incident.

**Reconstruction:**

Rebuilding and replacement of destroyed structures and utilities to approximate the predisaster condition.

**Recovery:**

The period following response when immediate threat to human life has passed and general evacuation has ceased. Recovery refers to the actions taken to restore an affected area as nearly as possible to its preemergency condition. Thus, it refers to the process of reducing exposure rates and concentrations in the environment to acceptable levels for unconditional occupancy or use after the emergency phase of an accident or incident. Recovery differs from reentry in that recovery encompasses the efforts and resources needed to return the affected area to its preaccident condition. Recovery includes both short- and long-term activities. Short-term recovery returns vital systems to minimum operating standards, seeks to restore critical services to the community, and provides for the basic needs of the public. Long-term recovery focuses on restoring the community to its normal, or improved, state of affairs and on returning life to normal or improved levels. The recovery period is also an opportune time to institute mitigation measures, particularly those related to the recent emergency. (From a surety perspective, recovery has, in some circumstances, been defined as those actions required to resecure the munitions involved in a chemical agent accident, but that definition is not used in this report.)

**Reentry:**

Reentry is the entry of persons into an affected (i.e., contaminated or potentially contaminated) area following a release. The terms *controlled reentry*, *restricted reentry*, *occupational reentry*, and *emergency reentry* refer to the temporary, short-term readmission of persons (primarily emergency workers) into a restricted zone for the purpose of performing some essential task. The terms *uncontrolled reentry*, *unrestricted reentry*, and *general reentry* are used in the context of uncontrolled, permanent reaccess to refer to those provisions leading up to unlimited public access or the reoccupation or use of previously restricted zones after the hazards have been reduced to acceptable levels.

**Release:**

Controlled or uncontrolled escape of chemical agent into the environment.

**Relocation:**

Temporary or permanent removal of a population or community in response to an emergency or disaster. A protective action in which persons are asked to vacate a contaminated area to avoid chronic exposure from deposited contamination. Relocation is distinguished from evacuation in that during an emergency, the potential for a release exists; in contrast, during the relocation phase, there is no passing plume.

**Remedial actions:**

Actions taken to restore a contaminated site to its precontaminated condition. In contrast to removal actions, these are longer term actions, including cleanup, treatment, and neutralization of contamination and access control or permanent relocation of residents, if necessary. Remedial actions are coordinated by the remedial project manager. U.S. Department of the Army Pamphlet 50-6, *CAIRA Operations*, treats remedial actions as taking place in a "non-emergency atmosphere," and describes their goal as returning the chemical accident or incident site to "technically achievable and acceptable conditions."

**Removal actions:**

Immediate, short-term response actions for cleanup and removal of hazardous materials, assessment of the release, and actions to protect the public such as temporary relocation (CERCLA and NCP; 40 CFR 300.65). Removal operations are coordinated by the on-scene coordinator.

**Response:**

Response activities are immediate actions taken in response to an actual or potential chemical agent release to eliminate the source of the release, lifesaving measures for affected personnel, safety measures for potentially affected personnel, and initial security measures taken to preclude the exposure of additional personnel.

**Restoration:**

Removal and decontamination of all chemical warfare agents, removal of any rubble, and emergency repair of structures and facilities. The culmination of these activities is reestablishment of major utilities and services and the return of social and economic activities to near-normal levels. The terms *recovery* and *restoration* have been used in combination to refer to the entire group of activities undertaken to prepare a previously contaminated and restricted area for unlimited re-occupation and/or use by the public.

**Restricted area or zone:**

An area with controlled access from which the population has been evacuated or relocated; any area to which access is controlled for the protection of individuals from exposure to contamination from chemical agents.

**Return:**

Refers to the reoccupation of areas cleared for unrestricted residence or use for previously evacuated populations. It includes what was termed "resettlement" in earlier draft EPA guidance.

**Sarin:**

Methyl phosphonofluoridate, isopropyl ester. It is a nonpersistent organophosphate nerve agent also known as GB. Its chemical formula is  $C_4H_{10}FO_2P$ .

**Senior FEMA official (SFO):**

The official appointed by the director of the Federal Emergency Management Agency (FEMA), or by the representative of the director of FEMA, to direct the FEMA response in a chemical accident or incident. As the lead FEMA official, the SFO will coordinate the federal agency off-site response activities and participate in the presentation of the federal protective action recommendations to the state governor or the state governor's representative.

**Service response force commander (SRFC):**

A general officer of the Army with chemical background who has been dispatched by Headquarters, U.S. Army Material Command, to the scene of a chemical accident or incident. Upon arrival, the SRFC assumes responsibility for all operations at the accident scene and commands all emergency forces.

**State coordinating officer:**

An official designated by the governor of the affected state to work with the senior FEMA official and service response officer in coordinating among federal, state, local, and private agencies.

**Sulfur mustard:**

A blister agent also known as H (or HD) for distilled mustard. GB (2-chloroethyl) sulfide. The chemical formula is  $C_4H_8Cl_2S$ .

**T:**

Bis-[2(chloroethylthio)ethyl]ether. The chemical formula is  $C_8H_{16}Cl_2OS_2$ .

**Tabun:**

N,N-dimethyl phosphoramidocyanidate, ethyl ester. This is a nonpersistent organophosphate nerve agent also known as GA. Its chemical formula is  $C_5H_{11}N_2O_2P$ .

**Unitary chemical munitions:**

Munitions designed to contain a single-component chemical agent for release on a target.

**3X, 5X:**

Levels of decontamination in use by the Army. 3X is a level of decontamination intended to indicate that the surface of an object is decontaminated; it indicates that monitoring has verified that vapor concentrations of agent adjacent to the object's surface are below certain specified levels. 5X is a level of decontamination intended to render an object safe for release to the public without restriction according to Army regulations. An approved 5X method involves heating to 1,000 °F for a minimum of 15 minutes.

**Vesicant:**

Causing blisters, or vesicles.

**VX:**

S-(2-diisopropyl aminoethyl) methyl phosphonothiolate, O-ethyl ester. This is a persistent nerve agent. Its chemical formula is  $C_{11}H_{26}NO_2PS$ .

## APPENDIX C

### STATE EMERGENCY PREPAREDNESS STATUTES

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Most states, including all of the states with territory within a CSEPP PAZ, have enacted statutes regarding emergency management. They generally specify that the governor and, at the local level, the top county executive, may exercise particular emergency powers, including the power to declare a state or local "state of emergency" and implement protective actions. Emergency services statutes also typically assign responsibility for emergency planning and preparedness to particular officials. Following is a state-by-state summary of these statutes for the ten CSEPP PAZ states (as of May 1992). In order to be useful, check the most recent statutes given by the state.

#### Alabama

Emergency management powers and responsibilities are addressed in the Code of Alabama, Title 31, Chapter 9, Sections 31-9-1 to 31-9-24. The chapter establishes the Alabama Emergency Management Agency (AEMA), whose director is to "coordinate the activities of all organizations of emergency management within the state, and ... maintain liaison with and cooperate with major commanders of the armed forces within the state, the state department of public safety, the state military department and with emergency management agencies and organizations of other states and of the federal government...."<sup>1</sup> AEMA's functions include medical and health services, rescue, communications, "radiological, chemical and other special weapons of defense," evacuation, emergency transportation, and other related functions.

The statute empowers the governor of Alabama to prepare a comprehensive emergency plan and program to be coordinated with federal and local government plans and programs to the extent possible. In a disaster, the governor may declare a state of emergency during which the governor may exercise various emergency powers, including the power to assume direct

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<sup>1</sup> Section 31-9-4(d). The term "emergency management," as defined in the statute, encompasses response to disasters "caused by enemy attack, sabotage or other hostile action, or by fire, flood, earthquake or other natural cause." Although this definition does not on its face include technological hazards, AEMA does in fact include technological hazards in its programs; for example, it has conducted planning and preparation for nuclear power plant accidents for several years.

operational control of all emergency management forces in the state, "provide for and compel the evacuation of all or part of the population from any stricken or threatened area...", control traffic, seize property for emergency response use, and perform "such other functions, powers and duties as are necessary to promote and secure the safety and protection of the civilian population." The statute also authorizes creation of local emergency management organizations by political subdivisions of the state. The local emergency management organizations may prepare local plans, in accordance with the state plan, establish local emergency operation centers, and otherwise prepare for and respond to disasters. However, there does not appear to be a local equivalent of the governor's power to declare a state of emergency. Thus, any compulsory aspects of response apparently must be initiated at the state level.

The Alabama emergency management statute bears considerable resemblance to the Kentucky statute.

### Arkansas

Emergency management in Arkansas is addressed in the Arkansas Code of 1987 Annotated, Title 12, Chapter 75. Sections 12-75-110 and 111 establish the Arkansas Office of Emergency Services (OES) and describe its powers and duties. The OES is charged with preparation and maintenance of the State Disaster Plan; coordination with the federal government, other states, and local governments; and review of local disaster plans and other emergency management activities. The statute also requires that local OESs be maintained by each county and by those municipalities that the governor determines need one. Each local OES must prepare a local emergency response plan and submit it to the state OES for approval. There is also provision for interjurisdictional plans. Two or more local units of government may agree to jointly operate an OES, or the governor may designate an interjurisdictional emergency planning district, combining two or more counties.

In a disaster, the governor is empowered to issue a declaration of disaster emergency, which activates all aspects of the disaster plan. Declaration of a disaster emergency enables the governor to exercise various emergency powers, including direct control of the resources of state and local agencies, and seizure of property (subject to compensation) needed for response. The governor may also "direct and compel the evacuation of all or part of the population from any stricken or threatened area...; prescribe routes, modes of transportation, and destinations in connection with evacuation; [and] control ingress and egress to

and from a disaster area...."<sup>2</sup> The principal executive officer of a local jurisdiction may declare a local disaster emergency, thereby activating the local plan. During the local disaster emergency, the principal executive officer may exercise powers similar to the governor's emergency powers within the local jurisdiction.

The Arkansas disaster emergency statute is generally similar to the Colorado statute.

### Colorado

Emergency management in Colorado is addressed in the Colorado Disaster Emergency Act of 1992, Colorado Revised Statute Title 24, Article 32, Part 21, Sections 24-32-2101 et seq. The Act establishes an Office of Disaster Emergency Services within the division of local government. This Office is responsible for preparing and updating the state disaster plan and for assisting in the development of local disaster plans. The Act also addresses the local emergency management structure. Each county is to maintain a disaster agency or participate in a local or interjurisdictional disaster agency. The governor is charged with deciding which municipal corporations require their own disaster agency. County disaster agencies do not have jurisdiction within municipalities that have their own disaster agency.

In emergency, the governor is to declare a state of disaster emergency, which activates the state, local, and interjurisdictional emergency plans and confers a variety of special powers upon the governor. In a state-of-disaster emergency, the governor is in command of all forces available for emergency duty and may utilize all available state and local government resources, as necessary. The governor may compel evacuation, control access to affected areas, provide for temporary emergency housing, and perform other necessary response actions. The principal executive officer of a political subdivision declares a local disaster emergency, activating local and interjurisdictional emergency plans.

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<sup>2</sup> Section 12-75-114.

## Illinois

Emergency management in Illinois is covered by the Illinois Emergency Management Agency Act, P.A. 85-1027 (1988), as amended by P.A. 87-168 (1991); codified in Illinois Revised Statute, Chapter 127, Sections 1051-1072. Section 5 of the Act establishes the Illinois Emergency Management Agency (IEMA) and describes the agency's powers and duties. IEMA is to "coordinate the overall emergency management program of the State" (Illinois Revised Statute, Section 1055(f) (1991)), including planning, assistance, and oversight of local agency planning and arrangements for staff and resources that can be called upon when needed for emergency response. The Act also provides (Section 10) for a local emergency services and disaster agency for each political subdivision of the state. Counties are the primary level for local agencies, except for municipalities with populations greater than 500,000. The Act also provides for mutual aid agreements between political subdivisions (Section 13) and for creation of mobile support teams (Section 8) that can be activated to augment agency response efforts in an emergency.

In a disaster, the governor may issue a disaster proclamation that activates the state emergency operations plan. The disaster proclamation also enables the governor to exercise special emergency powers for up to 30 days, including use of state resources as necessary to cope with the disaster, temporary or permanent seizure of property (subject to compensation), recommendation of evacuation and control of ingress and egress to and from a disaster area, and arrangements for emergency housing (Section 7). At the local level, the principal executive officer of a political subdivision may declare a local disaster that activates the local emergency operations plan (Section 11). Local disaster declarations are limited to seven days, except upon consent of the political subdivision's governing board.

## Indiana

The Indiana Civil Defense and Disaster Law of 1975, as amended, appears in the Indiana Code, Title 10, Article 4, Chapter 1, Sections 10-4-1-1 to 10-4-1-27. The Law creates the Indiana State Emergency Management Agency, which is responsible for preparing and maintaining a state disaster plan, managing all aspects of the state disaster preparedness program, and coordinating with other governmental bodies.<sup>3</sup> The Law also requires that each political subdivision within the state be

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<sup>3</sup> Section 10-4-1-5.

served by a local department of civil defense. Local governments may combine to form interjurisdictional disaster agencies. The governor may also require a political subdivision to establish and maintain a disaster agency jointly with one or more others, but only "with the concurrence of the affected political divisions."<sup>4</sup> Local disaster agencies may prepare for emergencies by recruiting response personnel, establishing emergency operations centers, and arranging for emergency supplies.

In an actual or imminent disaster, the governor may declare a state of disaster emergency. During the state of disaster emergency, the governor may exercise emergency powers, including the powers to use of all state and local government resources to cope with the emergency, commandeer private property (subject to compensation), assist in the evacuation of all or part of the population from a stricken or threatened area, prescribe evacuation routes, control access to stricken areas, and provide for temporary emergency housing. There is no provision for declaration of emergency at the local level.

### Kentucky

Disaster and emergency services management is addressed in the Kentucky Revised Statutes, Chapter 39, Sections 39.400 - 39.990. Responsibility for state emergency planning and management is delegated to the Department of Military Affairs, under the direction of the adjutant general.<sup>5</sup> At the local level, each "county, urban-county or metropolitan government, or city" is to maintain a local organization for emergency response. The judge/executive of a county, or the chief executive of a city or urban-county or metropolitan government, is responsible for appointing and overseeing the local emergency organization director. Local governments may combine in establishing joint emergency organizations. Local governments are authorized to expend funds for emergency planning and preparation, including establishing local emergency operations centers, stockpiling supplies, and employing emergency response personnel. In an emergency, they may provide local government resources and personnel to the response effort, and if the governor has declared a state of emergency, various "formalities and procedures" may be waived to expedite response efforts.<sup>6</sup>

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<sup>4</sup> Section 10-4-1-10.

<sup>5</sup> Sections 39.401 and 39.407.

<sup>6</sup> Sections 39.415 and 39.416.

In an actual or threatened emergency, the governor may declare that a state of emergency exists, activating certain supplemental powers on the part of the governor. During the state of emergency, the governor may direct and control all emergency response forces, may seize (subject to compensation) certain types of private property needed for the response effort, including means of transportation and communication, stocks of fuel, food, clothing and medical supplies, and facilities such as buildings and plants. The governor may also "exclude all nonessential personnel" from the scene of the emergency, declare curfews, and "perform and exercise such other functions, powers, and duties as may be deemed necessary to promote and secure the safety and protection of the civilian population."<sup>7</sup> There is no provision for declaration of emergency at the local level.

The Kentucky statute resembles the Alabama statute in several key respects.

### Maryland

The Maryland Emergency Management Agency Act is codified in the Annotated Code of the Public General Laws of Maryland, Article 16a, Sections 1-36. The Act establishes the Maryland Emergency Management Agency (MEMA) within the state Military Department. The state adjutant general appoints the MEMA director. The director is responsible for carrying out the state emergency management program, and for coordinating implementation of response measures in an emergency. The governor is assigned general direction and control of MEMA, but may delegate "such powers as he may see fit" to the adjutant general or the director.<sup>8</sup> At the local level, "each political subdivision of [the] state is to establish a local organization for emergency management in accordance with the state emergency plan and program and shall participate in federal programs for emergency management."<sup>9</sup> The directors of the local organizations are appointed by the governor upon recommendation of the local mayor, executive, or governing body. And, the local organization is to "include such positions and program as may be recommended from time to time by the Maryland Emergency Management Agency to meet federal and state standards, subject to the budgets of the local jurisdictions."

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<sup>7</sup> Section 39.409.

<sup>8</sup> Section 6.

<sup>9</sup> Section 7.

In an actual or threatened emergency, the governor may declare a state of emergency. The state of emergency activates state and local emergency plans and authorizes deployment and use of resources to implement it. It also confers additional powers upon the governor, including the power to direct and compel evacuation of all or part of the population from any stricken or threatened area, set evacuation routes and destinations, control access to the emergency area, authorize use of private property (subject to compensation), and provide for temporary housing. There is no equivalent power to declare emergencies at the local level.

### Oregon

The legal framework for emergency management in Oregon is described in the Oregon Revised Statutes Annotated, Chapter 401, Sections 401.015-401.990. The governor is allocated responsibility for the state emergency services system, assisted by the state Emergency Management Division (EMD). The EMD is responsible for coordinating the activities of all public and private emergency services agencies within the state and for establishing a liaison with other states and the federal government.<sup>10</sup> At the local level, the executive officer or governing body of each county or city is responsible for the emergency services system within that jurisdiction. Each county must, and each city may, establish an emergency management agency directly responsible to the executive officer or governing body of the county or city. The functions of local emergency management agencies are stated generally as "emergency program management functions."<sup>11</sup>

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<sup>10</sup> Sections 401.260 and 270.

<sup>11</sup> Section 401.305.

The governor may declare a state of emergency at the request of a county governing body or after determining that an emergency has occurred or is imminent. The declaration must describe the geographical area covered, which must be no larger than necessary to effectively respond to the emergency. During a declared emergency, the governor may exercise direct control over state agency resources and operations to effect response and recovery measures. The governor may also assume control of local law enforcement agencies, direct all rescue and salvage work, close roads and limit access to the emergency area, arrange for temporary housing, and "do all things deemed advisable and necessary to alleviate the immediate conditions."<sup>12</sup> There is no equivalent power to declare emergencies at the local level.

## Utah

Emergency management is addressed in Utah Code Annotated, Title 63, Chapters 5 and 5a. The statute establishes a Division of Comprehensive Emergency Management within the Department of Public Safety and charges it with the responsibility to "prepare, implement and maintain programs and plans" for disaster prevention and response, including assistance to local officials in designing local plans, and coordination of emergency operations plans with the federal government. It also establishes the Hazardous Chemical Emergency Response Commission, pursuant to SARA III, consisting of the executive directors of the Department of Public Safety and the Department of Environmental Quality. The Department of Public Safety is charged with primary responsibility for emergency planning, whereas the Department of Environmental Quality is designated as the primary agency for processing the information requirements of SARA. The Commission is responsible for establishing local emergency planning districts and appointing local emergency planning committees.

Emergency powers are assigned to the governor and to the principal executive officer of a political subdivision. They can declare a state or local state of emergency during which they are empowered to, among other things, employ all government personnel and resources as reasonably necessary to cope with the emergency; recommend evacuation, including routes and destination; control access to evacuated areas; and arrange for temporary housing of evacuees.

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<sup>12</sup> Sections 401.055 through 401.115.

## Washington

Emergency management in Washington is addressed in the Revised Code of Washington, Title 38, Chapter 38.52 (1991). Section 38.52.005 places responsibility for state emergency management within the Washington Department of Community Development. The director of community development is charged with carrying out the state emergency management program, subject to the direction and control of the governor. The director's enumerated duties include, among other things, developing and maintaining an all-hazard state emergency plan; managing related training and public information programs; serving as liaison with political subdivisions, other states, and the federal government; managing response operations; and appointing a state coordinator for radioactive and hazardous waste emergency response programs (Section 38.52.030). The statute also provides for the Emergency Management Council, a panel of experts whose duties include advising the governor and director on matters pertaining to emergency management and arbitrating disagreements between local and state agency staff on emergency planning. The Washington Code also provides for local emergency management organizations to be administered by local directors under the direction of the local executive head.

The governor is assigned general responsibility for control and implementation of emergency management functions. In a disaster beyond local control, the governor may assume direct operational control of all or part of any emergency management functions within the state (Section 38.52.050). In carrying out emergency response functions, the governor and executive heads of political subdivisions are to use the resources of state and local government to the extent practicable but are also authorized to "command the service and equipment of as many citizens as considered necessary" in light of this disaster, but only after the governor has issued a proclamation of disaster (Section 38.52.110). The Revised Code of Washington, Section 43.06.010, describes the governor's power to declare a state of emergency.

At the local level, political subdivisions also are authorized to bypass normal governmental procedures for procurement, hiring, and the like in order to carry out emergency response functions in an "extreme emergency situation" (Section 38.52.070).

## APPENDIX D

### STATE LIABILITY PROTECTION

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All of the CSEPP protective action zone states have statutory immunity provisions that would apply to at least some aspects of emergency management. Most of the states have provisions in their emergency management statutes that specifically address the issue of liability for agencies and personnel carrying out emergency management activities. Where there is no such provision, the issue is governed by the state's general law of liability for government agencies and employees. Below are summaries of the statutory liability provisions applying to emergency management activities in each CSEPP protective action zone host state (as of May 1992). Check in your state to ensure these are the latest summaries.

#### Alabama

The Alabama statute addresses the liability issue in considerable detail. It provides that all activities carried out pursuant to the Alabama emergency management statute are designated as "governmental functions" and thus immune from suit. It specifically defines the scope of the immunity as applying to the state, political subdivisions of the state, state and local government agencies, individuals, partnerships, corporations, and "emergency management workers" engaged in emergency response. The term "emergency management worker" is defined to include all full- or part-time paid, volunteer, and auxiliary employees, including employees of other states or the federal government who come in to assist at the request of Alabama. Immunity also applies to those who voluntarily provide shelter for evacuees. The statute also waives license requirements for emergency workers performing any "professional, mechanical or other skill" that would normally require one.<sup>1</sup>

The Alabama emergency management immunity provision is similar to those of Arkansas and Indiana.

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<sup>1</sup> Code of Alabama, Sections 31-9-16,17.

## Arkansas

The immunity provided by the Arkansas statute<sup>2</sup> is the same as that provided by the Alabama statute (see summary immediately above) with one difference: in Arkansas, the license waiver does not apply to medical licenses, except in cases of first aid treatment.

## Colorado

Colorado provides personal immunity for "state employees and agents" providing disaster relief<sup>3</sup> and for owners of property used in an emergency or in a drill or exercise.<sup>4</sup> The Colorado statute does not immunize the state, however; it provides that the state of Colorado will be liable for damages to persons and property caused by actions performed in good faith to carry out the functions described in the Disaster Emergency Act. Colorado also promises to indemnify civil defense workers against liability for actions taken in good faith in pursuit of civil defense duties.

## Illinois

Section 15 of the Illinois Emergency Management Agency Act (Illinois Revised Statute, Chapter 127, Section 1065 (1991)) provides immunity from liability for the state and political subdivisions when carrying out its provisions, and similarly for executives and response personnel, "except in cases of negligence or willful misconduct." The statute specifically provides, however, that political subdivisions and principal executive officers must establish an emergency services and disaster agency, as provided in Section 10 of the Act (Illinois Revised Statute, Chapter 127, Section 1060 (1991)) in order to enjoy this immunity.

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<sup>2</sup> Arkansas Code Annotated, Sections 12-75-125, 128.

<sup>3</sup> Colorado Revised Statutes, Section 24-33.5-1108.

<sup>4</sup> Section 24-33.5-902.

## Indiana

The Indiana Civil Defense and Disaster Law, as amended, provides for immunity for governmental entities and personnel engaged in emergency response.<sup>5</sup> The provisions of the Indiana law are essentially the same as those of the Alabama law.

## Kentucky

The Kentucky statute provides immunity for those engaged in emergency management activities, including state and local employees and volunteers.<sup>6</sup>

## Maryland

The Maryland emergency management statute does not specifically address the issue of liability for emergency management activities. However, other Maryland statutes bear on the issue. The Annotated Code of Maryland, Section 12-105, provides generally that state personnel are immune from tort liability for actions taken within the scope of their public duties. Section 5-309.1 provides immunity for fire and rescue companies and their personnel for actions taken in the course of performing their duties.

## Oregon

The Oregon statute provides immunity for state and local governments, their employees, and "emergency service workers" engaged in emergency services activity, but only for actions undertaken *during the existence of an emergency*; this provision would not appear to cover planning and preparation performed prior to an emergency.<sup>7</sup> "Emergency service worker," as defined in the statute, includes volunteers acting under the direction of an emergency service agency and members of the Oregon National Guard Reserve.

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<sup>5</sup> West's Annotated Indiana Code Section 10-4-1-8, Cumulative Annual Pocket Part for 1989.

<sup>6</sup> Kentucky Revised Statutes, Section 39.433.

<sup>7</sup> Oregon Revised Statutes Annotated, Section 401.515.

## Utah

The Utah emergency management statute does not address the issue of liability for emergency management activities. However, the issue is addressed in another Utah statute, the Governmental Immunity Act.<sup>8</sup> That statute provides immunity for all governmental entities for injury caused by employees acting within the scope of their employment if the injury, "...arises out of the activities of: (i) providing emergency medical assistance; (ii) fighting fire; (iii) regulating, mitigating, or handling hazardous materials or hazardous waste; or (iv) emergency evacuations...."<sup>9</sup> It is not clear from this statute whether the scope of immunity in Utah would include predisaster planning and preparation, the actions of volunteers, or owners of property being used for sheltering evacuees.

## Washington

The Revised Code of Washington, Title 38, Chapter 52, Section 38.52.180 provides that all legal liability for acts done to carry out emergency management functions pursuant to Washington law will be the obligation of the state, except in cases of gross negligence or willful misconduct. Section 38.52.180 exempts emergency services in good faith. Members of the State Emergency Response Commission or a Local Emergency Planning Committee (committees created pursuant to SARA Title III) acting in good faith, are exempt from liability for any errors or omissions in the development, review, or implementation of hazardous materials plans, under Section 4.24.480.

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<sup>8</sup> Utah Code Annotated, Title 63, Chapter 30, as amended.

<sup>9</sup> Section 63-30-10-1(l).

## APPENDIX E

### SITE BACKGROUND

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In the event of a chemical agent release during any stage of the storage or disposal process, the potential for contamination of water, soil, forage crops, grains, garden produce and livestock exists. Persistent agents, such as VX or the mustards, pose the greatest health concern for post-incident reentry (reference 24). Table E-1 provides agent stockpile characteristics for each installation. Chemical and physical properties of each agent are summarized in Table E-2. The user needs to become familiar with, and select appropriate information from, these two tables for characterizing the potential hazard at their local installation.

One recent example of how poor knowledge of local stockpile characteristics resulted in potentially life-threatening decisions by local officials comes from the SRFX-91 experience at TEAD (Tooele Army Depot in Utah). The mock accident scenario was an explosive release of mustard agent that winds carried off-post into an agricultural area. When pet owners and herdsman requested decontamination and treatment advice from a state agency, they were provided information specific to nerve agents, rather than sulfur mustard. If this had been an actual emergency, valuable time would have been lost on ineffectual treatments, and the risk of cross-contamination, serious injury or death to animals and their owners would have been great.

Knowledge of the area where a chemical event occurs is critically important during recovery and reentry. Table E-3 provides some location-specific elements that should be characterized, as well as some sources for necessary data. This table is presented as a draft planning checklist that should be reviewed by local planning authorities and "tailored" to fit local considerations. If existing installation or other location-specific environmental monitoring programs have already generated maps marked with monitoring points such as wells or air sampling stations, these data should be integrated into characterization of each location (including on- and off-post areas). It is absolutely essential that standardized maps be readily available for use by reentry planners and at each installation. These maps should include **compatible scales**, the installation boundary lines, current monitoring stations for stockpiled agents, stockpile storage locations, surface water bodies, sources of local drinking water, populated areas, and any information related to crop and livestock locations. It is further recommended that critical off-post sampling points be pre-determined and identified on all

available maps. Such pre-planning will expedite management of initial screening data collected for monitoring agent movement or transport. There may be other information not identified in Table E-3 that the user will find helpful; the authors of this document encourage resourcefulness.

Table E-1 Stockpile Composition at Storage Sites<sup>a</sup>

Location	Percentage of Stockpile	Type of Agent <sup>b</sup>	Type of Munitions
Aberdeen Proving Ground, Maryland	5.1	H	Ton containers
Anniston Army Depot, Alabama	7.2	H, GB, VX	Projectiles, cartridges, rockets, mines, ton containers
Johnston Island, U.S. Pacific Territory	6.5	H, GB, VX	Bombs, projectiles, rockets, mines, ton containers
Lexington-Blue Grass Army Depot, Kentucky	1.7	H, GB, VX	Projectiles, rockets, ton containers
Newport Army Ammunition Plant, Indiana	4.0	VX	Ton containers
Pine Bluff Arsenal, Arkansas	12.6	H, GB, VX, HN <sup>c</sup>	Rockets, mines, ton containers, cartridges
Pueblo Depot Activity, Colorado	8.3	H	Projectiles, cartridges
Tooele Army Depot, Utah	42.8	H, GB, VX, GA, L	Bombs, projectiles, cartridges, rockets, mines, ton containers spray tanks
Umatilla Depot Activity, Oregon	11.8	H, GB, VX	Bombs, projectiles, rockets, mines, ton containers, spray tanks

<sup>a</sup>Fact sheet; Office of Public Affairs, U.S. Army Armament, Munitions and Chemical Command (USAMCCOM), Rock Island, IL.

<sup>b</sup> H Sulfur mustard (blister agent)  
 L Lewisite (blister agent)  
 GB Sarin (non-persistent nerve agent)  
 GA Tabun (non-persistent nerve agent)  
 VX (persistent nerve agent)

<sup>c</sup> A number of captured German WWII rockets containing nitrogen mustard (HN) are included in the Pine Bluff unitary stockpile.

Table E-2 Chemical and physical properties of chemical munitions

	GA <sup>a,b</sup>	GB <sup>a,b</sup>	VX <sup>c,d</sup>
Chemical name	N,N-dimethyl phosphoramido-cyanidate, ethyl ester	Methyl phosphonofluoridate, isopropyl ester	S-(diisopropyl aminoethyl) methyl phosphonothiolate, O-ethyl ester
Chemical formula	C <sub>7</sub> H <sub>11</sub> N <sub>2</sub> O <sub>2</sub> P	C <sub>4</sub> H <sub>10</sub> FO <sub>2</sub> P	C <sub>11</sub> H <sub>26</sub> NO <sub>2</sub> PS
Chemical Abstract (CAS) No.	77-81-6	107-44-8	50782-69-9
Molecular weight	162.1	170.1	267.4
Description	Colorless, odorless liquid	Colorless, odorless liquid	Colorless, odorless liquid
Melting point	-50°C	-56°C	-39°C (calculated)
Boiling point	245°C	158°C	298°C
Density (liquid)	1.08 g/mL (25°C)	1.09 g/mL (25°C)	1.0083 g/mL (25°C)
Volatility	610 mg/m <sup>3</sup> (25°C)	2.2 x 10 <sup>6</sup> mg/m <sup>3</sup> (25°C)	10.5 mg/m <sup>3</sup> (25°C)
Solubility, water	98 g/L (25°C), miscible	Miscible	30 g/L (25°C) 75 g/L (15°C) miscible <9.4°C
Solubility, other	Very soluble in most organic solvents	Readily soluble in organic solvents	Readily soluble in organic solvents
Biological activity	Lethal anticholinesterase agent	Lethal anticholinesterase agent	Lethal anticholinesterase agent

<sup>a</sup>Department of the Army 1974. Note that agent GA and L are stockpiled in small quantities as ton containers at one installation and are not available in munition form. These data are provided for the sake of completeness.

<sup>b</sup>Windholz et al. 1983.

<sup>c</sup>Fox and Scott 1980.

<sup>d</sup>Department of the Army and U.S. Air Force 1975.

Table E-2 Chemical and physical properties of chemical munitions (continued)

	II, HD <sup>a,c</sup>	III <sup>a,b</sup>	Lewisite <sup>a,b</sup>
Chemical name	Bis(2-chloroethyl)sulfide	Plant-run mixture containing about 60% HD and <40% "T" or Bis-[2(2-chloroethylthio)ethyl]ether	Dichloro(2-chlorovinyl)arsine
Chemical formula	C <sub>4</sub> H <sub>8</sub> Cl <sub>2</sub> S	"T" = C <sub>8</sub> H <sub>16</sub> Cl <sub>2</sub> OS <sub>2</sub>	C <sub>2</sub> H <sub>2</sub> AsCl <sub>2</sub>
Chemical Abstract (CAS) No.	505-60-2	"T" = 63918-89-8	541-25-3
Molecular weight	159.1	"T" = 263.26	207.31
Description	Oily, pale yellow liquid	Clear, yellowish liquid	Liquid with faint odor of geranium
Melting point	13-15°C	0-1.3°C	0.1°C (purified form) (-18.0 to 0.1°C, depending on purity and isomers present) <sup>d</sup>
Boiling point	215-217°C	>228°C (not constant)	190°C
Density (liquid)	1.27 g/mL (25°C)	1.27 g/mL (25°C)	1.89 g/mL (20°C)
Volatility	920 mg/m <sup>3</sup> (25°C)	831 mg/m <sup>3</sup> (25°C)	6.5 x 10 <sup>3</sup> mg/m <sup>3</sup> (25°C)
Solubility, water	0.68-0.92 g/L (25°C)	Insoluble	Insoluble (slightly soluble in distilled water)
Solubility, other	Very soluble in organic solvents	Soluble in organic solvents	Soluble in ordinary organic solvents
Biological activity	Lethal blister agent	Lethal blister agent	Lethal blister agent

<sup>a</sup>Department of the Army 1974. Note that agent GA and L are stockpiled in small quantities as ton containers at one installation and are not available in munition form. These data are provided for the sake of completeness.

<sup>b</sup>Windholz et al. 1983.

<sup>c</sup>Fox and Scott 1980.

<sup>d</sup>Department of the Army and U.S. Air Force 1975.

Table E-3 Examples of Location-Specific Information Needed

Parameter	Civilian	Military
Demographics (day & night, seasonal) <sup>a,b</sup>	Schools Hospitals Manufacturing areas Retail stores Residential Seasonal workers Air, bus, train stations Baseball stadium, etc. Seasonal gatherings (county fairs) Police stations Fire stations Emergency operations centers	Administration area Food service Motor pool Residential Operations areas Guard posts Open house on post Tenant activities
Land use <sup>c,d</sup>	Pasture—horse, cow, sheep, etc. Crop land—corn, soybeans, tree, sod, etc. Hay land Manufacturing Retail stores Wildlife refuge/parks Athletic fields Vegetable gardens	Pasture—horse, cow, sheep, etc. Crop land—corn, soybeans, etc. Hay land Manufacturing Retail stores Residential Athletic fields Storage
Land Characteristics <sup>e,f</sup>	Types of soil <sup>g</sup> Rock formations Plants & trees Special geologic conditions Elevations	Types of soil <sup>g</sup> Rock formations Plants & trees Special geologic conditions Elevations
Transportation Resources <sup>h,i</sup>	Routes—rail, air, motor, river Equipment Critical bridges	Routes—rail, air, motor, river Equipment Critical bridges
Water characteristics <sup>k,l</sup> (including special seasonal variations)	Surface waters Ground waters Water treatment facilities (i.e., primary, secondary, or tertiary) potable, sewage Flood areas Wetlands pH Temperature Sources of irrigation, stock water, recreation	Surface waters Ground waters Water treatment facilities (potable, sewage) Flood areas Wetlands pH Temperature Sources of irrigation, stock, water, recreation

Table E-3 Examples of Location-Specific Information Needed (Continued)

Parameter	Civilian	Military
Food of Animal Origin	Cattle herds Poultry farms for meat/egg production Commercial fish & shellfish operations	Cattle herds Game birds and mammals
Meteorological Characteristics <sup>a</sup>	Precipitation (type, quantities) Temperature (water, air, ground) Wind-speed/direction Unusual weather patterns	Precipitation (type quantities) Temperature (water, air, ground) Wind-speed/direction Unusual weather patterns
Buildings and structures (location)	Residential Institutional (schools, hospitals, etc.) Exterior construction materials	Residential Institutional Exterior construction materials

Likely sources of needed information:

<sup>a</sup>Civilian: local, county and state offices, assessor, police, fire, environmental.

<sup>b</sup>Military: comptroller, environmental, provost marshal, fire offices, buildings and ground offices.

<sup>c</sup>Civilian: tax assessor, police, fire.

<sup>d</sup>Military: buildings and grounds, fire, environmental offices.

<sup>e</sup>Civilian: state environmental office, fire; schools and universities in the area.

<sup>f</sup>Military: environmental office, buildings and grounds, National Pollutant Discharge Elimination System (NPDES) and Resource Conservation and Recovery Act (RCRA) permits.

<sup>g</sup>Civilian or Military: pH, clay/organic matter content, permeability, water content, bacteria and microfauna, as available.

<sup>h</sup>Civilian: emergency personnel such as fire, police, Chambers of Commerce.

<sup>i</sup>Military: environmental, logistics, transportation offices.

<sup>j</sup>Sizes and types available, i.e., truck, backhoe, grader, etc.

<sup>k</sup>Civilian: water, sewer departments, county planning commission, state environmental offices. NPDES Permits.

<sup>l</sup>Military: Environmental, buildings and grounds, engineering and housing offices. NPDES Permits.

<sup>m</sup>National Weather Service, universities, state offices, Army facility, etc.

## **APPENDIX F**

### **RECOVERY/REENTRY SAMPLING**

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This appendix provides some general information on sample handling and analyses to acquaint the users of this sourcebook with the resources and personnel capabilities required to manage this key area of reentry/restoration response.

There are four sections contained in this appendix:

1. Sample Handling and Analysis
2. Key Contacts
3. Analytical Program and Surety Laboratories
4. Monitoring Equipment

#### **SECTION 1: SAMPLE HANDLING AND ANALYSIS**

It is important for decision-makers and planners to understand that obtaining accurate and reliable laboratory results after any chemical agent event will require at least several days. This time lag needs to be incorporated into response decisions *re* mass care, security of suspect area, caretaker teams for livestock and pet care, etc.

In accordance with DA policy as stated in Army-FEMA correspondence of December 1991 (E. K. Azuma, OASA, DA, The Pentagon, Washington, D.C., letter to D. E. Kohl, Chemical Preparedness Division, FEMA, Washington, D.D., 24 December 1991) and CSEPP Policy Paper #2 (CSEPP 1992), the Department of the Army, as the On-Scene Coordinator, will be responsible for sampling soil, air and water to analyze for contamination by chemical agents on- and off-post in a post-incident situation. This environmental sampling is to be conducted in accordance with all applicable regulatory standards. State participation in monitoring is to be as observers of procedures and reviewers of data and records. State personnel will not be physically collecting or conducting independent analyses of environmental samples. (See Table F-1 as an example to follow in developing a site-specific sampling plan).

##### **1.1 Sample Handling**

Deciding where to take a sample so as to obtain real/best information is critical; however, if correctly taken samples are not handled properly, the sample results may be invalid. Therefore, handling of samples must be planned and necessary resources obtained before the first samples are collected.

Samples should be kept cool (at 4° C or less) and out of direct sunlight, and handled quickly. The U.S. EPA prescribes specific limits for holding environmental samples (40 CFR Part 261. App II [8]) and the U.S. Army follows these guidelines during agent sample handling. During an agent

release situation, quick turnaround times will be required. Some specific guidelines for handling and packaging various sample types are detailed in Simini (1992), Sadusky (1992), and (U.S. EPA (1989 a,b).

Depending on the magnitude of the agent release event, samples may have to be shipped to other laboratories for analyses. The (U.S. EPA) provides exception to requirements for RCRA permits to allow shipment of samples, (air, water, soil, or solid waste), which are collected for the sole purpose of testing to determine their characteristics or composition. (40CFR261.4d)

Transportation of these samples is specified by 49CFR172.101 (c) (11) which states "a material for which the hazard class is uncertain and must be determined by testing may be assigned a tentative shipping name, hazard class and identification number based on . . . the shipper's tentative determination according to the shipper's knowledge of the material." Packaging will usually consist of bottles with lids sealed with Parafilm™, and/or plastic bags, each overpacked in a second plastic bag, packed inside a cooler with dry ice or other coolant, and the ice chest overpacked in a wooden box. Marking, labeling and any placarding, if required, will be in accordance with appropriate portions of 49CFR. Properly completed shipping documents and chain of custody documents will accompany the shipment.

If air shipment is required due to 49CFR requirements or to ensure analysis can occur as quickly as possible, U.S. Army or other DoD aircraft can be used, with personnel accompanying the shipment to insure quick delivery.

## 1.2 Chain of Custody

A chain of custody program must be an integral part of sample handling to ensure sample results are valid. The program must provide absolute accountability for each sample as well as associated analytical results. Sample logs must describe sampling location and conditions under which samples were collected. A sample numbering system must be established to prevent sample mix-up, and a unique number must be assigned to each particular sample. Samples should be sealed to protect their integrity and provide a custody trail. Analytical laboratory logs are used to record sample numbers, conditions of analysis, and analytical results for each unique sample.

Custodians must be established at each location where samples will be held, and a chain-of-custody log used to provide a trail of sample movement. Two guides recently published by CRDEC (Simini 1992; Sadusky 1992) provide appropriate chain-of-custody procedures, as does the U.S. EPA (1986).

**TABLE F-1 PROTOTYPE SAMPLING PLAN OUTLINE**

1. Project Description
2. Quality Assurance Roles and Responsibility
  - 2.1 Responsibility and resources
3. Quality Assurance Objectives
  - 3.1 Representativeness
  - 3.2 Completeness
  - 3.3 Comparability
  - 3.4 Precision
  - 3.5 Accuracy
  - 3.6 Reporting
4. Field Procedures
  - 4.1 Field measurements and screening protocols
  - 4.2 Soil sampling
    - 4.1.1 Field screening soil sampling procedures
  - 4.3 Ground- and surface-water sampling
    - 4.2.1 Existing monitoring wells
    - 4.2.2 Domestic wells
    - 4.2.3 Surface streams and reservoirs
  - 4.4 Sediment sampling
  - 4.5 Vegetation sampling
  - 4.6 Food crop sampling
  - 4.7 Meat and milk sampling
  - 4.8 Decontamination procedures
    - 4.7.1 Sampling equipment
    - 4.7.2 Monitoring equipment
    - 4.7.3 Protective clothing and equipment
  - 4.9 Sample labels and records
5. Sample Collection and Management
  - 5.1 Sampling Objectives
  - 5.2 Sample design(s)
    - 5.2.1 Sample sites
  - 5.3 Sample containers
    - 5.3.1 Precleaned sample containers
      - 5.3.1.1 Amber glass bottles and wide-mouth, clear glass jars
      - 5.3.1.2 40 ml borosilicate glass vials
  - 5.4 Sample preservation
  - 5.5 Sample holding
  - 5.6 Sample shipment

**TABLE F-1 PROTOTYPE SAMPLING PLAN OUTLINE (CONTINUED)**

- 6. Sample Custody
  - 6.1 Laboratory custody
  - 6.2 Sample security, storage, and disposal
- 7. Calibration Procedures
  - 7.1 Field measurements
  - 7.2 Laboratory measurements
- 8. Analytical Procedures
  - 8.1 Laboratory certification
  - 8.2 Laboratory equipment decontamination
  - 8.3 Reference standards and calibration frequency
  - 8.4 Sample preparation
  - 8.5 Analytical methods
    - 8.5.1 VX
    - 8.5.2 GA
    - 8.5.3 GB
    - 8.5.4 H/HD/HT
    - 8.5.5 L
    - 8.5.6 Agent breakdown products
- 9. Data Reduction, Validation and Reporting
  - 9.1 Field measurement data
  - 9.2 Laboratory data
    - 9.2.1 Record keeping and review
    - 9.2.2 Raw data storage
  - 9.3 Data procession and collection
    - 9.3.1 Reduction
    - 9.3.2 Validation
    - 9.3.3 Reporting
    - 9.3.4 Control charts
  - 9.5 Document control
  - 9.6 Out-of-Control situations
- 10. Internal Quality control
  - 10.1 Measurement systems
    - 10.1.1 Trip blanks
    - 10.1.2 Reinstate samples
  - 10.2 Background samples
  - 10.3 Completeness

**TABLE F-1 PROTOTYPE SAMPLING PLAN OUTLINE (CONTINUED)**

- 11. Audits
  - 11.1 Performance audits
  - 11.2 System audits
  - 11.3 Documentation and reporting audits
- 12. Preventive Maintenance
  - 12.1 Calibration identification
  - 12.2 Calibration standards
- 13. Data Management
- 14. corrective Actions
  - 14.1 Laboratory corrective action
- 15. Quality Control Reports
- 16. References Cited

**APPENDIX F**  
**RECOVERY/REENTRY SAMPLING**

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**Section 2. Key Contracts**

Telephone numbers of key contact persons and organizations, including hotline numbers, should be accessible to all staff.

**I. SELECTED FEDERAL GOVERNMENT AND NATIONAL PRIVATE ORGANIZATIONS**

<u>Information Source</u>	<u>Telephone No.</u>
National Response Center Hotline . . . . .	800-424-8802
. . . . .	202-426-2675
EPA's SARA/Chemical Emergency . . . . .	800-535-0202
. . . . .	202-479-2449
EPA's Public Information Center . . . . .	202-382-2080
National Pesticides Telecommunications Network . . . . .	800-858-7378
(Texas) . . . . .	806-743-3091
Hazardous Materials Information Exchange (HMIX)	
Information . . . . .	800-752-6367
(in Illinois) . . . . .	800-367-9592
. . . . .	708-972-3275
EPA's RCRA Ombudsman Program . . . . .	202-475-9361
EPA's RCRA/Superfund Hotline . . . . .	800-424-9346
. . . . .	202-382-3000
EPA's Safe Drinking Water Hotline . . . . .	800-424-9346
. . . . .	202-382-5533
EPA's Toxic Substances Control Act Hotline . . . . .	202-554-1404
American Council of Government Industrial Hygienists . . . . .	513-825-0312

CHEMTREC . . . . .	800-424-9300
CMA CAER Information Line . . . . .	202-463-1599
CMA Chemical Referral Center . . . . .	800-262-8200
Department of Transportation Hotline . . . . .	202-426-2075
Government Refuse collection and Disposal Association . . . . .	301-585-2898
Institute of Chemical Waste Management . . . . .	202-659-4613
National Solid Waste Management Association . . . . .	202-659-4613
U.S. Occupational Safety and Health Administration . . . . .	202-561-2221

## II. PROFESSIONAL RESOURCES

Some of the following organizations may be able to provide additional information or may be able to refer you to regional/local offices for information specific to your area. It is suggested that you identify numbers and points of contact for state and local resources to keep on hand as part of your R&R plan. These names and numbers should be checked and updated regularly (yearly).

American Chemical Society (includes: Agrochemical div, Environmental Div, Chemical Safety and Health Div, and the Analytical Div)

1155 16th Street NW  
Washington D.C. 20036  
202-872-4600

American Conference of Governmental Industrial Hygienists (ACGIH)

Bldg D-7  
6500 Glenway Avenue  
Cincinnati, OHIO 45211-4438  
513-661-7881

American Industrial Hygiene Association (AIHA)

PO Box 8390  
345 White Pond Drive  
Akron, OHIO 44320  
216-873-2442

American Farm Bureau Federation

225 Touhy Avenue  
Parkridge, Illinois 60068  
312-399-5700

Chemical Manufacturer's Association

2501 M Street NW  
Washington, D.C. 20037  
202-887-1100

National Agricultural Chemical Association (NACA)

1155 15th Street NW -- Suite 900  
Washington, D.C. 20005  
202-296-1585

National Food Processors Association

1401 New York Avenue NW -- Suite 400  
Washington, D.C. 20005  
202-639-5900

National Pest Control Association  
8100 Oak Street  
Dunnloring, VA 22027  
203-573-8330

In addition, the following types of associations/professional organization may exist in your area and should be identified. Specific names and numbers should be included in the R&R Plan; these should also be updated regularly.

Crop Growers' Associations

Herdsmen's associations (Cattlemen, Dairy, etc.)

Veterinary Associations

### III. TECHNICAL RESOURCES

Telephone numbers and addresses are current as of September 1992. Users are urged to update this contact information periodically.

Fitzsimmons Army Hospital--ChE baseline and test analyses. POC is

Cholinesterase Laboratory Division  
USAEHA West  
HSHB-AW-C  
Fitzsimmons Army Medical Center  
Aurora, CO 80045-5001  
DSN 943-3318  
Comm. (303) 361-3318 (switchboard)  
(303) 361-4838 (official)

### IV. INSTITUTIONAL RESOURCES

Reentry/Restoration Working Group members-see title page of this document.

Regional Response Teams--obtain from FEMA regional offices of your State Emergency Response Coordinator; see also *Hazardous Materials Emergency Planning Guidance* of March 1987.

Local Installations--Surety Officer and Environmental Officer at each installation.

U.S. Department of the Army Technical Escort Unit-POC SMCTE-OP, Mark Fisher, (410) 671-4381.

Local universities--list the universities near you and identify appropriate departments/staff who can provide technical support (for example, planners near NAAP could access Purdue and Indiana Universities and the University of Illinois).

U.S. Department of Agriculture (USDA)--obtain telephone numbers and POCs for your local Agricultural Extension Service, Food and Agricultural Emergency Boards, Soil Conservation Service, Food Safety and Inspection Service, etc.

State agencies--obtain telephone numbers and POCs of appropriate agencies such as Departments of Health, Environment, Agriculture, Emergency Planning, etc.; the Office of the State Medical Examiner, Office of the Governor, etc. In the states of Indiana and Oregon, information of this nature from the states of Illinois and Washington respectively, will be useful.

## V. BIBLIOGRAPHIC RESOURCES

Reentry/Restoration Working Group Technical Support Bibliography

CAIRA Plan--Installation and Programmatic (DA 1991) versions

CDC Workshop report--"Results of a Workshop Meeting to Discuss Protection of Public Health and Safety During Reentry into areas Potentially Contaminated with a Lethal Chemical Agent (GB, VX, or Mustard Agent)." Copies may be obtained upon request to Linda Anderson, Chief, Special Programs Group, Center for Environmental Health and Injury control (F29), Centers for Disease Control, 1600 Clifton Road NE, Atlanta, Georgia 30333

Local Telephone books

National Contingency Plan [National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR 300, 55 FR 8666 (March 8, 1990)]

Regional guidance under the National Contingency Plan

State regulatory accident response guidance

Fact/Advisory sheets generated by the DA/FEMA (as CRDEC 1990)

Material Safety Data Sheets (MSDSs) for chemical agents--available from CRDEC, SMCCR-CMS-E, Aberdeen Proving Ground, MD 21010-5423

Equipment manuals

Instruction books

Automated databases--such as GIS (Geographic Information System, which is available at some installations) and TYGER files

*Chemical Stockpile Disposal Program Final Programmatic Environmental Impact Statement* (DA 1988)--Chapter 3 contains good information on existing environments at and near each installation

Site-specific environmental documents generated for NPDES (National Pollutant Discharge Elimination System/U.S. EPA), Chemical Stockpile Disposal, etc.

### Section 3. Analytical Program and Laboratories

#### I. PURPOSE

The purpose of the analytical program is to make suitable provision for and conduct laboratory analyses of samples. Protocol for the analytical program should cover laboratory receipt of samples, analytical methodology, quality assurance and quality control (QA/QC), and data reporting.

#### II. CONCEPTS

Adequate laboratory resources and any needed regulatory review and approval of analytical methods must be arranged in advance--there will not be time enough during an emergency. The Recovery Plan should include a listing of laboratories capable of dealing with samples of the types that may be encountered in a chemical accident or incident (CAI). (Such laboratories would require a surety capability.) The listing should include both laboratories at Army chemical storage facilities and commercial laboratories (see Tables F-1 and F-2). Accessory information on the capabilities of support laboratories for sample analysis should also include: agents, media, analytical techniques used, rate of sampling, and cost per sample. This information on the identified laboratory network will allow estimation of the total capacity for sample analysis (sample analysis rate).

For organizations with a laboratory capability, information on analytical procedures for analysis of samples is summarized in *Chemical Accident or Incident Response and Assistance (CAIRA) Operations*.<sup>1</sup>

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<sup>1</sup> *Chemical Accident or Incident Response and Assistance (CAIRA) Operations*, Pamphlet 50-6, Headquarters, U.S. Department of the Army (May 17, 1991).

Table F-2  
 Surety, Environmental, Safety, and Laboratory Officers at  
 Each of the Eight Unitary Installations (as of September 1992)

Surety POC	Environmental POC	Safety POC	Laboratory POC
Anniston Army Depot, Anniston, AL 36201-5046 Mr. Tony Burdell SDSAN-CS DSN 571-7577 205-235-7577 FAX 6664/4630	Mr. Ron Grant SDSAN-DEL-EMD DSN 571-6350 205-235-6350 FAX 571-7726	Mr. Sonny Smith SDSAN-SF DSN 571-7541 205-235-7541 FAX 571-6997	Mr. Bob Phillips SDSAN-DL-EMD DSN 571-7241 205-235-7241 FAX 571-7726
Aberdeen Proving Ground (ERDEC), Aberdeen, MD 21010-5423 Mr. Walt Majerle SMCCR-CMC DSN 584-2051 410-671-2051 FAX 410-671-4445	Mrs. Janis K.D. Seegar SMCCR-CME DSN 584-4912 410-671-4912 FAX 410-671-2351	Mr. Manuel Lopez SMCCE-CMS DSN 584-4414 410-671-4414 FAX 410-671-2375	Mr. Frank "Gary" Lattin SCBRD-ODC-M DSN: 584-4479 410-671-4479 FAX 584-2969
Dugway Proving Ground, Dugway, UT 84022-5000 Chris C. Dunn STEDP-SU DSN 789-5387 801-831-5387 FAX 789-5711	Dr. Ted Austin STEDP-ED DSN 789-3417 801-831-3417 801-831-2985	Mr. Clair McBride STEDP-SA DSN 789-5317 801-831-5317 FAX 789-5597	Mr. John Madacsi STEDP-MT-C-A DSN 789-5385, 5301 801-831-5835 FAX 789-5432
Lexington-Blue Grass Army Depot, Lexington, KY 40511-5008 <i>[check office symbols]</i> Mr. Bill Bryant SDSBG-CS DSN 745-6530 606-624-6530 FAX 745-6428	Mr. Terry Hazle SDSBG-IOE-E DSN 745-6579 606-624-6579 FAX 745-6323	Mr. Bill Baber SDSBG-SO DSN 745-6508 606-624-6508 FAX 745-6548	Mr. Thomas Hancock SBSBG-RM-C DSN 745-7346 606-624-6346 FAX 745-6548

Table F-2 (Continued)  
 Surety, Environmental, Safety, and Laboratory Officers at  
 Each of the Eight Unitary Installations (as of September 1992)

Surety POC	Environmental POC	Safety POC	Laboratory POC
Rocky Mountain Arsenal, Denver, CO			
	MAJ Wendall Moore AMXRM-SH&E DSN 749-2441 303-289-0441	Mr. Clifford Wendell AMXRM-SH&E DSN 749-2112 303-289-0112	Mr. Elijah Jones AMXRM-LSA DSN 556-2196 FAX
Newport Army Ammunition Plant, Newport, IN 47966-0458			
Mr. Ken Hirsig SMCNE-SR DSN 369-1374 317-245-4374	Mr. Jerry Kovarik SMCNE-EQ DSN 369-1550 317-245-1550	Mr. Russ Miller SMCNE-SF DSN 369-1534 317-245-1534	Ms. Virginia Stockman DSN 369-1400 317-245-4400 FAX 369-1418
Pine Bluff Arsenal, Pine Bluff, AR 71622-9500			
Mr. Ed Parham SMCPB-PAC DSN 966-2763 501-540-2763 FAX 501-540-2769	Mr. Wendell Fortner SMCPB-EM DSN 966-2819 501-540-2819 FAX 501-540-2819	Mr. Richard O. Dedman SMCPD-SF DSN 966-3045 501-540-3045 FAX 501-540-3013	Mr. Steve Lowrey SMCPD-QAL DSN 966-3826 501-540-3820 FAX 966-3100
Pueblo Army Depot Activity, Pueblo, CO 81001-5000			
Mr. Bill Decker SDSTE-PU-SO DSN 749-4143 719-549-4143 FAX 749-4722	Mr. Ronald Connell SDSTE-PU-IE DSN 749-4544 719-549-4544 FAX 749-4317	Mrs. Patricia Steranka SDSTEPU-IS DSN 749-4980 719-549-4980 FAX 749-4317	Ms. Debra Strait SDSTE-PUQ DSN 749-4357 719-549-4356 FAX 749-4860

Table F-2 (Continued)  
 Surety, Environmental, Safety, and Laboratory Officers at  
 Each of the Eight Unitary Installations (as of September 1992)

Surety POC	Environmental POC	Safety POC	Laboratory POC
Tooele Army Depot, Tooele, UT 84074-5000			
Mr. Jeff Principe	Mr. Glen Roberts	Mr. Harold Oliver	Mr. Jim Oster
STSTE-SO	SDSTE-IRE	SDSTE-IRS	SFIL-CDE-PCML
DSN 790-4288/89	DSN 790-2761	DSN 790-2713	DSN 790-4342
801-833-4288/89	801-833-2761	801-833-2713	801-833-4342
FAX 790-4346	FAX 790-2619	FAX 790-2973	FAX 790-4338
Umatilla Depot Activity, Hermiston, OR 97838-9544			
Mr. Larry Large	Mr. Mark Daughery	Mr. Mervin L. Beck	Mr. Don Brooks
(ACTG)	SDSTE-UAI-EO	SDSTE-UAI-SF	SDSTE-UAP
SDSTE-UA-SU	DSN 790-5294	DSN 790-5361	DSN 790-5212
DSN 790-5362	503-564-5294	503-564-5361	503-564-8632
503-564-5362	FAX 790-5250	FAX 790-5250	FAX 790-5250,
FAX 790-5250			-5340

TABLE F-3 Contract Laboratories and Points of Contact<sup>a</sup>  
for Analyzing Environmental Samples Containing Warfare Agents

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Environmental Technologies Group, Inc.  
1400 Taylor Ave.  
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<sup>a</sup> Adapted from Nesbit, R., and K. Zimmerman, *Utah Reentry and Restoration Plan*, Health Department, State of Utah, Salt Lake City (May 1991).

#### **Section 4. Monitoring Equipment**

This section describes some of the types of equipment used for detection, identification, and sampling of chemical agents currently in use by the U.S. Department of the Army. Material provided here is adapted from information made available by Tooele Army Depot<sup>2</sup> and the *Jefferson County Arkansas Recovery/Reentry Plan*.<sup>3</sup>

##### **I. AIR STREAM SAMPLING-BUBBLER**

The bubbler, a device that absorbs agent from a sample air stream, consists of a glass tube, glass beads, and a liquid medium. The device is sent to a chemical laboratory, where the contents are analyzed through the use of the auto analyzer and gas chromatograph.

A quality control procedure is in place to verify that the bubbler is working correctly. The technique used to prove the reliability entails actually putting agent in a bubbler. The bubbler is spiked with a known quantity of agent that is sent through the system as a test to prove that the system works. This procedure is done once each shift.

##### **II. DEPOT AREA AIR MONITORING SYSTEM**

The Depot Area Air Monitoring System (DAAMS) is a portable air sampling unit. This device, which absorbs agent, consists of a glass or steel tube with internal dry, absorbent material. The DAAMS unit is sent to a chemical laboratory, where the contents are analyzed through the use of the auto analyzer and gas chromatograph.

A quality control procedure is in place to verify that the DAAMS tubes are working correctly. The technique used to prove the reliability entails actually putting agent in a DAAMS tube. The DAAMS tube is spiked with a known quantity of agent that is sent through the system as a test to prove that the system works. This procedure is done once each shift.

##### **III. AUTOMATIC CONTINUOUS AIR MONITORING SYSTEM**

The Automatic Continuous Air Monitoring System (ACAMS) is a type of automated gas chromatograph that provides real-time agent detection and alarm capability at various levels. It is adjustable to detect gross levels of agent in 2 minutes and unmasked levels in 8 to 20 minutes, depending on the type of agent being detected. This instrument not only provides an alarm, but indicates the level of concentration and records the indication on a graph. This device is capable of detecting both nerve and blister agents.

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<sup>2</sup> Tooele Army Depot Data Package, SRFX-91.

<sup>3</sup> Jefferson County Arkansas Recovery/Reentry Plan, Annex K, Attachment 2.

A quality control procedure is in place to verify that the ACAMS is working correctly. The detectors are challenged with a dilute agent liquid to ensure that they will alarm. This procedure is done once each 24 hours.

#### **IV. REAL-TIME MONITOR**

The real-time monitor (RTM) is a wet chemistry device. This device uses an enzyme and a colorimeter. The RTM, which is used in the storage program, is sensitive enough to detect the unmasked levels of nerve agent.

A quality control procedure is in place to verify that the RTM systems work correctly. The detectors are challenged with a dilute agent liquid to ensure that they will alarm. this procedure is done once each 24 hours.

#### **V. MODEL M8 SERIES ALARM**

The Model M8 series alarm is capable of detecting self-contained levels [*What is a self-contained level of nerve agent?*] of nerve agent in 2 minutes or less. This device monitors through a sample air stream.

A quality control procedure is in place to verify that the alarms are working correctly. A harmless nerve agent stimulant is used to test the alarm. The stimulant is sampled to ensure that the alarm will audibly function. This procedure is done each 24-hour period.

#### **VI. MODEL M18 FIELD DETECTION KIT**

The M18 kit is a field use kit that detects blister and nerve agents. It detects levels that required "self-contained" protection.

A quality control procedure is in place to verify that the monitors are working correctly. Before issue and use, the M18 kit is checked for a current shelf life date.

#### **VII. MONITORING EQUIPMENT SENSITIVITIES AND RESPONSE TIMES**

Table F-3 summarized information on sensitivities and response times for chemical agent monitoring equipment.<sup>4</sup> Civilian emergency personnel will use or see only some of the items in Table F-3. The information on other monitoring equipment will help in the event military personnel refer to them in conversation.

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<sup>4</sup> Adapted from *Jefferson County Arkansas Recovery/Reentry Plan*, Annex K, Attachment 2, Tab 2.

Table F-4 Agent detector sensitivity and response/processing time<sup>a,b</sup>

Equipment	Sensitivity (mg/m <sup>3</sup> )			Response Time	Limitations
	Mustard	GB	VX		
Detector Paper, M8/M9 <sup>c</sup>	Positive or Negative only for liquid agent			Immediately	Not effective in water, false positive from interferents and scuffs, effective temperature between 32 °F and 125 °F
Detector Ticket	Not Capable	0.1	0.1	3 min	--
Blue Band Tube	0.5	1.0	Not Capable	3 min	--
White Band Tube	Not Capable	1.0	Not Capable	3 min	First entry monitoring to igloo
M256 Kit	2.5	0.05	0.1	12-15 min	False positive from battlefield interferents; detection capability in field
M256A1 Kit	2.5	0.005	0.02	3-5 min	--
Bubbler	0.003	0.0001	0.00001	2-4 h	--
DAAMS (Depot Area Air Monitoring System)	0.003	0.0001	0.00001	1 h	--
ACAMS (Automated Continuous Air Monitoring)	0.003	0.0001	0.00001	3-5 min	Can detect at fractions of TWA levels (see Table 1.3) if air samples aspirated for 12 h with sorbent

Table F-4 Agent detector sensitivity and response/processing time<sup>a,b</sup> (continued)

Equipment	Sensitivity (mg/m <sup>3</sup> )			Response Time	Limitations
	Mustard	GB	VX		
RTM (Real-Time Monitor)	Not Capable	0.0001	0.00001	8-12 min	--
DCAC (Demilitarization Chemical Agent Concentrator)	Not Capable	0.001	--	33 min	--
	--	0.2	0.4	2-3 min	--
M8	Not Capable	0.2	0.4	2-3 min	Requires extensive servicing with electrolyte solution; no agent specificity
M8A1	Not Capable	0.2	0.4	1-2 min	Requires extensive servicing with electrolyte solution; no agent specificity
M43A1	Not Capable	0.2	0.4	2 min	Requires extensive servicing with electrolyte solution; no agent specificity
HYFED (Hydrogen Flame Photometric Emission Detector)	0.003	0.001	0.001	1-2 min	--

Table F-4 Agent detector sensitivity and response/processing time<sup>a,b</sup> (continued)

Equipment	Sensitivity (mg/m <sup>3</sup> )			Response Time	Limitations
	Mustard	GB	VX		
CAM (Chemical Agent Monitor)	0.1	0.1	0.1	Minutes, depending on agent concentration	Cannot simultaneously detect nerve and blister agents, which requires change in drift tube polarity accomplished by control switch. Field portable, semiquantitative
Mini-cam	To be added				

<sup>a</sup> Processing time, it required, includes transport time from the site to the lab, set-up time, and analysis. Times are approximate and may vary from installation to installation.

<sup>b</sup> From U.S. Dept. of the Army 1987; Mengel et al 1988; P. Wojciechowski, Office of Program Manager for chemical Demilitarization, Aberdeen Proving Ground, Md., personal communication to A.P. Watson, Oak Ridge National Laboratory, Oak Ridge, Tenn., March 15, 1990; E. Peterson, Armament Munitions and chemical Command, Rock Island, Ill., personal communication to A.P. Watson, Oak Ridge National Laboratory, Oak Ridge, Tenn., Jan. 17 and April 5, 1990; and C. Campbell, U.S. Army Material command, Charlestown, IN, memorandum to Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Md., October 26, 1989.

<sup>c</sup> M9 paper does not distinguish between mustard and nerve agents.

APPENDIX G  
FACT SHEETS

# FACT SHEET

## "RULES OF THUMB" FOR UNITARY AGENT REENTRY

The following points of information about agent reactions in environmental media should assist in the decision-making process.

- 1) GB is readily broken down (hydrolyzed) in water or other aqueous media; the breakdown products of GB are not acutely harmful.
- 2) VX and the sulfur mustards are *not* hydrolyzed quickly, and therefore problematic in water. A hydrolysis product of VX, S-2-diisopropylaminoethylmethylphosphonothioic acid, (C<sub>9</sub>H<sub>22</sub>NO<sub>2</sub>PS) has mammalian toxicity similar to that of VX.
- 3) The persistent agents VX and sulfur mustard gas will generate a risk of dermal exposure wherever liquid agent has accumulated or deposited.
- 4) Standard agricultural management of tree crops (citrus, apples, pears, etc.) and tall row crops (such as corn) would create many opportunities for significant dermal exposure to persistent agents deposited (as liquid, aerosol, or dry deposition) on plant surfaces (e.g., whole-body exposures during harvest or pruning). Agricultural management of stoop crops (green beans, squash, peppers, etc.) also provide opportunities for dermal exposure, but to a lesser degree than tree and tall row crops due to the limited body surface in contact with the crop item (e.g., usually hands, arms, and lower leg only). Harvesting and care of sod or logging/forestry practices are likely to provide dermal exposures intermediate to that of tree crops and stoop crops.
- 5) Liquid deposition of VX or sulfur mustard agents on garden produce, berries, or tree fruits could be a potential source of ingestion exposure.
- 6) Rate of agent residue dissipation will depend on temperature and climatic conditions.
- 7) Liquid contamination by agent will require laboratory analysis to determine degree of contamination and clean-up levels.
- 8) Quarantine times for (liquid) GB contamination could be on the order of 2 to 14 days, depending on agent concentrations released. Quarantine periods for the persistent agents VX or the sulfur mustards could be on the order of weeks or months. During the quarantine, extensive environmental monitoring will be necessary to determine if a suspect area is safe. "Safe" levels for dermal and ingestion exposure have not been determined for the general public.
- 9) The initial eye irritation and skin erythema, itching and blisters that result from sulfur mustard exposure resemble the irritation and blisters that form after exposure to oils found in poison ivy. Contact with any part of the poison ivy plant or smoke from burning poison ivy vegetation is known to result in a burning, itching irritation to the skin, eyes, and respiratory tract, as well as skin blisters. However damage caused by mustard agent exposure is usually more severe and takes longer to heal; damaged skin takes on a "bronzed" appearance and the blisters are usually larger. Prompt decontamination with soap and water will reduce the degree and extent of injury from either poison ivy or sulfur mustard agent.

# Detailed Facts About Mustard Blister Agents (H, HD, and HT)

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*Agent H*--Levinstein mustard. Mixture of 70% bis(2-chloroethyl) sulfide and 30% sulfur impurities produced by the unstable Levinstein process.

*Agent HD*--Distilled-mustard or bis(2-chloroethyl) sulfide, chemical abstract service registry No. 505-60-2. HD is H that has been purified by washing and vacuum distillation to reduce sulfur impurities.

*Agent HT*--Plant-run mixture containing about 60% HD and 40% T, plus a variety of sulfur contaminants and impurities. T is bis 2 (chloroethylthioethyl) ether, chemical abstract service registry No. 63918-89-8.

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## Physical Properties of Mustard (HD)

Chemical structure	$\begin{array}{l} \text{S} \begin{array}{l} \diagup \text{CH}_2\text{CH}_2\text{Cl} \\ \diagdown \text{CH}_2\text{CH}_2\text{Cl} \end{array} \end{array}$
Description	Mustard agent <i>liquid</i> is colorless when pure, but is normally a yellow to brown oily substance. Mustard agent <i>vapor</i> is colorless with a slight garlic- or mustard-like odor.
Molecular weight	159.08
Boiling point	215-217°C; slowly vaporizes at ordinary temperatures
Freezing point	14.5°C
Density	Liquid = 1.27 Vapor = 5.4 (air = 1)
Solubility	Very sparingly soluble in H <sub>2</sub> O; freely soluble in animal oils, fats, organic solvents
Stability	Stable for days-weeks, under normal ranges of atmospheric temperature; slowly hydrolyzed by water; destroyed by strong oxidizing agents (e.g., household chlorine bleach, ammonia)

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### References

Department of the Army. 1991. DA PAM 40-173, *Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT*. Washington, DC: U.S. GPO.

Institute of Medicine, National Academy of Sciences, C.M. Pechura and D.P. Rall, eds. 1993. *Veterans at Risk: The Health Effects of Mustard Gas and Lewisite*. Washington, DC: National Academy Press.

Papirmeister, B., et al. 1991. *Medical Defense Against Mustard Gas: Toxic Mechanisms and Pharmacological Implications*. Boca Raton, FL: CRC Press.

Department of the Army. 1975. DA FM 3-9, *Military Chemistry and Chemical Compounds*. Washington, DC: U.S. GPO.

# Toxic Properties of Mustard

*Mustard agents stored in the unitary stockpile are in ton containers, artillery shells, and other munitions. Stockpiled at Aberdeen Proving Ground, MD; Anniston Army Depot, AL; Blue Grass Army Depot, KY; Pine Bluff, AR; Pueblo Depot Activity, CO; Tooele Army Depot, UT; and Umatilla Depot Activity, OR.*

The signs and symptoms of acute mustard-induced lesions characteristically are delayed in appearance. The length of the delay and the degree of injury are both dependent on the severity of the exposure as well as the organs affected. The delay of onset is typically between 2 and 24 hours, or as long as 48 hours.

The eye is the most sensitive organ and may become inflamed at mustard levels that do not affect the skin or respiratory tract significantly. Mustard agent conjunctivitis may be present with lacrimation, discomfort, and erythema of the lids and conjunctiva. More severe exposures may produce photophobia, blepharospasm, pain, corneal erosion, iritis, conjunctival vascularization, ulceration, and corneal opacification. Delayed keratitis has been documented in some cases as long as 45 years after the original exposure.

Exposure of the skin to mustard vapor is marked by the appearance of erythema and edema, later followed by the development of vesication. Itching and burning may occur during the erythematous phase. Multiple small vesicles arise in the erythematous skin and gradually enlarge and coalesce to form typical large, fragile, yellowish bullae (the fluid of which has no irritating properties). These are usually painless. Liquid mustard contamination of the skin may result in an area of gray-white necrotic skin surrounded by erythema and vesication.

If mustard inhalation occurs, the signs and symptoms may develop slowly over several days. Early signs could include hoarseness and a cough. The cough may later become productive and the hoarseness may progress to aphonia. Pseudomembranes, fever, dyspnea, and moist rales may develop.

Ingestion of mustard can produce nausea, vomiting, abdominal pain, diarrhea, and prostration.

Malaise, nausea, vomiting, and fever may accompany any significant exposure to mustard by any route.

Symptoms/signs referable to central nervous system depression may accompany severe exposure to mustard.

At high concentrations, and accompanying severe blistering or skin burns, signs of leukopenia and thrombocytopenia such as infection, abnormal bruising, or bleeding may develop. Bradycardia and cardiac arrhythmias may occur. Shock may develop in severely affected patients.

Chronic mustard-induced illness is most commonly referable to the respiratory tract.

Dyspnea, productive cough, loss of exercise tolerance, frequent pulmonary infections, and changes in pulmonary function tests may indicate possible mustard-induced chronic lung disease.

The delayed development (sometimes for years) of leukoplakia, masses, or ulcerations that fail to heal on the skin or in the upper respiratory tract might indicate carcinoma. Other respiratory tract symptoms such as chest pain, dyspnea, cough, hemoptysis, or hoarseness could suggest a respiratory tract malignancy.

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# Detailed Facts About Blister Agent Lewisite (L)

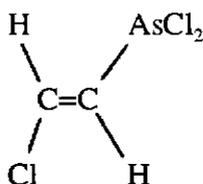
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Lewisite--The chemical 2-Chlorovinylchloroarsine, chemical abstract service registry No: 541-25-3.

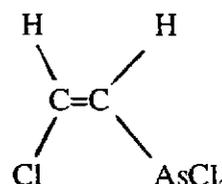
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## Physical Properties of Lewisite

Chemical structure



(Trans Form)



(Cis Form)

Description

Pure Lewisite is a colorless, oily liquid with very little odor. "War gas" has a geranium-like odor and is an amber to dark brown liquid.

Molecular weight

207.32

Boiling point

190°C (Trans)

170°C (Cis)

Freezing point

-1°C (Trans)

-45°C (Cis)

Density

Liquid = 1.89  
Vapor = 7.2 (air=1)

Solubility

Insoluble in H<sub>2</sub>O; soluble in ordinary organic solvents

Stability

Rapidly hydrolyzed by water to 2-chlorovinyl arsine oxide which also has blistering properties.

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### References

Institute of Medicine, National Academy of Sciences, C.M. Pechura and D.P. Rall, eds. 1993. *Veterans at Risk: The Health Effects of Mustard Gas and Lewisite*. Washington, DC: National Academy Press.

U.S. Army Edgewood Research, Development and Engineering Center. 11 January 1993. "Material Safety Data Sheet: Lewisite." Aberdeen Proving Ground, MD.

Department of the Army. 1975. DA FM 3-9, *Military Chemistry and Chemical Compounds*. Washington, DC: U.S. GPO.

# Toxic Properties of Blister Agent Lewisite (L)

*Lewisite stored in the unitary stockpile is in ton containers. Stockpile is at Tooele Army Depot, UT.*

## Acute Exposure

Eyes. Instant pain, conjunctivitis, and blepharospasm leading to closure of eyelids, followed by corneal scarring and iritis. Mild exposure produces reversible eye damage if decontaminated instantly; otherwise, more permanent injury or blindness is possible within one minute of exposure.

Skin. Immediate stinging pain increasing in severity with time. Erythema (skin reddening) appears within 30 minutes after exposure accompanied by pain with itching and irritation for 24 hours. Blisters appear within 12 hours after exposure with more pain, which diminishes after two to three days.

Respiratory Tract. Irritating to nasal passages and produces a burning sensation followed by a profuse nasal secretion and violent sneezing. Prolonged exposure causes coughing and production of large quantities of frothy mucus.

Systemic Effects. Lewisite on the skin and inhaled vapor are absorbed and may cause systemic poisoning. A manifestation of this is a change in capillary permeability, which permits loss of sufficient fluid from the bloodstream to cause hemoconcentration, shock, and death. In nonfatal cases, hemolysis of erythrocytes has occurred with a resultant hemolytic anemia. The excretion of oxidized products into the bile by the liver produces focal necrosis of the liver, necrosis of the mucosa of the biliary passages with periobiliary hemorrhages, and some injury to the intestinal mucosa. Acute systematic poisoning from large skin burns causes pulmonary edema, diarrhea, restlessness, weakness, subnormal temperature, and low blood pressure in animals.

## Chronic Exposure

Lewisite can cause sensitization and chronic lung impairment. Some evidence suggests that Lewisite might also be a carcinogen.

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# Detailed Facts About Nerve Agent VX

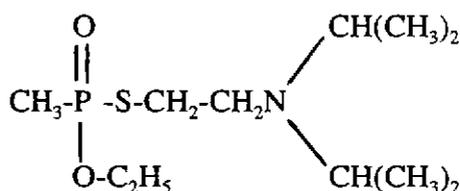
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*Agent VX*--The chemical O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothioate chemical abstract service registry No. 50782-69-9.

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## Physical Properties of Nerve Agent VX

Chemical structure



Description	Nerve agent VX is an oily liquid that is clear, colorless, odorless, and tasteless.
Molecular weight	267.4
Boiling point	298° C
Freezing point	-51° C
Density	Liquid = 1.01 Vapor = 9.2 (air=1)
Solubility	Moderate in H <sub>2</sub> O
Stability	Persistent

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### References

Department of the Army. 1990. DA PAM 40-8, *Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX*. Washington, DC: U.S. GPO.

Department of the Army. 1975. DA FM 3-9, *Military Chemistry and Chemical Compounds*. Washington, DC: U.S. GPO.

## Toxic Properties of Nerve Agent VX

*Nerve agent VX is stored in the unitary stockpile in ton containers, artillery shells, mortar projectiles, rockets, and land mines. Stockpiled at Anniston Army Depot, AL; Blue Grass Army Depot, KY; Newport Army Ammunition Plant, IN; Pine Bluff Arsenal, AR; Tooele Army Depot, UT; and Umatilla Depot Activity, OR.*

Nerve agent VX is a persistent, nonvolatile agent that is primarily a liquid exposure hazard to the skin or eyes, although small amounts of VX vapor may be generated under extremely high temperatures. Nerve agent VX affects the body by blocking the action of the enzyme acetylcholinesterase. When this enzyme is blocked, large amounts of the chemical acetylcholine build up at critical places within the nervous system, causing hyperactivity of the body organs stimulated by these nerves. The signs and symptoms of exposure to nerve agent VX depends upon the *route of exposure* and the *amount of exposure*.

### Vapor Exposure

Nerve agent VX does **not** pose a vapor hazard, except at high temperatures. Exposure to small amounts of vapor will usually affect the eyes, nose, and/or lungs. These effects may occur within seconds of exposure and reach their peak within several minutes after exposure ceases. Early, mild signs/symptoms might include: pinpoint pupils, pain behind the eyes, and/or blurred vision; runny nose or drooling; and a tight chest. Moderate signs/symptoms might include: increasing shortness of breath or worsening of respiratory signs such as coughing or wheezing; a feeling of weakness, followed by muscle twitching in the large muscles; and nausea, vomiting, and/or diarrhea. Severe signs/symptoms following exposure to high concentrations might include: loss of consciousness, seizures, complete muscle weakness and paralysis, and cessation of respiration.

### Skin Exposure

Nerve agent VX penetrates the skin extremely well and may be up to 100-200 times more toxic than a G-type nerve agent. Effects from skin exposure to liquid nerve agent VX are slower to develop and slower to reach their peak, compared to vapor exposures of the eyes or respiratory tract. This is because agent uptake across the skin is slower than via inhalation, and there is continued absorption of agent through the various skin layers, even hours after the skin surface has been decontaminated. In general, signs and symptoms of percutaneous exposure may occur within minutes or be delayed up to 18 hours. Mild initial signs of skin exposure might include: localized sweating and/or muscle twitching at the exposure site. Moderate signs/symptoms might include: nausea, vomiting, and/or diarrhea and a feeling of weakness followed by generalized muscle twitching (no respiratory signs or symptoms). Severe signs/symptoms might include: sudden loss of consciousness and collapse, seizures, complete muscle weakness and paralysis, and cessation of respiration.

The larger the skin exposure to liquid nerve agent, the shorter the time of onset to signs and symptoms. The first sign following a large skin exposure to liquid nerve agent may be loss of consciousness. Pinpoint pupils do **not** occur early on following skin exposures to nerve agent; pinpoint pupils are generally the direct result of a vapor exposure to the eye. Death following vapor or liquid exposures to nerve agent is usually due to compromise or failure of the respiratory system.

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# Detailed Facts About Nerve Agents GA and GB

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*Agent GA*--The chemical Ethyl N,N-dimethylphosphoramidocyanidate, chemical abstract service registry No. 77-81-6.

*Agent GB*--The chemical isopropyl methylphosphonofluoridate, chemical abstract service registry No. 107-44-8.

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## Physical Properties of G-type Nerve Agents

Chemical structure	$\begin{array}{c} \text{O} \\    \\ \text{C}_2\text{H}_5\text{O}-\text{P}-\text{N} \begin{array}{l} \nearrow \text{CH}_3 \\ \searrow \text{CH}_3 \end{array} \\   \\ \text{CN} \end{array}$ <p>(GA)</p>	$\begin{array}{c} \text{O} \\    \\ \text{CH}_3-\text{P}-\text{OC}_3\text{H}_7 \\   \\ \text{F} \end{array}$ <p>(GB)</p>
Description	G-type nerve agents are clear, colorless, and tasteless liquids, chemically similar to organophosphate pesticides such as Malathion or Parathion. GA has a slightly fruity odor and GB has no odor.	
Molecular weight	162.3	140.1
Boiling point	240°C	158°C
Freezing point	-50°C	-56°C
Density	Liquid = 1.07 Vapor = 5.6 (air=1)	1.09 4.9
Solubility	Miscible	Miscible
Stability	~24 hours	~20 hours

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### References

Department of the Army. 1990. DA PAM 40-8, *Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX*. Washington, DC: U.S. GPO.

Department of the Army. 1975. DA FM 3-9, *Military Chemistry and Chemical Compounds*. Washington, DC: U.S. GPO.

# Toxic Properties of G-type Nerve Agents

*G-type nerve agents stored in the unitary stockpile are in ton containers, artillery shells, mortar projectiles, rockets, and land mines. GA is stockpiled at Tooele Army Depot, UT. GB is stockpiled at Anniston Army Depot, AL; Blue Grass Army Depot, KY; Pine Bluff Arsenal, AR; Tooele Army Depot, UT; and Umatilla Depot, OR.*

G-type nerve agents are considered to be nonpersistent chemical agents that may present a significant vapor hazard to the respiratory tract, eyes, or skin. G-type nerve agents affect the body by blocking the action of the enzyme acetylcholinesterase. When this enzyme is blocked, large amounts of the chemical acetylcholine build up at critical places within the nervous system, causing hyperactivity of the body organs stimulated by these nerves. The signs and symptoms of exposure to G-type nerve agents depend upon the *route of exposure* and the *amount of exposure*.

## Vapor Exposure

G-type nerve agents primarily pose a vapor hazard. Exposure to small amounts of vapor will usually affect the eyes, nose, and/or lungs. These effects may occur within seconds of exposure and reach their peak within several minutes after exposure ceases. Early, mild signs/symptoms might include: pinpoint pupils, pain behind the eyes, and/or blurred vision; runny nose or drooling; and a tight chest. Moderate signs/symptoms might include: increasing shortness of breath or worsening of respiratory signs such as coughing or wheezing; a feeling of weakness, followed by muscle twitching in the large muscles; and nausea, vomiting, and/or diarrhea. Severe signs/symptoms following exposure to high concentrations might include: loss of consciousness, seizures, complete muscle weakness and paralysis, and cessation of respiration.

## Skin Exposure

Effects from skin exposure to liquid G-type nerve agents are slower to develop and slower to reach their peak, compared to vapor exposures of the eyes or respiratory tract. This is because agent uptake across the skin is slower than via inhalation, and there is continued absorption of agent through the various skin layers, even hours after the skin surface has been decontaminated. In general, signs and symptoms of percutaneous exposure may occur within minutes or be delayed up to 18 hours. Mild initial signs of skin exposure might include: localized sweating and/or muscle twitching at the exposure site. Moderate signs/symptoms might include: nausea, vomiting, and/or diarrhea and a feeling of weakness followed by generalized muscle twitching (no respiratory signs or symptoms). Severe signs/symptoms might include: sudden loss of consciousness and collapse, seizures, complete muscle weakness and paralysis, and cessation of respiration.

The larger the skin exposure to liquid nerve agent, the shorter the time of onset to signs and symptoms. The first sign following a large skin exposure to liquid nerve agent may be loss of consciousness. Pinpoint pupils do **not** occur early on following skin exposures to nerve agent; pinpoint pupils are generally the direct result of a vapor exposure to the eye. Death following vapor or liquid exposures to nerve agent is usually due to compromise or failure of the respiratory system.

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Date: 14 Dec 1992

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MATERIAL SAFETY DATA SHEET

LETHAL NERVE AGENT (GA)

SECTION I - GENERAL INFORMATION

MANUFACTURER'S NAME: Department of the Army

MANUFACTURER'S ADDRESS: U.S. ARMY CHEMICAL AND BIOLOGICAL DEFENSE AGENCY  
EDGEWOOD RESEARCH DEVELOPMENT AND ENGINEERING  
CENTER  
ATTN: SCBRD-ODR-S  
ABERDEEN PROVING GROUND, MD 21010-5423

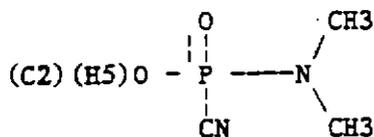
CAS REGISTRY NUMBER: None

CHEMICAL NAME: Ethyl N,N-dimethylphosphoramidocyanidate

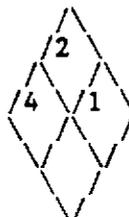
TRADE NAME AND SYNONYMS: Ethyl dimethylphosphoramidocyanidate  
Dimethylaminoethoxy-cyanophosphine oxide  
Dimethylamidoethoxyphosphoryl cyanide  
Ethyl dimethylaminocyanophosphonate  
Ethyl ester of dimethylphosphoroamidocyanidic acid  
Ethylphosphorodimethylamidocyanidate  
GA  
EA1205  
Tabun

CHEMICAL FAMILY: Organophosphorus compound

FORMULA/CHEMICAL STRUCTURE: C5 H11 N2 O2 P



NFPA 704 SIGNAL: Health - 4  
Flammability - 2  
Reactivity - 1



SECTION II - COMPOSITION

INGREDIENTS NAME	FORMULA	PERCENTAGE BY WEIGHT	AIRBORNE EXPOSURE LIMIT (AEL)
GA	C5 H11 N2 O2 P	100	0.0001 mg/m3

### SECTION III - PHYSICAL DATA

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BOILING POINT DEG F (DEG C): 247.5 DEG C  
VAPOR PRESSURE (mm Hg): 0.07 @ 24 DEG C  
VAPOR DENSITY (AIR=1): 5.6  
SOLUBILITY IN WATER (g/100 g): 9.8 @ 25 DEG C  
7.2 @ 20 DEG C  
SPECIFIC GRAVITY (H2O=1): Not available  
FREEZING (MELTING) POINT: -50 DEG C  
AUTOIGNITION TEMPERATURE DEG F (DEG C): Not available  
VISCOSITY (CENTISTOKES): 2.18 @ 25 DEG C  
PERCENTAGE VOLATILE BY VOLUME: 610 mg/m<sup>3</sup> @ 25 DEG C  
EVAPORATION RATE: Not available  
APPEARANCE & ODOR: Colorless to brown liquid. Faintly fruity; none when pure.

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### SECTION IV - FIRE AND EXPLOSION DATA

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FLASHPOINT: 78 DEG C  
FLAMMABILITY LIMITS (% by volume): Not available  
EXTINGUISHING MEDIA: Water, fog, foam, CO<sub>2</sub> - Avoid using extinguishing methods that will cause splashing or spreading of the GA.  
UNUSUAL FIRE & EXPLOSION HAZARDS: Fires involving this chemical may result in the formation of hydrogen cyanide.  
SPECIAL FIRE FIGHTING PROCEDURES: All persons not engaged in extinguishing the fire should be immediately evacuated from the area. Fires involving GA should be contained to prevent contamination to uncontrolled areas. When responding to a fire alarm in buildings or areas containing agents, fire-fighting personnel should wear full firefighter protective clothing (without TAP clothing) during chemical agent firefighting and fire rescue operations. Respiratory protection is required. Positive pressure, full facepiece, NIOSH-approved self-contained breathing apparatus (SCBA) will be worn where there is danger of oxygen deficiency and when directed by the fire chief or chemical accident/incident (CAI) operations officer. In cases where fire-fighters are responding to a chemical accident/incident for rescue/reconnaissance purposes vice firefighting, they will wear appropriate levels of protective clothing (see Section 8).

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### SECTION V - HEALTH HAZARD DATA

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AIRBORNE EXPOSURE LIMIT (AEL): The permissible airborne exposure concentration for GA for an 8-hour workday or a 40 hour work week is an 8-hour time weight average (TWA) of 0.0001 mg/m<sup>3</sup>. This value is listed in "AR 40-8, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX". To date, however, the Occupational Safety and Health Administration (OSHA) has not promulgated a permissible exposure concentration for GA.

EFFECTS OF OVEREXPOSURE: GA is an anticholinesterase agent similar in action to GB. Although only about half as toxic as GB by inhalation, GA in low concentrations is more irritating to the eyes than GB.

The number and severity of symptoms which appear are dependent on the quantity and rate of entry of the nerve agent which is introduced into the body. (Very small skin dosages sometimes cause local sweating and tremors with few other effects.)

Individuals poisoned by GA display approximately the same sequence of symptoms regardless of the route by which the poison enters the body (whether by inhalation, absorption, or ingestion). These symptoms, in normal order of appearance, are: runny nose; tightness of chest; dimness of vision and pin pointing of the eye pupils; difficulty in breathing; drooling and excessive sweating; nausea; vomiting, cramps, and involuntary defecation and urination; twitching, jerking, and staggering; and headache, confusion, drowsiness, coma, and convulsion. These symptoms are followed by cessation of breathing and death.

**Onset Time of Symptoms:** Symptoms appear much more slowly from skin dosage than from respiratory dosage. Although skin absorption great enough to cause death may occur in 1 to 2 minutes, death may be delayed for 1 to 2 hours. Respiratory lethal dosages kill in 1 to 10 minutes, and liquid in the eye kills almost as rapidly.

**Median Lethal Dosage, Animals:**

LD50 (monkey, percutaneous) = 9.3 mg/kg (shaved skin)  
LCt50 (monkey, inhalation) = 187 mg-min/m<sup>3</sup> (t = 10)

**Median Lethal Dosage, Man:**

LCt50 (man, inhalation) = 135 mg-min/m<sup>3</sup> (t = 0.5-2 min) at RMV\* of 15 l/min;  
200 mg-min/m<sup>3</sup> at RMV\* of 10 l/min

\*Respiratory Minute Volume

GA is not listed by the International Agency for Research on Cancer (IARC), American Conference of Governmental Industrial Hygienists (ACGIH), Occupational Safety and Health Administration (OSHA), or National Toxicology Program (NTP) as a carcinogen.

#### EMERGENCY AND FIRST AID PROCEDURES:

**INHALATION:** Hold breath until respiratory protective mask is donned. If severe signs of agent exposure appear (chest tightens, pupil constriction, incoordination, etc.), immediately administer, in rapid succession, all three Nerve Agent Antidote Kit(s), Mark I injectors (or atropine if directed by the local physician). Injections using the Mark I kit injectors may be repeated at 5 to 20 minute intervals if signs and symptoms are progressing until three series of injections have been administered. No more injections will be given unless directed by medical personnel. In addition, a record will be maintained of all injections given. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when approved mask-bag or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination exists. If breathing is difficult, administer oxygen. Seek medical attention IMMEDIATELY.

**EYE CONTACT:** IMMEDIATELY flush eyes with water for 10 -15 minutes then don respiratory protective mask. Although miosis (pinpointing of the pupils) may be an early sign of agent exposure, an injection will not be administered when miosis is the only sign present. Instead, the individual will be taken IMMEDIATELY to the medical treatment facility for observation.

**SKIN CONTACT:** Don respiratory protection mask and remove contaminated clothing. Immediately wash contaminated skin with copious amounts of soap and water, 10% sodium carbonate solution, or 5% liquid household bleach. Rinse well with water to remove decontaminate. Administer an intramuscular injection with the MARK I kit injectors only if local sweating and muscular twitching symptoms are observed. Seek medical attention IMMEDIATELY.

**INGESTION:** Do not induce vomiting. First symptoms are likely to be gastrointestinal. IMMEDIATELY administer 2 mg intramuscular injection of the MARK I kit auto-injectors. Seek medical attention IMMEDIATELY.

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## SECTION VI - REACTIVITY DATA

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STABILITY: Stable

INCOMPATIBILITY: Not available

HAZARDOUS DECOMPOSITION: Decomposes within 6 months at 60 DEG C. Complete decomposition in 3-1/4 hours at 150 DEG C. May produce HCN. Oxides of nitrogen, oxides of phosphorus, carbon monoxide, and hydrogen cyanide.

HAZARDOUS POLYMERIZATION: Not available

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## SECTION VII - SPILL, LEAK, AND DISPOSAL PROCEDURES

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STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: If leaks or spills occur, only personnel in full protective clothing (see section 8) will remain in area. In case of personnel contamination see section V "Emergency and First Aid Instructions."

### RECOMMENDED FIELD PROCEDURES:

Spills must be contained by covering with vermiculite, diatomaceous earth, clay, fine sand, sponges, and paper or cloth towels. This containment is followed by treatment with copious amounts of aqueous Sodium Hydroxide solution (a minimum 10 wt percent). Scoop up all material and place in a fully removable head drum with a high density polyethylene liner. The decontamination solution must be treated with excess bleach to destroy the CN formed during hydrolysis. Cover the contents with additional bleach before affixing the drum head. After sealing the head, the exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material IAW waste disposal methods provided below. Conduct general area monitoring with an approved monitor (see Section 8) to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

If 10 wt percent Sodium Hydroxide is not available then the following decontaminants may be used instead and are listed in order of preference: Decontamination Solution No. 2 (DS2), Sodium Carbonate and Supertropical Bleach Slurry (STB).

### RECOMMENDED LABORATORY PROCEDURES:

A minimum of 56 grams of decon solution is required for each gram of GA. The decontamination solution is agitated while GA is added and the agitation is maintained for at least one hour. The resulting solution is allowed to react for 24 hours. At the end of 24 hours, the solution must be titrated to a pH between 10 and 12. After completion of the 24 hour period, the decontamination solution must be treated with excess bleach (2.5 mole OCl<sup>-</sup>/mole GA) to destroy the CN formed during hydrolysis. Scoop up all material and place in a fully removable head drum with a high density polyethylene liner. Cover the contents with additional bleach before affixing the drum head. All contaminated clothing will be placed in a fully removable head drum with a high density polyethylene liner. Cover the contents of the drum with decontaminating solution as above before affixing the drum head. After sealing the head, the exterior of the drum shall be decontaminated and then labeled IAW state, EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW State, EPA and DOT regulations. Conduct general area monitoring with an approved monitor (see Section 8) to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

WASTE DISPOSAL METHOD: Open pit burning or burying of GA or items containing or contaminated with GA in any quantity is prohibited. The detoxified GA (using procedures above) can be thermally destroyed by incineration in an EPA approved incinerator in accordance with appropriate provisions of Federal, State and/or local RCRA regulations.

NOTE: Some states define decontaminated surety material as a RCRA Hazardous Waste.

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SECTION VIII - SPECIAL PROTECTION INFORMATION

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RESPIRATORY PROTECTION:

Concentration (mg/m3)

Respiratory Protective Equipment

Less than or equal  
to 0.0001

A full facepiece, chemical canister, air-purifying protective mask will be onhand for escape. (The M9-, M17-, or M40-series masks are acceptable for this purpose. Other masks certified as equivalent may be used.)

Greater than 0.0001  
to 0.2

A NIOSH/MSHA approved pressure demand full facepiece SCBA or supplied air respirator with escape air cylinder may be used.

Alternatively, a full facepiece, chemical canister air-purifying protective mask is acceptable for this purpose (for example M9-, M17-, or M40-series mask or other mask certified as equivalent) is acceptable. (See DA PAM 385-61 for determination of appropriate level)

> 0.2 or unknown

NIOSH/MSHA approved pressure demand full facepiece SCBA suitable for use in high agent concentrations with protective ensemble (See DA PAM 385-61 for examples).

VENTILATION: Local Exhaust: Mandatory must be filtered or scrubbed. Air emissions must meet local, state and federal regulations.

Special: Chemical laboratory hoods shall have an average inward face velocity of 100 linear feet per minute + or - 10% with the velocity at any point not deviating from the average face velocity by more than 20%. Existing laboratory hoods shall have an inward face velocity of 150 lfpm plus or minus 20 percent. Laboratory hoods shall be located such that cross drafts do not exceed 20% of the inward face velocity. A visual performance test utilizing smoke producing devices shall be performed in the assessment of the inclosure's ability to contain agent GA. Emergency backup power necessary. Hoods should be tested semi-annually or after modification or maintenance operations. Operations should be performed 20 cm inside hood face.

Other: Recirculation of exhaust air from agent areas is prohibited. No connection between agent areas and other areas through ventilation system.

PROTECTIVE GLOVES: Butyl Glove M3 and M4  
Norton, Chemical Protective Glove Set

EYE PROTECTION: Chemical goggles. When there is potential for severe exposure (e.g. sampling pressurized systems, loading & unloading operations) chemical goggles and face shield are recommended.

OTHER PROTECTIVE EQUIPMENT: For general lab work, gloves and lab coat shall be worn with M9 or M17 mask readily available.

MONITORING: Available monitoring equipment for agent GA is the Automatic Chemical Agent Detector Alarm (ACADA), bubblers (GC method), Miniature Chemical Agent Monitor (MINICAM), Chemical Agent Monitor (CAM) and Real Time Analytical Platform (RTAP).

Real-time, low-level monitors (with alarm) are required for GA operations. In their absence, an IDLH atmosphere must be presumed. Laboratory operations conducted in appropriately maintained and alarmed engineering controls require only periodic low-level monitoring.

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#### SECTION IX - SPECIAL PRECAUTIONS

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**PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:** In handling, the buddy system will be incorporated. No smoking, eating and drinking in areas containing agent is permitted. Containers should be periodically inspected for leaks (either visually or by a detector kit). Stringent control over all personnel practices must be exercised. Decontamination equip shall be conveniently located. Exits must be designed to permit rapid evacuation. Chemical showers, eye-wash stations, and personal cleanliness facilities be provided. Wash hands before meals and each worker will shower thoroughly with special attention given to hair, face, neck, and hands, using plenty of soap before leaving at the end of the workday.

**OTHER PRECAUTIONS:** Agents must be double contained in liquid and vapor tight containers when in storage or when outside of ventilation hood.

For additional information see "AR 385-61, The Army Toxic Chemical Agent Safety Program", "DA PAM 385-61, Toxic Chemical Agent Safety Standards", and "AR 40-8, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX".

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#### SECTION X - TRANSPORTATION DATA

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**PROPER SHIPPING NAME:** Poisonous liquids, n.o.s.

**DOT HAZARD CLASSIFICATION:** 6.1

**DOT LABEL:** Poison

**DOT MARKING:** Poisonous liquids, n.o.s. (Ethyl dimethylphosphoramidocyanide) UN-2810

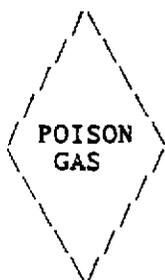
**DOT PLACARD:** POISON

**PRECAUTIONS TO BE TAKEN IN TRANSPORTATION:** Motor vehicles will be placarded regardless of quantity. Driver shall be given full and complete information regarding shipment and conditions in case of emergency. AR 50-6 deals specifically with the shipment of chemical agents. Shipments of agent will be escorted IAW AR 740-32.

**EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURES:** See sections IV, VII, and VIII.

While the Edgewood Research Development and Engineering Center, Department of the Army believes that the data contained herein are factual and the opinions expressed are those of qualified experts regarding the results of the tests conducted, the data are not to be taken as a warranty or representation for which the Department of the Army or Edgewood Research Development and Engineering Center assumes legal responsibility. They are offered solely for your consideration, investigation, and verification. Any use of these data and information must be determined by the user to be in accordance with applicable

DATE: 14 Dec 1992



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MATERIAL SAFETY DATA SHEET

LETHAL NERVE AGENT (GB)

SECTION I - GENERAL INFORMATION

MANUFACTURER'S NAME: Department of the Army

MANUFACTURER'S ADDRESS: U.S. ARMY CHEMICAL AND BIOLOGICAL DEFENSE AGENCY  
EDGEWOOD RESEARCH, DEVELOPMENT AND ENGINEERING  
CENTER  
ATTN: SCBRD-ODR-5  
ABERDEEN PROVING GROUND, MD 21010-5423

CAS REGISTRY NUMBER: 107-44-8 or 50642-23-4

CHEMICAL NAME AND SYNONYMS:

Phosphonofluoridic acid, methyl-, isopropyl ester  
Phosphonofluoridic acid, methyl-, 1-methylethyl ester

ALTERNATE CHEMICAL NAMES:

Isopropyl methylphosphonofluoridate  
Isopropyl ester of methylphosphonofluoridic acid  
Methylisopropoxfluorophosphine oxide  
Isopropyl Methylfluorophosphonate  
O-Isopropyl Methylisopropoxfluorophosphine oxide  
O-Isopropyl Methylphosphonofluoridate  
Methylfluorophosphonic acid, isopropyl ester  
Isopropoxymethylphosphonyl fluoride

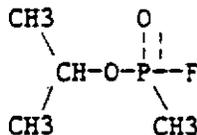
TRADE NAME AND SYNONYMS:

GB Sarin  
Zarin

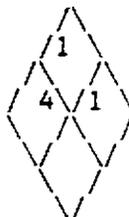
CHEMICAL FAMILY: Fluorinated organophosphorous compound

FORMULA/CHEMICAL STRUCTURE:

C4 H10 F02 P



NFPA 704 SIGNAL: Health - 4  
Flammability - 1  
Reactivity - 1



SECTION II - COMPOSITION

INGREDIENTS                      FORMULA                      PERCENTAGE                      AIRBORNE

NAME		BY WEIGHT	EXPOSURE LIMIT (AEL)
GB	C4 H10 F02 P	100	0.0001 mg/m3

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### SECTION III - PHYSICAL DATA

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BOILING POINT DEG F (DEG C): 316 (158)

VAPOR PRESSURE (mm Hg): 2.9 @ 25 DEG C

VAPOR DENSITY (AIR=1): 4.86

SOLUBILITY IN WATER: Complete

SPECIFIC GRAVITY (H2O=1): 1.0887 @ 25 DEG C

APPEARANCE AND ODOR: Colorless liquid  
Odorless in pure form

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### SECTION IV - FIRE AND EXPLOSION DATA

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FLASH POINT (METHOD USED): Did not flash to 280 DEG F

FLAMMABLE LIMIT: Not applicable

LOWER EMPLOSIVE LIMIT: Not available

UPPER EXPLOSIVE LIMIT: Not available

EXTINGUISHING MEDIA: Water mist, fog, foam, CO2 - Avoid using extinguishing methods that will cause splashing or spreading of the GB.

SPECIAL FIRE FIGHTING PROCEDURES: GB will react with steam or water to produce toxic & corrosive vapors. All persons not engaged in extinguishing the fire should be evacuated. Fires involving GB should be contained to prevent contamination to uncontrolled areas. When responding to a fire alarm in buildings or areas containing agents, firefighting personnel clothing (without TAP clothing) during chemical agent firefighting and fire rescue operations. Respiratory protection is required. Positive pressure, full facepiece, NIOSH-approved self-contained breathing apparatus (SCBA) will be worn where there is danger of oxygen deficiency and when directed by the fire chief or chemical accident/incident (CAI) operations officer. The M9 or M17 series mask may be worn in lieu of SCBA when there is no danger of oxygen deficiency. In cases where firefighters are responding to a chemical accident/incident for rescue/reconnaissance purposes vice firefighting, they will wear appropriate levels of protective clothing (see Section 8).

UNUSUAL FIRE AND EXPLOSION HAZARDS: Hydrogen may be present.

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### SECTION V - HEALTH HAZARD DATA

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AIRBORNE EXPOSURE LIMIT (AEL): The permissible airborne exposure concentration for GB for an 8-hour workday or a 40 hour work week is an 8-hour time weight average (TWA) of 0.0001 mg/m3. This value is based on the TWA of GB which can be found in "AR 40-8, "Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX". To date, however, the Occupational Safety and Health Administration (OSHA) has not promulgated a permissible exposure concentration for GB.

#### EFFECTS OF OVEREXPOSURE:

It is a lethal anticholinergic agent. Doses which are potentially life-threatening may be only slightly larger than those producing minimal effects.

GB

Route	Form	Effect	Type	Dosage
ocular	vapor	miosis	ECT50	<2 mg-min/m <sup>3</sup>
inhalation	vapor	runny nose	ECT50	<2 mg-min/m <sup>3</sup>
inhalation (15 l/min)	vapor	severe incapacitation	ICT50	35 mg-min/m <sup>3</sup>
inhalation (15 l/min)	vapor	death	LCT50	70 mg-min/m <sup>3</sup>
percutaneous	liquid	death	LD50	1700 mg/70 kg man

Effective dosages for vapor are estimated for exposure durations of 2-10 minutes.

Symptoms of overexposure may occur within minutes or hours--depending upon dose. They include: miosis (constriction of pupils) and visual effects, headache and pressure sensation, runny nose and nasal congestion, salivation, tightness in the chest, nausea, vomiting, giddiness, anxiety, difficulty in thinking, difficulty sleeping, nightmares, muscle twitches, tremors, weakness, abdominal cramps, diarrhea, involuntary urination and defecation.

With severe exposure symptoms progress to convulsions and respiratory failure.

GB is not listed by the International Agency for Research on Cancer (IARC), American Conference of Governmental Industrial Hygienists (ACGIH), Occupational Safety and Health Administration (OSHA), or National Toxicology Program (NTP) as a carcinogen.

#### EMERGENCY AND FIRST AID PROCEDURES:

**INHALATION:** Hold breath until respiratory protective mask is donned. If severe signs of agent exposure appear (chest tightens, pupil constriction, incoordination, etc.), immediately administer, in rapid succession, all three Nerve Agent Antidote Kit(s), Mark I injectors (or atropine if directed by the local physician). Injections using the Mark I kit injectors may be repeated at 5 to 20 minute intervals if signs and symptoms are progressing until three series of injections have been administered. No more injections will be given unless directed by medical personnel. In addition, a record will be maintained of all injections given. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when approved mask-bag or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination exists. If breathing is difficult, administer oxygen. Seek medical attention IMMEDIATELY.

**EYE CONTACT:** Immediately flush eyes with water for 10-15 minutes. Then don respiratory protective mask. Although miosis (pinpointing of the pupils) may be an early sign of agent exposure, an injection will not be administered when miosis is the only sign present. Instead, the individual will be taken IMMEDIATELY to the medical treatment facility for observation.

**SKIN CONTACT:** Don respiratory protective mask and remove contaminated clothing. Immediately wash contaminated skin with copious amounts of soap and water, 10% sodium carbonate solution, or 5% liquid household bleach. Rinse well with water to remove decontaminant. Administer an intramuscular injection with the MARK I kit injectors only if local sweating and muscular twitching symptoms are observed. SEEK MEDICAL ATTENTION IMMEDIATELY.

**INGESTION:** Do not induce vomiting. First symptoms are likely to be gastrointestinal. Immediately administer an intramuscular injection of the MARK I kit auto-injectors. SEEK MEDICAL ATTENTION IMMEDIATELY.

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#### SECTION VI - REACTIVITY DATA

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**STABILITY:** Stable when pure.

**INCOMPATIBILITY:** Attacks tin, magnesium, cadmium plated steel, some alumi-

nums. Slight attack on copper, brass, lead, practically no attack on 1020 steel, Inconel & K-monel.

Hydrolyzes to form HF under acid conditions and isopropyl alcohol & polymers under basic conditions.

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## SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURES

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**STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:** If leak or spills occur, only personnel in full protective clothing (see section 8 ) will remain in area. In case of personnel contamination see section V "Emergency and First Aid Instructions".

**RECOMMENDED FIELD PROCEDURES:** Spills must be contained by covering with vermiculite, diatomaceous earth clay, fine sand, sponges, and paper or cloth towels. Decontaminate with copious amounts of aqueous Sodium Hydroxide solution (a minimum 10 wt percent). Scoop up all material and place in a fully removable head drum with a high density polyethylene liner. Cover the contents of the drum with decontaminating solution as above before affixing the drum head. After sealing the head, the exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material IAW waste disposal methods provided below. Dispose of material used to decontaminate exterior of drum IAW Federal, state and local regulations. Conduct general area monitoring with an approved monitor (see Section 8) to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

If 10 wt percent aqueous Sodium Hydroxide solution is not available then the following decontaminants may be used instead and are listed in the order of preference: Decontamination Solution No. 2 (DS2), Sodium Carbonate, and Super-tropical Bleach Slurry (STB).

**RECOMMENDED LABORATORY PROCEDURES:** A minimum of 56 grams of decon solution is required for each gram of GB. Decontaminant/agent solution is allowed to agitate for a minimum of one hour. Agitation is not necessary following the first hour. At the end of the one hour, the resulting solution should be adjusted to a pH greater than 11.5. If the pH is below 11.5, NaOH should be added until a pH above 11.5 can be maintained for 60 minutes.

An alternate solution for the decontamination of GB is 10 wt percent Sodium Carbonate in place of the 10 percent Sodium Hydroxide solution above. Continue with 56 grams of decon to 1 gram of agent. Agitate for one hour but allow three (3) hours for the reaction. The final pH should be adjusted to above 10. It is also permitted to substitute 5.25% Sodium Hypochlorite or 25 wt percent Monoethylamine (MEA) for the 10% Sodium Hydroxide solution above. MEA must be completely dissolved in water prior to addition of the agent. Continue with 56 grams of decon for each gram of GB and provide agitation for one hour. Continue with same ratios and time stipulations.

Scoop up all material and place in a fully removable head drum with a high density polyethylene liner. Cover the contents of the drum with decontaminating solution as above before affixing the drum head. After sealing the head, the exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material IAW waste disposal methods provided below. Dispose of material used to decontaminate exterior of drum IAW Federal, state and local regulations. Conduct general area monitoring with an approved monitor (see Section 8) to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

**WASTE DISPOSAL METHOD:** Open pit burning or burying of GB or items containing or contaminated with GB in any quantity is prohibited. The detoxified GB using procedures above) can be thermally destroyed by incineration in an EPA approved incinerator in accordance with appropriate provisions of Federal, state and local RCRA regulations.

NOTE: Some states define decontaminated surety material as a RCRA Hazardous waste.

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SECTION VIII - SPECIAL PROTECTION INFORMATION  
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RESPIRATORY PROTECTION:

Concentration

Respiratory Protective Equipment

< .0001 mg/m<sup>3</sup>

A full facepiece, chemical canister, air-purifying protective mask will be onhand for escape. (The M9-, M17-, or M40-series masks are acceptable for this purpose)

.0001 to 0.2 mg/m<sup>3</sup>

A NIOSH/MSHA approved pressure demand full face-piece SCBA or supplied air respirator with escape air cylinder may be used.

Alternatively, a full facepiece, chemical canister air-purifying protective mask is acceptable for this purpose (for example, M9-, M17-, or M40-series mask or other mask certified as equivalent) is acceptable. (See DA PAM 385-61 for determination of appropriate level)

> 0.2 mg/m<sup>3</sup>  
or unknown

NIOSH/MSHA approved pressure demand full face-piece SCBA suitable for use in high agent concentrations with protective ensemble (See DA PAM 385-61 for examples).

VENTILATION: Local Exhaust: Mandatory must be filtered or scrubbed to limit exit concentration to < .0001 mg/m<sup>3</sup> averaged over 8 hr/day indefinitely.

SPECIAL: Chemical laboratory hoods shall have an average inward face velocity of 100 linear feet per minute (lfpm) plus or minus 10% with the velocity at any point not deviating from the average face velocity by more than 20%. Laboratory hoods shall be located such that cross drafts do not exceed 20 percent of the inward face velocity. A visual performance test utilizing smoke producing devices shall be performed in the assessment of the hood's ability to contain agent GB. Emergency backup power necessary. Hoods should be tested semi-annually or after modification or maintenance operations. Operations should be performed 20 cm inside hood face.

Other: Recirculation of exhaust air from agent areas is prohibited. No connection is allowed between agent areas and other areas through ventilation system.

PROTECTIVE GLOVES: Butyl Glove M3 and M4  
Norton, Chemical Protective Glove Set

EYE PROTECTION: Chemical goggles. For splash hazards use goggles and faceshield.

OTHER PROTECTIVE EQUIPMENT: For general lab work, gloves and lab coat shall be worn with M9, M17 or M40 mask readily available.

MONITORING: Available monitoring equipment for agent GB is the M8/M9 Detector paper, detector ticket, blue band tube, M256/M256A1 kits, bubbler, Depot Area Air Monitoring System (DAAMS), Automatic Continuous Air Monitoring System (ACAMS), real time monitoring (RTM), Demilitarization Chemical Agent Concentrator (DCAC), M8/M43, M8A1/M43A2, Hydrogen Flame Photometric Emission Detector (HYFED), CAM-M1, Miniature Chemical Agent Monitor (MINICAM) and the Real Time Analytical Platform (RTAP).

Real-time, low-level monitors (with alarm) are required for GB operations. In their absence, an IDLH atmosphere must be presumed. Laboratory opera-

tions conducted in appropriately maintained and alarmed engineering controls require only periodic low-level monitoring.

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### SECTION IX - SPECIAL PRECAUTIONS

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#### PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

In handling, the buddy system will be incorporated. No smoking, eating and drinking in areas containing agent is permitted. Containers should be periodically inspected for leaks (either visually or by a detector kit). Stringent control over all personnel practices must be exercised. Decontamination equip shall be conveniently located. Exits must be designed to permit rapid evacuation. Chemical showers, eye-wash stations, and personal cleanliness facilities must be provided. Wash hands before meals and each worker will shower thoroughly with special attention given to hair, face, neck, and hands, using plenty of soap before leaving at the end of the work day.

OTHER PRECAUTIONS: Agents must be double contained in liquid and vapor tight containers when in storage or when outside of ventilation hood.

For additional information see "AR 385-61, The Army Toxic Chemical Agent Safety Program", "DA PAM 385-61, Toxic Chemical Agent Safety Standards", and "AR 40-8, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX".

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### SECTION X - TRANSPORTATION DATA

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PROPER SHIPPING NAME: Poisonous liquids, n.o.s.

DOT HAZARD CLASSIFICATION: 6.1

DOT LABEL: Poison

DOT MARKING: Poisonous liquid, n.o.s. (Isopropyl methylphosphonofluoridate)  
UN2810

DOT PLACARD: POISON

PRECAUTIONS TO BE TAKEN IN TRANSPORTATION: Motor vehicles will be placarded regardless of quantity. Driver shall be given full and complete information regarding shipment and conditions in case of emergency.

AR 50-6 deals specifically with the shipment of chemical agents. Shipments of agent will be escorted in accordance with AR 740-32.

EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURES: See sections IV, VII, and VIII.

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While the Edgewood Research, Development and Engineering Center, Dept. of the Army believes that the data contained herein are factual and the opinion expressed are those of qualified experts regarding the results of the tests conducted, the data are not to be taken as a warranty or representation for which the Department of the Army or Edgewood Research, Development and Engineering Center assumes legal responsibility. They are offered solely for your consideration, investigation, and verification. Any use of these data and information must be determined by the user to be in accordance with applicable Federal, State, and local laws and regulations.



DATE: 14 Dec 1992  
HCSDS NO: 20058A

U.S. ARMY EDGEWOOD  
RESEARCH, DEVELOPMENT  
AND ENGINEERING CENTER

Emergency Telephone #s:  
ERDEC Safety Office  
410-671-4411 0700-1700  
EST After normal duty  
hours: 410-278-5201  
Ask for ERDEC Staff  
Duty Officer

HD, AND THD (See Addendum A)

MATERIAL SAFETY DATA SHEET

SECTION I - GENERAL INFORMATION

MANUFACTURER'S NAME: Department of the Army

MANUFACTURER'S ADDRESS: U.S. ARMY CHEMICAL AND BIOLOGICAL DEFENSE AGENCY  
EDGEWOOD RESEARCH DEVELOPMENT AND ENGINEERING  
CENTER  
ATTN: SCBRD-ODR-S  
ABERDEEN PROVING GROUND, MD 21010-5423

CAS REGISTRY NUMBER: 505-60-2, 39472-40-7, 68157-62-0

CHEMICAL NAME AND SYNONYMS:

Sulfide, bis (2-chloroethyl)  
Bis(beta-chloroethyl)sulfide  
Bis(2-chloroethyl)sulfide  
1-chloro-2(beta-chloroethylthio)ethane  
beta, beta'-dichlorodiethyl sulfide  
2,2'-dichlorodiethyl sulfide  
Di-2-chloroethyl sulfide  
beta, beta'-dichloroethyl sulfide  
2,2'-dichloroethyl sulfide

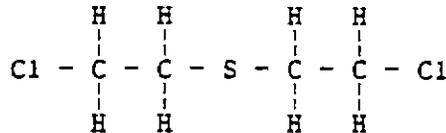
TRADE NAME AND SYNONYMS:

HD	Senfgas	H
Sulfur mustard	S-lost	HS
Iprit	Sulphur mustard gas	
Kampstoff "Lost"	S-yperite	
Lost	Yellow Cross Liquid	
Mustard Gas	Yperite	

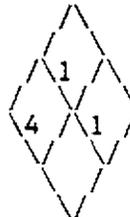
CHEMICAL FAMILY: chlorinated sulfur compound

FORMULA/CHEMICAL STRUCTURE:

C4(H8)Cl2(S)



NFPA 704 SIGNAL: Health - 4  
Flammability- 1  
Reactivity- 1



SECTION II - COMPOSITION

INGREDIENTS NAME	FORMULA	PERCENTAGE BY WEIGHT	AIRBORNE EXPOSURE LIMIT (AEL)
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Sulfur Mustard

C4(H8)Cl2(S)

100

0.003 mg/m<sup>3</sup> (8 hr-TWA)

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SECTION III - PHYSICAL DATA

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BOILING POINT DEG F (DEG C): 422 DEG F (217 DEG C)

VAPOR PRESSURE (mm Hg): 0.072 mm Hg @ 20 DEG C (0.11 mm Hg @ 25 DEG C)

VAPOR DENSITY (AIR=1): 5.5

SOLUBILITY IN WATER: Negligible. Soluble in acetone, CH<sub>3</sub>(Cl), tetrachloroethane, ethylbenzoate, and ether.

SPECIFIC GRAVITY (H<sub>2</sub>O=1): 1.27 @ 20 DEG C

VOLATILITY: 610 mg/m<sup>3</sup> @ 20 DEG C  
920 mg/m<sup>3</sup> @ 25 DEG C

APPEARANCE AND ODOR: Water clear if pure. Normally pale yellow to black. Slight garlic type odor. The odor threshold for HD is 0.0006 mg/m<sup>3</sup>

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SECTION IV - FIRE AND EXPLOSION DATA

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FLASHPOINT (METHOD USED): 105 DEG C (ignited by large explosive charges)

FLAMMABILITY LIMITS (% by volume): Unknown

EXTINGUISHING MEDIA: Water, fog, foam, CO<sub>2</sub>. Avoid use of extinguishing methods that will splash or spread mustard.

SPECIAL FIRE FIGHTING PROCEDURES: All persons not engaged in extinguishing the fire should be immediately evacuated from the area. Fires involving HD should be contained to prevent contamination to uncontrolled areas. When responding to a fire alarm in buildings or areas containing agents, fire-fighting personnel should wear full firefighter protective clothing (without TAP clothing) during chemical agent firefighting and fire rescue operations. Respiratory protection is required. Positive pressure, full facepiece, NIOSH-approved self-contained breathing apparatus (SCBA) will be worn where there is danger of oxygen deficiency and when directed by the fire chief or chemical accident/incident (CAI) operations officer. In cases where fire-fighters are responding to a chemical accident/incident for rescue/reconnaissance purposes vice firefighting, they will wear appropriate levels of protective clothing (see Section 8).

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SECTION V - HEALTH HAZARD DATA

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AIRBORNE EXPOSURE LIMIT (AEL): The AEL for HD is 0.003 mg/m<sup>3</sup> as found in "AR 40-173, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, HT". To date, however, the Occupational Safety and Health Administration (OSHA) has not promulgated a permissible exposure concentration for HD.

EFFECTS OF OVEREXPOSURE: HD is a vesicant (causing blisters) and alkylating agent producing cytotoxic action on the hematopoietic (blood-forming) tissues which are especially sensitive. The rate of detoxification of HD in the body is very slow and repeated exposures produce a cumulative effect. HD has been found to be a human carcinogen by the International Agency for Research on Cancer (IARC).

Median doses of HD in man are:

LD<sub>50</sub> (skin) = 100 mg/kg

ICT<sub>50</sub> (skin) = 2000 mg-min/m<sup>3</sup> at 70 - 80 DEG F (humid environment)

= 1000 mg-min/m<sup>3</sup> at 90 DEG F (dry environment)  
ICt50 (eyes) = 200 mg-min/m<sup>3</sup>  
ICt50 (inhalation) = 1500 mg-min/m<sup>3</sup> (Ct unchanged with time)  
LD50 (oral) = 0.7 mg/kg

Maximum safe Ct for skin and eyes are 5 and 2 mg-min/m<sup>3</sup>, respectively.

ACUTE PHYSIOLOGICAL ACTION OF HD IS CLASSIFIED AS LOCAL AND SYSTEMIC.

LOCALLY, HD affects both the eyes and the skin. SKIN damage occurs after percutaneous resorption. Being lipid soluble, HD can be resorbed into all organs. Skin penetration is rapid without skin irritation. Swelling (blisters) and reddening (erythema) of the skin occurs after a latency period of 4-24 hours following the exposure, depending on degree of exposure and individual sensitivity. The skin healing process is very slow. Tender skin, mucous membrane and perspiration covered skin are more sensitive to the effects of HD. HD's effect on the skin, however, is less than on the eyes. Local action on the eyes produces severe necrotic damage and loss of eyesight. Exposure of eyes to HD vapor or aerosol produces lacrimation, photophobia, and inflammation of the conjunctiva and cornea.

SYSTEMIC ACTIONS occur primarily through inhalation and ingestion. The HD vapor or aerosol is less toxic to the skin or eyes than the liquid form. When inhaled, the upper respiratory tract (nose, throat, trachea) is inflamed after a few hours latency period, accompanied by sneezing, coughing, and bronchitis, loss of appetite, diarrhea, fever, and apathy. Exposure to nearly lethal dose of HD can produce injury to bone marrow, lymph nodes, and spleen as indicated by a drop in WBC count and, therefore, results in increased susceptibility to local and systemic infections. Ingestion of HD will produce severe stomach pains, vomiting, and bloody stools after a 15-20 minute latency period.

CHRONIC EXPOSURE to HD can cause sensitization, chronic lung impairment, (cough, shortness of breath, chest pain), and cancer of the mouth, throat, respiratory tract, skin, and leukemia. It may also cause birth defects.

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION. Remove from the source IMMEDIATELY. If breathing has stopped, give artificial respiration. If breathing is difficult, administer oxygen. Seek medical attention IMMEDIATELY.

EYE CONTACT. Speed in decontaminating the eyes is absolutely essential. Remove person from the liquid source, flush the eyes immediately with water by tilting the head to the side, pulling the eyelids apart with the fingers and pouring water slowly into the eyes. Do not cover eyes with bandages but, if necessary, protect eyes by means of dark or opaque goggles. Transfer the patient to a medical facility IMMEDIATELY.

SKIN CONTACT. Don respiratory protective mask and gloves; remove victim from agent source immediately. Flush skin and clothes with 5 percent solution of sodium hypochlorite or liquid household bleach within one minute. Cut and remove contaminated clothing, flush contaminated skin area again with 5 percent sodium hypochlorite solution, then wash contaminated skin area with soap and water. If shower facilities are available, wash thoroughly and transfer to medical facility. If the skin becomes contaminated with a thickened agent, blot/wipe the material off immediately with an absorbent pad/paper towel prior to using decontaminating solution.

INGESTION. Do not induce vomiting. Give victim milk to drink. Seek medical attention IMMEDIATELY.

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#### SECTION VI - REACTIVITY DATA

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STABILITY: Stable at ambient temperatures. Decomposition temperature is 149 DEG C to 177 DEG C. Mustard is a persistent agent depending on pH and moisture, and has been known to remain active for up to three years in soil.

INCOMPATIBILITY: Conditions to avoid. Rapidly corrosive to brass @ 65 DEG

C. Will corrode steel at a rate of .0001 in. of steel per month @ 65 DEG C.

HAZARDOUS DECOMPOSITION: Mustard will hydrolyze to form HCl and thiodiglycol.

HAZARDOUS POLYMERIZATION: Will not occur.

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## SECTION VII - SPILL, LEAK, AND DISPOSAL PROCEDURES

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STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Only personnel in full protective clothing (see Section 8) will be allowed in an area where mustard is spilled.

### RECOMMENDED FIELD PROCEDURES:

The mustard should be contained using vermiculite, diatomaceous earth, clay or fine sand and neutralized as soon as possible using copious amounts of 5.25 percent Sodium Hypochlorite solution.

Scoop up all material and place in an approved DOT container. Cover the contents of the drum with decontaminating solution as above. The exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material IAW waste disposal methods provided below. Dispose of the material used to decontaminate exterior of drum IAW Federal, state and local regulations. Conduct general area monitoring with an approved monitor (see Section 8) to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

If 5.25 percent Sodium Hypochlorite solution is not available then the following decontaminants may be used instead and are listed in the order of preference: Calcium Hypochlorite, Decontamination Solution No. 2 (DS2), and Super Tropical Bleach Slurry (STB). WARNING: Pure, undiluted Calcium Hypochlorite (HTH) will burn on contact with liquid blister agent.

### RECOMMENDED LABORATORY PROCEDURES:

A minimum of 65 grams of decon solution per gram of HD is allowed to agitate for a minimum of one hour. Agitation is not necessary following the first hour if a single phase is obtained. At the end of 24 hours, the resulting solution shall be adjusted to a pH between 10 and 11. Test for presence of active chlorine by use of acidic potassium iodide solution to give free iodine color. Place 3 ml of the decontaminate in a test tube. Add several crystals of Potassium Iodine and swirl to dissolve. Add 3 ml of 50 wt percent Sulfuric Acid:water and swirl. IMMEDIATE Iodine color indicates the presence of active chlorine. If negative, add additional 5.25 percent Sodium Hypochlorite solution to the decontamination solution, wait two hours, then test again for active chlorine. Continue procedure until positive chlorine is given by solution.

A 10 wt percent Calcium hypochlorite (HTH) mixture may be substituted for Sodium Hypochlorite. Use 65 grams of decon per gram of HD and continue the test as described for Sodium Hypochlorite.

Scoop up all material and place in approved DOT containers. Cover the contents of the drum with decontaminating solution as above. The exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material IAW waste disposal methods provided below. Dispose of the material used to decontaminate exterior of drum IAW Federal, state and local regulations. Conduct general area monitoring with an approved monitor (see Section 8) to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (see Section 8).

NOTE: Surfaces contaminated with HD and then rinse-decontaminated may evolve sufficient mustard vapor to produce a physiological response.

WASTE DISPOSAL METHOD: All decontaminated material should be collected,

contained and chemically decontaminated or thermally decomposed in an EPA approved incinerator, which will filter or scrub toxic by-products from effluent air before discharge to the atmosphere. Any contaminated protective clothing should be decontaminated using HTH or bleach and analyzed to assure it is free of detectable contamination (3X) level. The clothing should then be sealed in plastic bags inside properly labeled drums and held for shipment back to the DA issue point. Decontamination of waste or excess material shall be accomplished in accordance with the procedures outlined above with the following exception:

---- HD on laboratory glassware may be oxidized by its vigorous reaction with concentrated nitric acid.

Open pit burning or burying of HD or items containing or contaminated with HD in any quantity is prohibited.

NOTE: Some states define decontaminated surety material as a RCRA hazardous waste.

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### SECTION VIII - SPECIAL PROTECTION INFORMATION

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#### RESPIRATORY PROTECTION:

Concentration mg/m <sup>3</sup>	Respiratory Protection/Ensemble Required
Less than or equal to 0.003	A full facepiece, chemical canister, air-purifying protective mask will be onhand for escape. (The M9-, M17-, and M40-series masks are acceptable for this purpose. Other masks certified as equivalent may be used.)
Greater than 0.003	NIOSH/MSHA approved pressure demand full facepiece SCBA suitable for use in high agent concentrations with protective ensemble. (See DA PAM 385-61 for examples).

#### VENTILATION:

Local Exhaust. Mandatory. Must be filtered or scrubbed. Air emissions shall meet local, state and federal regulations.

Special. Chemical laboratory hoods shall have an average inward face velocity of 100 linear feet per minute (1fpm) plus or minus 10% with the velocity at any point not deviating from the average face velocity by more than 20%. Existing laboratory hoods shall have an inward face velocity of 150 lfpm plus or minus 20 percent. Laboratory hoods shall be located such that cross drafts do not exceed 20% of the inward face velocity. A visual performance test utilizing smoke producing devices shall be performed in assessing the ability of the hood to contain agent HD.

Other. Recirculation of exhaust air from agent areas is prohibited. No connection between agent area and other areas through the ventilation system is permitted. Emergency backup power is necessary. Hoods should be tested semi-annually or after modification or maintenance operations. Operations should be performed 20 cm inside hoods.

PROTECTIVE GLOVES: MANDATORY. Butyl toxicological agent protective gloves (M3, M4, gloveset).

EYE PROTECTION: As a minimum, chemical goggles will be worn. For splash hazard, use goggles and face-shield.

OTHER PROTECTIVE EQUIPMENT: For general lab work, gloves and lab coat shall be worn with M9 or M17 mask readily available.

In addition, when handling contaminated lab animals, a daily clean smock,

foot covers, and head covers are required.

**MONITORING:** Available monitoring equipment for agent HD is the M8/M9 detector paper, blue band tube, M256/M256A1 kits, bubbler, Depot Area Air Monitoring System (DAMMS), Automated Continuous Air Monitoring System (ACAMS), CAM-M1, Hydrogen Flame Photometric Emission Detector (HYFED), the Miniature Chemical Agent Monitor (MINICAM), and Real Time Analytical Platform (RTAP).

Real-time, low-level monitors (with alarm) are required for HD operations. In their absence, an IDLH atmosphere must be presumed. Laboratory operations conducted in appropriately maintained and alarmed engineering controls require only periodic low-level monitoring.

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#### SECTION IX - SPECIAL PRECAUTIONS

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##### PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

During handling, the "buddy" (two-man) system will be used. Containers should be periodically inspected for leaks, either visually or using a detector kit, and prior to transferring the containers from storage to work areas. Stringent control over all personnel handling HD must be exercised. Chemical showers, eyewash stations, and personal cleanliness facilities must be provided. Each worker will wash their hands before meals and shower thoroughly with special attention given to hair, face, neck, and hands using plenty of soap before leaving at the end of the work day. No smoking, eating, or drinking is permitted at the work site. Decontaminating equipment shall be conveniently located. Exits must be designed to permit rapid evacuation. HD should be stored in containers made of glass for Research, Development, Test and Evaluation (RDTE) quantities or one-ton steel containers for large quantities. Agent shall be double-contained in liquid-tight containers when in storage.

**OTHER PRECAUTIONS:** For additional information see "AR 385-61, The Army Toxic Chemical Agent Safety Program", "DA PAM 385-61, Toxic Chemical Agent Safety Standards", and "AR 40-173, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT".

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#### SECTION X - TRANSPORTATION DATA

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**PROPER SHIPPING NAME:** Poisonous liquids, n.o.s.

**DOT HAZARD CLASS:** 6.1

**DOT LABEL:** Poison

**DOT MARKING:** Poisonous liquids, n.o.s. (Sulfide, bis 2-chloroethyl))  
UN 2810

**DOT PLACARD:** POISON

**EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURES:** See Sections IV and VIII.

**PRECAUTIONS TO BE TAKEN IN TRANSPORTATION:** Motor vehicles will be placarded regardless of quantity. Driver shall be given full and complete information regarding shipment and conditions in case of emergency. AR 50-6 deals specifically with the shipment of chemical agents. Shipment of agents will be escorted in accordance with AR 740-32.

While the Edgewood Research Development and Engineering Center, Department of the Army believes that the data contained herein are factual and the opinions expressed are those of qualified experts regarding the results of the tests conducted, the data are not to be taken as a warranty or representation for which the Department of the Army or Edgewood Research Development and Engineering Center assumes legal responsibility. They are offered solely for your consideration,

investigation, and verification. Any use of these data and information must be determined by the user to be in accordance with applicable Federal, State, and local laws and regulations.

ADDENDUM A  
ADDITIONAL INFORMATION FOR THICKENED HD

TRADE NAME AND SYNONYMS: Thickened HD, THD

HAZARDOUS INGREDIENTS: K125 (acryloid copolymer, 5%) is used to thicken HD. K125 is not known to be hazardous except in a finely-divided, powder form.

PHYSICAL DATA: Essentially the same as HD except for viscosity. The viscosity of HV is between 1000 and 1200 centistokes @ 25 DEG C.

FIRE AND EXPLOSION DATA: Same as HD.

HEALTH HAZARD DATA: Same as HD except for skin contact. For skin contact, don respiratory protective mask and remove contaminated clothing IMMEDIATELY. IMMEDIATELY scrape the HV from the skin surface, then wash the contaminated surface with acetone. Seek medical attention IMMEDIATELY.

SPILL, LEAK, AND DISPOSAL PROCEDURES: If spills or leaks of HV occur, follow the same procedures as those for HD, but dissolve the THD in acetone prior to introducing any decontaminating solution. Containment of THD is generally not necessary. Spilled THD can be carefully scraped off the contaminated surface and placed in a fully removable head drum with a high density, polyethylene lining. The THD can then be decontaminated, after it has been dissolved in acetone, using the same procedures used for HD. Contaminated surfaces should be treated with acetone, then decontaminated using the same procedures as those used for HD.

NOTE: Surfaces contaminated with THD or HD and then rinse-decontaminated may evolve sufficient mustard vapor to produce a physiological response.

SPECIAL PROTECTION INFORMATION: Same as HD.

SPECIAL PRECAUTIONS: Same as HD with the following addition. Handling the THD requires careful observation of the "stringers" (elastic, thread-like attachments) formed when the agents are transferred or dispensed. These stringers must be broken cleanly before moving the contaminating device or dispensing device to another location, or unwanted contamination of a working surface will result.

TRANSPORTATION DATA: Same as HD.



DATE: 3 Dec 1990

U.S. ARMY CHEMICAL  
RESEARCH, DEVELOPMENT  
AND ENGINEERING CENTER

Emergency Telephone #s:  
CRDEC Safety Office  
301-671-4411 0700-1700  
EST After normal duty  
hours: 301-278-5201  
Ask for CRDEC Staff  
Duty Officer

HT MATERIAL SAFETY DATA SHEET

SECTION I - GENERAL INFORMATION

MANUFACTURER'S NAME: Department of the Army

MANUFACTURER'S ADDRESS: U.S. ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND  
CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING  
CENTER  
ATTN: SMCCR-CMS-E  
ABERDEEN PROVING GROUND, MD 21010-5423

CAS REGISTRY NUMBER: Not Available

CHEMICAL NAME:

HD : Bis-(2-chloroethyl) sulfide  
T : Bis-[2-(2-chloroethylthio)-ethyl] ether

Alternate chemical names:

See components (HD, T)

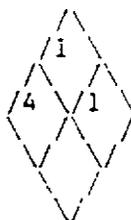
TRADE NAME AND SYNONYMS:

HT  
Sulfur - Mustard (Vesicant)

CHEMICAL FAMILY: Chlorinated sulfur compound

FORMULA/CHEMICAL STRUCTURE: Mixture of 60% Sulfur Mustard (HD) and 40%  
Sulfur Mustard (T) by weight  
HD: C4 H8 Cl2 S  
T: C8 H16 Cl2 O S2

NFPA 704 SIGNAL: Health - 4  
-Flammability - 1  
Reactivity - 1



SECTION II - COMPOSITION

INGREDIENTS NAME	FORMULA	PERCENTAGE BY WEIGHT	AIRBORNE EXPOSURE LIMIT (AEL)
HT	*	100	0.003 mg/m3

\* See Section I

SECTION III - PHYSICAL DATA

BOILING POINT: No constant boiling point. Above 228 DEG C

VAPOR PRESSURE (torr): 0.104 @ 25 DEG C

VAPOR DENSITY (AIR=1): 6.92

SOLUBILITY IN WATER: Practically insoluble.

SPECIFIC GRAVITY (H2O=1): 1.265 at 20 DEG C

FREEZING (MELTING) POINT: 0.0 to 1.3 DEG C

AUTOIGNITION TEMPERATURE DEG F (DEG C): Data not available

VISCOSITY (CENTISTOKES): 6.05 @ 20 DEG C

VOLATILITY (mg/m3): 831 @ 25 DEG C

EVAPORATION RATE: Data not available

APPEARANCE & ODOR: Odor: Garlic-like

Appearance: Highly viscous clear to pale yellow liquid

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#### SECTION IV - FIRE AND EXPLOSION DATA

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FLASHPOINT: (METHOD USED): approximately 100 DEG C (method unknown)

FLAMMABILITY LIMITS (% by volume): Data not available

EXTINGUISHING MEDIA: Water, fog, foam, CO2. Avoid use of extinguishing methods that will splash or spread mustard.

UNUSUAL FIRE & EXPLOSION HAZARDS: May produce hydrogen chloride and sulfur oxides in a fire. Unburned agent vapors may be present and can cause toxic and vesicant effects.

SPECIAL FIRE FIGHTING PROCEDURES: All persons not engaged in extinguishing the fire should be immediately evacuated from the area. Fires involving HT should be contained to prevent contamination to uncontrolled areas. When responding to a fire alarm in buildings or areas containing agents, fire-fighting personnel should wear full firefighter protective clothing (without IAP clothing) during chemical agent firefighting and fire rescue operations. Respiratory protection is required. Positive pressure, full facepiece, NIOSH-approved self-contained breathing apparatus (SCBA) will be worn where there is danger of oxygen deficiency and when directed by the fire chief or chemical accident/incident (CAI) operations officer. The M9 or M17 series mask may be worn in lieu of SCBA when there is no danger on oxygen deficiency. In cases where firefighters are responding to a chemical accident/incident for rescue/reconnaissance purposes vice firefighting, they will wear appropriate levels of protective clothing (see Section 8).

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#### SECTION V - HEALTH HAZARD DATA

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AIRBORNE EXPOSURE LIMIT (AEL): The AEL for HT is 0.003 mg/m3 as proposed in the USAEHA Technical Guide No. 173, "Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT". No individual should be intentionally exposed to any direct skin or eye contact.

HD, a component of HT, is recognized as a human carcinogen by the International Agency for Research on Cancer (IARC).

EFFECTS OF OVEREXPOSURE: HT is a vesicant (causing blisters). Since HT contains HD, HT is an alkylating agent producing cytotoxic action on the hematopoietic (blood-forming) tissues which are especially sensitive. The rate of detoxification of HT in the body is very slow and repeated exposure

produce a cumulative effect. Median lethal and incapacitating doses of HT in man have not been established. However, the inhalation LC50s in certain animal species have been established as follows:

Dog:	100 - 200 mg-min/m <sup>3</sup>
Guinea Pig:	3000 - 6000 mg-min/m <sup>3</sup>
Rabbit:	3000 - 6000 mg-min/m <sup>3</sup>
Mouse:	820 mg-min/m <sup>3</sup>

Maximum safe Ct for HD for skin and eyes are 5 and 2 mg-min/m<sup>3</sup>, respectively.

ACUTE PHYSIOLOGICAL ACTION OF HT IS CLASSIFIED AS LOCAL AND SYSTEMIC.

LOCALLY, HT affects both the eyes and the skin. SKIN damage occurs after percutaneous resorption. Being lipid soluble, HT can be resorbed into all organs. Skin penetration is rapid without skin irritation. Swelling (blisters) and reddening (erythema) of the skin occurs after a latency period of 4-24 hours following the exposure, depending on the degree of exposure and individual sensitivity. The skin healing process is very slow. Tender skin, mucous membranes, and perspiration covered skin are more sensitive to the effects of HT. HT's effect on the skin, however, is less than on the eyes. Local action on the eyes produces severe necrotic damage and loss of eyesight. Exposure of eyes to HT vapor or aerosol produces lacrimation, photophobia, and inflammation of the conjunctiva and cornea.

SYSTEMIC ACTIONS occur primarily through inhalation and ingestion. The HT vapor or aerosol is less toxic to the skin or eyes than the liquid form. When inhaled, the upper respiratory tract (nose, throat, trachea) is inflamed after a few hours latency period, accompanied by sneezing, coughing and bronchitis, loss of appetite, diarrhea, fever, and apathy. Exposure to nearly lethal doses of HT can produce injury to bone marrow, lymph nodes, and spleen as indicated by a drop in WBC count and, therefore, results in an increased susceptibility to local and systemic infections. Ingestion of HT will produce severe stomach pains, vomiting, and bloody stools after a 15-20 minute latency period.

CHRONIC EXPOSURE to HT can cause sensitization, chronic lung impairment, (cough, shortness of breath, chest pain) and cancer of the mouth, throat, respiratory tract, and skin, and leukemia. It may also cause birth defects.

#### EMERGENCY AND FIRST AID PROCEDURES:

**INHALATION:** Remove from the source IMMEDIATELY. If breathing has stopped, give artificial respiration. If breathing is difficult, administer oxygen. Seek medical attention IMMEDIATELY.

**EYE CONTACT:** Speed in decontaminating the eyes is absolutely essential. Remove person from the liquid source, flush the eyes immediately with water by tilting the head to the side, pulling the eyelids apart with the fingers and pouring water slowly into the eyes. Do not cover eyes with bandages but, if necessary, protect eyes by means of dark or opaque goggles. Transfer the victim to the medical facility IMMEDIATELY.

**SKIN CONTACT:** Don respiratory protection mask and gloves; remove victim from agent source immediately. Flush skin and clothes with 5 percent sodium hypochlorite solution or liquid household bleach; then wash contaminated skin area with soap and water. If shower facilities are available, wash thoroughly and transfer to medical facility IMMEDIATELY.

**INGESTION:** Do not induce vomiting. Give victim milk to drink. Seek medical attention IMMEDIATELY.

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#### SECTION VI - REACTIVITY DATA

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**STABILITY:** Stable at ambient temperatures. Decomposition temperature is 165 DEG C to 185 DEG C. HT is a persistent agent depending on pH and moisture, and has been known to remain active for up to three years in soil.

**INCOMPATIBILITY:** Conditions to avoid. Rapidly corrosive to brass @ 65 DEG

C. Will corrode steel at a rate of .0001 in. of steel per month @ 65 DEG C.

HAZARDOUS DECOMPOSITION: HT will hydrolyze to form HCl, thiodiglycol, and bis-(2-(2-hydroxyethylthio) ethyl ether.

HAZARDOUS POLYMERIZATION: Will not occur.

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## SECTION VII - SPILL, LEAK, AND DISPOSAL PROCEDURES

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STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Only personnel in full protective clothing will be allowed in an area where HT is spilled (See section 8). In case of personnel contamination see section V "Emergency and First Aid Instructions."

RECOMMENDED FIELD PROCEDURES: Spills of HT must be contained by using vermiculite, diatomaceous earth, clay or fine sand and neutralized as possible using copious amounts of 5.25 percent Sodium Hypochlorite solution. Scoop up all material and place in approved DOT containers. Cover the contents of the drum with decontaminating solution as above. The exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material used to decontaminate exterior of drum IAW Federal, state and local regulations. Conduct general area monitoring with an approved monitor (see Section 8) to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

If 5.25 percent Sodium Hypochlorite solution is not available then the following decontaminants may be used instead and are listed in the order of preference: Calcium Hypochlorite, Decontamination Solution No. 2 (DS2) and Super Tropical Bleach Slurry (STB). WARNING: Pure, undiluted Calcium Hypochlorite (HTH) will burn on contact with liquid blister agent.

RECOMMENDED LABORATORY PROCEDURES: A minimum of 65 grams of decon solution is allowed to agitate for a minimum of one hour. Agitation is not necessary following the first hour if a single phase is obtained. At the end of 24 hours, the resulting solution shall be adjusted to a pH between 10 and 11. Test for presence of active chlorine by use of acidic potassium iodide solution to give free iodine color. Place 3 ml of the decontaminate in a test tube. Add several crystals of Potassium Iodine and swirl to dissolve. Add 3 ml of 50 wt percent Sulfuric Acid:water and swirl. IMMEDIATE Iodine color indicates the presence of active chlorine. If negative, add additional 5.25 percent Sodium Hypochlorite solution to the decontamination solution, wait two hours, then test again for active chlorine. Continue procedure until positive chlorine is given by solution.

A 10 wt percent HTH (calcium hypochlorite) mixture may be substituted for Sodium Hypochlorite. Use 65 grams of decon per gram of HT and continue the test as described for Sodium Hypochlorite.

Scoop up all material and place in approved DOT containers. Cover the contents of the drum with decontaminating solution as above. The exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material IAW waste disposal methods provided below. Dispose of the material used to decontaminate exterior of drum IAW Federal, state and local regulations. Conduct general area monitoring with an approved monitor to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (see Section 8).

NOTE: Surfaces contaminated with HT and then rinse-decontaminated may evolve sufficient HT vapor to produce a physiological response.

WASTE DISPOSAL METHOD: All neutralized material should be collected, contained and thermally decomposed in an EPA permitted incinerator for decontaminated HT (see note), which will filter or scrub toxic by-products from ef-

fluent air before discharge to the atmosphere. Any contaminated protective clothing should be decontaminated using HTH or bleach and analyzed to assure it is free of detectable contamination (3X) level. The clothing should then be sealed in plastic bags inside properly labeled drums and held for shipment back to the DA issue point. Decontamination of waste or excess material shall be accomplished in accordance with the following procedure outlined above with the following exception:

--- HT on laboratory glassware may be oxidized by its vigorous reaction with concentrated nitric acid.

Open pit burning or burying of HT or items containing or contaminated with HT in any quantity is prohibited.

Note: Some states consider certain decontaminated surety agents as RCRA hazardous waste. Local regulations must be considered before disposal action is taken.

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## SECTION VIII - SPECIAL PROTECTION INFORMATION

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### RESPIRATORY PROTECTION:

Concentration (mg/m<sup>3</sup>)

Respiratory Protection/Ensemble Required

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Less than or equal  
to 0.003 as an  
8-hr TWA

Protective mask not required provided that:

- (a) Continuous real-time monitoring (with alarm capability) is conducted in the work area at the 0.003 mg/m<sup>3</sup> level of detection.
- (b) M9, M17 or M40 mask is available and donned if concentrations exceed 0.003 mg/m<sup>3</sup>.
- (c) Exposure has been limited to the extent practicable by engineering controls (remote operations, ventilation, and process isolation) or work practices.

If these conditions are not met then the following applies:

Full facepiece, chemical canister, air-purifying respirators. (The M9, M17, or M40 series or other certified equivalent masks acceptable for this purpose in conjunction with the M3 toxicological agent protective (TAP) suit for dermal protection.)

Greater than  
0.003 as an  
8-hr TWA

The Demilitarization Protective Ensemble (DPE), 30 mil, may be used with prior approval from the AMC Field Safety Activity. Use time for the 30 mil DPE must be restricted to two hours or less.

NOTE: When 30 mil DPE is not available the M9 or M40 series mask with Level A protective ensemble including impregnated innerwear can be used. However, use time shall be restricted to the extent operationally feasible, and may not exceed one hour.

As an additional precaution, the cuffs of the sleeves and the legs of the M3 suit shall be taped to the gloves and boots to reduce aspiration.

### VENTILATION:

Special. Chemical laboratory hoods shall have an average inward face velocity of 100 linear feet per minute (lfpm) plus or minus 10% with the velocity at any point not deviating from the average face velocity by more than 20%. Laboratory hoods shall be located such that cross drafts do not exceed 20% of inward face velocity. A visual performance test utilizing smoke producing devices shall be performed in assessing the ability of the hood to contain agent HT.

Other. Recirculation of exhaust air from agent areas is prohibited. No connection between agent area and other areas through the ventilation system is permitted. Emergency backup power is necessary. Hoods should be tested semi-annually or after modification or maintenance operations. Operations should be performed 20 cm inside hoods.

PROTECTIVE GLOVES: MANDATORY. Butyl Toxicological Agent Protective gloves (M3, M4, gloveset).

EYE PROTECTION: As a minimum, chemical goggles will be worn. For splash hazard use goggles and face-shield.

OTHER PROTECTIVE EQUIPMENT: Full protective clothing will consist of the M3 butyl rubber suit with hood, M2A1 boots, M3 gloves, impregnated underwear, M9 series mask and coveralls (if desired), or the Demilitarization Protective Ensemble (DPE). For general lab work, gloves and lab coat shall be worn with M9 or M17 mask readily available.

In addition, when handling contaminated lab animals, a daily clean smock, foot covers, and head covers are required.

MONITORING: Available monitoring equipment for agent HT is the M8/M9 detector paper, blue band tube, M256/M256A1 kits, bubbler, Depot Area Air Monitoring System (DAMMS), Automated Continuous Air Monitoring System (ACAMS), CAM-M1. Hydrogen Flame Photometric Emission Detector (HYFED), and the Miniature Chemical Agent Monitor (MINICAM).

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#### SECTION IX - SPECIAL PRECAUTIONS

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##### PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

During handling, the "buddy" (two-man) system will be used. Containers should be periodically inspected for leaks, either visually or using a detector kit, and prior to transferring the containers from storage to work areas. Stringent control over all personnel handling HT must be exercised. Chemical showers, eyewash stations, and personal cleanliness facilities must be provided. Wash hands before meals and each worker will shower thoroughly with special attention given to hair, face, neck, and hands, using plenty of soap before leaving at the end of the workday. No smoking, eating, or drinking is permitted at the work site. Decontamination equipment shall be conveniently located. Exits must be designed to permit rapid evacuation. HT should be stored in containers made of glass for Research Development Test and Evaluation (RDTE) quantities or one-ton steel containers for large quantities. Agent shall be double-contained in liquid-tight containers when in storage.

OTHER PRECAUTIONS: See AMC-R 385-131, "Safety Regulations for Chemical Agents H, HD, and HT, GB and VX," 9 Oct 1987 and USAEHA Technical Guide No. 173. "Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT," for additional information.

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#### SECTION X - TRANSPORTATION DATA

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PROPER SHIPPING NAME: Poisonous liquid, n.o.s.

DOT HAZARD CLASSIFICATION: Poison A

DOT LABEL: Poison Gas

DOT MARKING: Poisonous liquid, n.o.s. (Bis-(2-chloroethyl) sulfide, and Bis-[2-(2-chloroethylthio)-ethyl] ether) NA 1955

DOT PLACARD: POISON GAS

PRECAUTIONS TO BE TAKEN IN TRANSPORTATION: Motor vehicles will be placarded regardless of quantity. Driver shall be given full and complete information regarding shipment and conditions in case of emergency. AR 50-6 deals specifically with the shipment of chemical agents. Shipment of agents will be escorted in accordance with AR 740-32.

EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURES: See sections IV, VII, and VIII.

While the Chemical Research Development and Engineering Center, Department of the Army believes that the data contained herein are factual and the opinions expressed are those of qualified experts regarding the results of the tests conducted, the data are not to be taken as a warranty or representation for which the Department of the Army or Chemical Research Development and Engineering Center assumes legal responsibility. They are offered solely for your consideration, investigation, and verification. Any use of these data and information must be determined by the user to be in accordance with applicable Federal, State, and local laws and regulations.



DATE: 14 Dec 1992

U.S. ARMY EDGEWOOD  
RESEARCH, DEVELOPMENT  
AND ENGINEERING CENTER  
MATERIAL SAFETY DATA SHEET

Emergency Telephone #s:  
ERDEC Safety Office  
410-671-4411 0700-1700  
EST After normal duty  
hours: 410-278-5201  
Ask for ERDEC Staff  
Duty Officer

LETHAL NERVE AGENT (VX)

SECTION I - GENERAL INFORMATION

MANUFACTURER'S ADDRESS: U.S. ARMY CHEMICAL AND BIOLOGICAL DEFENSE AGENCY  
EDGEWOOD RESEARCH DEVELOPMENT AND ENGINEERING  
CENTER  
ATTN: SCBRD-ODR-S  
ABERDEEN PROVING GROUND, MD 21010-5423

CAS REGISTRY NUMBER: 50782-69-9, 51848-47-6, 53800-40-1, 70938-84-0

CHEMICAL NAME:

Phosphonothioic acid, methyl-, S-(2-bis(1-methylethylamino)ethyl) O-ethyl  
ester

O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothioate  
S-2-Diisopropylaminoethyl O-ethyl methylphosphonothioate  
S-2(2-Diisopropylamino)ethyl) O-ethyl methylphosphonothiolate  
O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothioate  
O-ethyl S-(2-diisopropylaminoethyl) methylthiolphosphonate

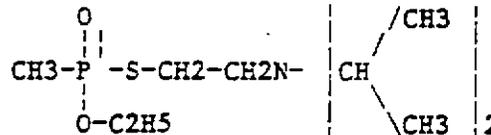
TRADE NAME AND SYNONYMS:

VX  
EA 1701  
TX60

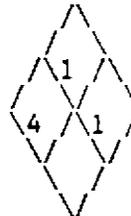
CHEMICAL FAMILY: sulfinated organophosphorus compound

FORMULA/CHEMICAL STRUCTURE:

C11 H26 N O2 P S



NFPA 704 SIGNAL: Health - 4  
Flammability - 1  
Reactivity - 1



SECTION II - COMPOSITION

INGREDIENTS NAME	FORMULA	PERCENTAGE BY WEIGHT	AIRBORNE EXPOSURE LIMIT
VX	C11H26NO2PS	100%	.00001 mg/m3

SECTION III - PHYSICAL DATA

BOILING POINT DEG F (DEG C): 568 (298)

VAPOR PRESSURE (mm Hg): 0.0007 @ 25 Deg C

VAPOR DENSITY (AIR=1): 9.2

SOLUBILITY IN WATER: moderate

APPEARANCE AND ODOR: Colorless to straw colored liquid & odorless, similar in appearance to motor oil.

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#### SECTION IV - FIRE AND EXPLOSION DATA

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FLASHPOINT: 159 Deg C (McCutchan - Young)

FLAMMABILITY LIMITS (% by volume): Not Available

LOWER EXPLOSIVE LIMIT: Not Applicable

UPPER EXPLOSIVE LIMIT: Not Applicable

EXTINGUISHING MEDIA: Water mist, fog, foam, CO2. Avoid using extinguishing methods that will cause splashing or spreading of the VX.

SPECIAL FIRE FIGHTING PROCEDURES: All persons not engaged in extinguishing the fire should be immediately evacuated from the area. Fires involving VX should be contained to prevent contamination to uncontrolled areas. When responding to a fire alarm in buildings or areas containing agents, fire-fighting personnel should wear full firefighter protective clothing (without TAP clothing) during chemical agent firefighting and fire rescue operations. Respiratory protection is required. Positive pressure, full facepiece, NIOSH-approved self-contained breathing apparatus (SCBA) will be worn where there is danger of oxygen deficiency and when directed by the fire chief of chemical accident/incident (CAI) operations officer. In cases where fire-fighters are responding to a chemical accident/incident for rescue/reconnaissance purposes vice firefighting, they will wear appropriate levels of protective clothing (see Section 8).

Do not breathe fumes. Skin contact with V-agents must be avoided at all times. Although the fire may destroy most of the agent, care must still be taken to assure the agent or contaminated liquids do not further contaminate other areas or sewers. Contact with VX or VX vapors can be fatal.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None known.

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#### SECTION V - HEALTH HAZARD DATA

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AIRBORNE EXPOSURE LIMIT (AEL):

The permissible airborne exposure concentration for VX for an 8-hour workday of a 40-hour work week is an 8-hour time weighted average (TWA) of 0.00001 mg/m<sup>3</sup>. This value can be found in "AR 40-8, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX". To date, however, the Occupational Safety and Health Administration (OSHA) has not promulgated a permissible exposure concentration for VX.

VX is not listed by the International Agency for Research on Cancer (IARC), American Conference of Governmental Industrial Hygienists (ACGIH), Occupational Safety and Health Administration (OSHA), or National Toxicology Program (NTP) as a carcinogen.

EFFECTS OF OVEREXPOSURE: VX is a lethal anticholinergic agent. Doses which are potentially life-threatening may be only slightly larger than those producing minimal effects.

VX

Route	Form	Effect	Type	Dosage
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ocular	vapor	miosis	ECt50	<0.09	mg-min/m <sup>3</sup>
inhalation	vapor	runny nose	ECt50	<0.09	mg-min/m <sup>3</sup>
inhalation (15 l/min)	vapor	severe incapacitation	ICt50	25	mg-min/m <sup>3</sup>
inhalation (15 l/min)	vapor	death	LCt50	30	mg-min/m <sup>3</sup>
percutaneous	liquid	death	LD50	10	mg/70 kg man

Effective dosages for vapor are estimated for exposure durations of 2-10 minutes.

Symptoms of overexposure may occur within minutes or hours--depending upon dose. They include: miosis (constriction of pupils) and visual effects, headache and pressure sensation, runny nose and nasal congestion, salivation, tightness in the chest, nausea, vomiting, giddiness, anxiety, difficulty in thinking, difficulty sleeping, nightmares, muscle twitches, tremors, weakness, abdominal cramps, diarrhea, involuntary urination and defecation.

With severe exposure symptoms progress to convulsions and respiratory failure.

#### EMERGENCY AND FIRST AID PROCEDURES:

**INHALATION:** Hold breath until respiratory protective mask is donned. If severe signs of agent exposure appear (chest tightens, pupil constriction, incoordination, etc.), immediately administer, in rapid succession, all three Nerve Agent Antidote Kit(s), Mark I injectors (or atropine if directed by the local physician). Injections using the Mark I kit injectors may be repeated at 5 to 20 minute intervals if signs and symptoms are progressing until three series of injections have been administered. No more injections will be given unless directed by medical personnel. In addition, a record will be maintained of all injections given. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when approved mask-bag or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination exists. If breathing is difficult, administer oxygen. Seek medical attention IMMEDIATELY.

**EYE CONTACT:** IMMEDIATELY flush eyes with water for 10-15 minutes, then don respiratory protective mask. Although miosis (pinpointing of the pupils) may be an early sign of agent exposure, an injection will not be administered when miosis is the only sign present. Instead, the individual will be taken IMMEDIATELY to the medical treatment facility for observation.

**SKIN CONTACT:** Don respiratory protective mask and remove contaminated clothing. Immediately wash contaminated skin with a solution of 5% household bleach, rinse well with water to remove excess bleach followed by copious soap and water wash. Administer nerve agent antidote kit, Mark I, only if local sweating and muscular twitching symptoms are observed. Seek medical attention IMMEDIATELY.

**INGESTION:** Do not induce vomiting. First symptoms are likely to be gastrointestinal. IMMEDIATELY administer Nerve Agent Antidote Kit, Mark I. Seek medical attention IMMEDIATELY.

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#### SECTION VI - REACTIVITY DATA

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**STABILITY:** Relatively stable at room temperature. Unstabilized VX of 95% purity decomposed at a rate of 5% a month at 71 Deg C.

**HAZARDOUS DECOMPOSITION PRODUCTS:** During basic hydrolysis of VX up to about 10% of the agent is converted to EA2192 (diisopropylaminoethyl methylphosphonic acid). Based on the concentration of EA2192 expected to be formed during hydrolysis and its toxicity (1.4 mg/kg dermal in rabbit at 24 hours in a 10/90 wt% ethanol/water solution), a Class B poison would result.

The large scale decon procedure, which uses both HTH and NaOH, destroys VX by oxidation and hydrolysis. Typically the large scale product contains 0.2 - 0.4 wt% EA2192 at 24 hours. At pH 12, the EA2192 in the large scale product has a half-life of about 14 days. Thus the 90 day holding period at pH 12 results in about a 64-fold reduction of EA2192 (six half-lives). This holding period has been shown to be sufficient to reduce the toxicity of the product below that of a Class B poison.

Other less toxic products are ethyl methylphosphonic acid, methylphosphinic acid, diisopropylaminoethyl mercaptan, diethyl methylphosphonate, and ethanol.

The small scale decontamination procedure uses sufficient HTH to oxidize all VX thus no EA2192 is formed.

HAZARDOUS POLYMERIZATION: Will not occur.

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## SECTION VII - SPILL, LEAK, AND DISPOSAL PROCEDURES

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### STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

If leaks or spills occur, only personnel in full protective clothing (See Section 8 ) will remain in area. In case of personnel contamination see Section V "Emergency and First Aid Instructions". Spills must be contained by covering with vermiculite, diatomaceous earth, clay or fine sand. This containment is followed by the following treatment:

### RECOMMENDED LABORATORY PROCEDURES (For Quantities less than 50 grams):

If the active chlorine of the Calcium Hypochlorite (HTH) is at least 55 percent, then 80 grams of a 10 percent slurry is required for each gram of VX. Proportionally more HTH is required if the chlorine activity of the HTH is lower than 55 percent. The mixture is agitated as the VX is added and the agitation is maintained for a minimum of one hour. If phasing of the VX/decon solution continues after 5 minutes, an amount of denatured ethanol equal to a 10 wt percent of the total agent/decon shall be added to assist miscibility. NOTE: ETHANOL SHOULD BE MINIMIZED TO PREVENT THE FORMATION OF A HAZARDOUS WASTE. Upon completion of the one hour agitation the decon mixture shall be adjusted to a pH between 10 and 11. Conduct general area monitoring to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

### RECOMMENDED FIELD PROCEDURES (For Quantities greater than 50 grams):

(NOTE: These procedures can only be used with the approval of the CRDEC Safety Office.)

An alcoholic HTH mixture is prepared by adding 100 milliliters of denatured ethanol to a 900 milliliter slurry of 10 percent HTH in water. This mixture should be made just prior to use since the HTH can react with the ethanol. Fourteen grams of alcoholic HTH solution is used for each gram of VX. Agitate the decontamination mixture as the VX is added. Continue the agitation for a minimum of one hour. This reaction is reasonable exothermic and evolves substantial off gassing. The evolved reaction gases should be routed through a decontaminate filled scrubber prior to release through filtration systems. After completion of the one hour minimum agitation, 10 percent Sodium Hydroxide is added in a quantity equal to that necessary to assure that a pH of 12.5 is maintained for a period not less than 24 hours. Hold the material at a pH between 10 and 12 for a period not less than 90 days to ensure that a hazardous intermediate material is not formed (see Section VI).

After sealing the head, the exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material IAW waste disposal methods provided below. Conduct general area monitoring to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

If the alcoholic Calcium Hypochlorite (HTH) mixture is not available then

the following decontaminants may be used instead and are listed in the order of preference: Decontamination solution No. 2 (DS2), Supertropical Bleach Slurry (STB), and Sodium Hypochlorite.

**WASTE DISPOSAL METHOD:** Open pit burning or burying of VX or items containing or contaminated with VX in any quantity is prohibited. The detoxified VX (using procedures above) can be thermally destroyed by incineration in an EPA approved incinerator in accordance with appropriate provisions of Federal, State and/or local RCRA regulations.

**NOTE:** Some states define decontaminated surety material as a RCRA Hazardous Waste.

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SECTION VIII - SPECIAL PROTECTION INFORMATION

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**RESPIRATORY PROTECTION:**

Concentration

Respiratory Protective Equipment

Less than or equal to 0.00001 mg/m<sup>3</sup>

A full facepiece, chemical canister, air-purifying protective mask will be onhand for escape. (The M9-, M17-, or M40-series masks are acceptable for this purpose)

Greater than 0.00001 or equal to 0.02 mg/m<sup>3</sup>

A NIOSH/MSHA approved pressure demand full facepiece SCBA or supplied air respirator with escape air cylinder may be used.

Alternatively, a full facepiece, chemical canister air-purifying protective mask is acceptable for this purpose (See DA PAM 385-61 for determination of appropriate level)

Greater than 0.02 mg/m<sup>3</sup> or unknown

NIOSH/MSHA approved pressure demand full facepiece SCBA suitable for use in high agent concentrations with protective ensemble. (See DA PAM 385-61 for examples)

**VENTILATION:**

**Local exhaust:** Must be filtered or scrubbed to limit exit concentration to 0.00001 mg/m<sup>3</sup>. Air emissions shall meet local, state and federal regulations.

**Special:** Chemical laboratory hoods shall have an average inward face velocity of 100 linear feet per minute (lfpm) + 10 percent with the velocity at any point not deviating from the average face velocity by more than 20 percent. Existing laboratory hoods shall have an inward face velocity of 150 lfpm plus or minus 20 percent. Laboratory hoods shall be located such that cross-drafts do not exceed 20 percent of the inward face velocity. A visual performance test utilizing smoke-producing devices shall be performed in assessing the ability of the hood to contain agent VX.

Emergency backup power necessary. Hoods should be tested semi-annually or after modification or maintenance operations. Operations should be performed 20 cm inside hood face.

**Other:** Recirculation or exhaust air from agent areas is prohibited. No connection between agent areas and other areas through ventilation system is permitted.

**PROTECTIVE GLOVES:** Butyl glove M3 and M4  
Norton, Chemical Protective Glove Set

**EYE PROTECTION:** Chemical goggles. For splash hazards use goggles and face-shield.

OTHER PROTECTIVE EQUIPMENT: For laboratory operations, wear lab coats, gloves and mask readily available.

In addition, daily clean smock, foot covers, and head covers will be required when handling contaminated lab animals.

MONITORING: Available monitoring equipment for agent VX is the M8/M9 detector paper, detector ticket, M256/M256A1 kits, bubbler, Depot Area Air Monitoring System (DAMMS), Automated Continuous Air Monitoring System (ACAMS), Real-Time Monitor (RTM), Demilitarization Chemical Agent Concentrator (DCAC), M8/M43, M8A1/M43A1, CAM-M1, Hydrogen Flame Photometric Emission Detector (HYFED), the Miniature Chemical Agent Monitor (MINICAM), and the Real Time Analytical Platform (RTAP).

Real-time, low-level monitors (with alarm) are required for VX operations. In their absence, an IDLH atmosphere must be presumed. Laboratory operations conducted in appropriately maintained and alarmed engineering controls require only periodic low-level monitoring.

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#### SECTION IX - SPECIAL PRECAUTIONS

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##### PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

In handling, the buddy system will be incorporated. No smoking, eating, and drinking in areas containing agent is permitted. Containers should be periodically inspected for leaks (either visually or by a detector kit). Stringent control over all personnel practices must be exercised. Decontamination equipment shall be conveniently located. Exits must be designed to permit rapid evacuation. Chemical showers, eye-wash stations and personal cleanliness facilities must be provided. Wash hands before meals and each worker will shower thoroughly with special attention given to hair, face, neck, and hands, using plenty of soap before leaving at the end of the workday.

OTHER PRECAUTIONS: Agent must be double contained in liquid and vapor tight container when in storage or when outside of ventilation hood.

For additional information see "AR 385-61, The Army Toxic Chemical Agent Safety Program", "DA PAM 385-61, Toxic Chemical Agent Safety Standards", and "AR 40-8, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX".

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#### SECTION X - TRANSPORTATION DATA

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PROPER SHIPPING NAME: Poisonous liquids, n.o.s.

DOT HAZARD CLASS: 6.1

DOT LABEL: Poison

DOT MARKING: Poisonous liquids, n.o.s. (O-ethyl S-(2-diisopropylaminoethyl) methyl phosphonothioate) UN 2810

DOT PLACARD: POISON

EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURES: See Sections IV, VII and VIII.

PRECAUTIONS TO BE TAKEN IN TRANSPORTATION: Motor vehicles will be placarded, regardless of quantity. Driver shall be given full and complete information regarding shipment and conditions in case of emergency. AR50-6 deals specifically with the shipment of chemical agents. Shipments of agent shall be escorted IAW AR740-32.

While the Edgewood Research Development and Engineering Center, Department of the Army believes that the data contained herein are

factual and the opinions expressed are those of qualified experts regarding the results of the tests conducted, the data are not to be taken as a warranty or representation for which the Department of the Army or Edgewood Research Development and Engineering Center assumes legal responsibility. They are offered solely for your consideration, investigation, and verification. Any use of these data and information must be determined by the user to be in accordance with applicable Federal, State, and local laws and regulations.

DATE: 7 January 1991



U.S. ARMY CHEMICAL  
RESEARCH, DEVELOPMENT  
AND ENGINEERING CENTER

Emergency Telephone #s:  
Cml Rsch Dev & Engr Cen  
301-671-4411 0700-1700  
EST After normal duty  
hours: 301-278-5201  
Ask for CRDEC Staff  
Duty Officer

MATERIAL SAFETY DATA SHEET

LEWISITE

SECTION I - GENERAL INFORMATION

MANUFACTURER'S NAME: Chemical Research, Development and Engineering Center

MANUFACTURER'S ADDRESS: U.S. ARMY ARMAMENT, RESEARCH & DEVELOPMENT COMMAND  
CHEMICAL RESEARCH, DEVELOPMENT & ENGINEERING CENTER  
ATTN: SMCCR-CMS-E  
ABERDEEN PROVING GROUND, MD 21010-5423

CAS REGISTRY NUMBER: 541-25-3

CHEMICAL NAME AND SYNONYMS:

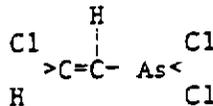
Arsine, (2-chlorovinyl) dichloro-  
Arsonous dichloride, (2-chloroethenyl)-  
Chlorovinylarsine dichloride  
2-Chlorovinyl dichloroarsine  
beta-Chlorovinyl dichloroarsine  
Dichloro (2-chlorovinyl) arsine

TRADE NAME AND SYNONYMS: Lewisite, L, EA 1034

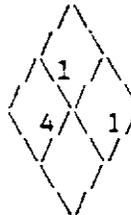
CHEMICAL FAMILY: Arsenical (vesicant)

FORMULA/CHEMICAL STRUCTURE:

C2H2AsCl3



NFPA 704 SIGNAL: Health - 4  
Flammability - 1  
Reactivity - 1



SECTION II - COMPOSITION

INGREDIENTS NAME	FORMULA	PERCENTAGE BY WEIGHT	AIRBORNE EXPOSURE LIMIT (AEL)
Lewisite	C2H2AsCl3	100	* 0.003 mg/m3

\* This is a ceiling value

SECTION III - PHYSICAL DATA

BOILING POINT DEG F (DEG C): 374 (190)

VAPOR PRESSURE (mm Hg): 0.35 @ 25 DEG C  
0.22 @ 20 DEG C

VAPOR DENSITY (AIR=1): 7.2

SOLUBILITY: Negligible in water, completely soluble in Et2O, CHCl3, all common organic solvents, mustard, oils, and alcohol.

SPECIFIC GRAVITY (H2O=1): 1.88 @ 25 Deg C

VOLATILITY (mg/m3): 3.9 x (10)3 @ 25 DEG C  
2.5 x (10)3 @ 20 DEG C

MOLECULAR WEIGHT: 207.32

APPEARANCE AND ODOR: Pure L is a colorless oily liquid. "War gas" is an amber to dark brown liquid; characteristic odor is usually geranium-like; very little odor when pure.

---

#### SECTION IV - FIRE AND EXPLOSION DATA

---

FLASHPOINT (Method Used): does not flash.

FLAMMABILITY LIMITS: N/A.

EXTINGUISHING MEDIA: N/A.

SPECIAL FIRE FIGHTING PROCEDURES: Full protective clothing (See Section 8) and full respiratory protection must be worn when fighting fires inside buildings and areas where L is stored. Full protective clothing and canister or filter type mask can be worn where oxygen deficiency is not a problem. All persons not engaged in extinguishing the fire should be evacuated. Skin contact and inhalation of L and its vapors must be avoided at all times. Although the fire may destroy most of the L, care must be taken to assure that the L does not contaminate uncontrolled areas and that the fire-fighters are adequately protected from physical contact with the agent and agent fumes.

---

#### SECTION V - HEALTH HAZARD DATA

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AIRBORNE EXPOSURE LIMIT (AEL): The AEL for Lewisite is 0.003 mg/m3 as a ceiling value. A ceiling value may not be exceeded at any time. Practically, it may be an average value over the minimum time required to detect the specified concentration. The ceiling value for Lewisite is based upon the present technologically feasible detection limit of 0.003 mg/m3. The ceiling value may be lowered as detection technology improves. The AEL for Lewisite is proposed by AR 385-64, Change 2 to DoD 6055.9-Std (Appendix A). To date, the Occupational Safety and Health Administration (OSHA) has not promulgated a permissible exposure limit (PEL) for Lewisite.

EFFECTS OF OVEREXPOSURE: L is a vesicant (blister agent), also, it acts as a systemic poison, causing pulmonary edema, diarrhea, restlessness, weakness, subnormal temperature, and low blood pressure. In order of severity and appearance of symptoms, it is: a blister agent, a toxic lung irritant, and absorbed in tissues, a systemic poison. When inhaled in high concentrations, may be fatal in as short a time as 10 minutes. L is not detoxified by the body. Common routes of entry into the body include ocular, percutaneous, and inhalation.

LCt50 (inhalation, man) = 1200 - 1500 mg min/m3

LCt50 (skin vapor exposure, man) = 100,000 mg min/m3

LDL0 (skin, human) = 20 mg/kg

LCt50 (skin, man): >1500 mg/min. L irritates eyes and skin and gives warning of its presence. Minimum effective dose (ED min) = 200 mg/m3 (30 min).

ICt50 (eyes, man): <300 mg min/m3.

ANIMAL TOXICOLOGICAL DATA:

LD50 (oral, rat) = 50 mg/kg  
LD50 (subcutaneous, rat) = 1 mg/kg  
LCtLO (inhalation, mouse) = 150 mg/m<sup>3</sup> 10m  
LD50 (skin, dog = 15 mg/kg RTECS) or 38 mg/kg (CRDEC chemical agent data sheets)  
LD50 (skin, rabbit) = 6 mg/kg  
LD50 (subcutaneous, rabbit) = 2 mg/kg  
LD50 (intravenous, rabbit) = 500 mg/kg  
LD50 (skin, guineapig) = 12 mg/kg  
LD50 (subcutaneous, guinea pig) = 1 mg/kg  
LD50 (skin, domestic farm animals) = 15 mg/kg  
LCt50 (inhalation, rat) = 1500 mg min/m<sup>3</sup> (9 min)  
LCt50 (vapor skin, rat) = 20,000 mg min m 25 min)  
LCD50 (skin, rat) = 15 - 24 mg/kg  
LD50 (ip, dog) = 2 mg/kg  
EDmin (skin, dog) = 50 mg/m<sup>3</sup> (30 min)  
EDmin (eye, dog) = 20 mg/m<sup>3</sup> (30 min)  
EDmin (skin, rabbit) = 25 mg/m<sup>3</sup> (30 min)  
EDmin (eye, rabbit) = 1 mg/m<sup>3</sup> (30 min)

a. Acute Exposure:

(1) Eyes. Severe damage. Instant pain, conjunctivitis and blepharospasm leading to closure of eyelids, followed by corneal scarring and iritis. Mild exposure produces reversible eye damage if decontaminated instantly, otherwise more permanent injury or blindness is possible within 1 minute of exposure.

(2) Skin. Immediate stinging pain increasing in severity with time. Erythema (skin reddening) appears within 30 minutes after exposure accompanied by pain with itching and irritation for 24 hours. Blisters appear within 12 hours after exposure with more pain which diminished after 2-3 days. Skin burns are much deeper than with HD. Tender and moist skin (mucous membrane; perspiration covered;...), absorbs more L, therefore is more sensitive than the skin. This, however, is counteracted by L's hydrolysis by moisture, producing less vesicant, higher vapor pressure product.

(3) Respiratory Tract. Irritating to nasal passages and produces a burning sensation followed by a profuse nasal secretion and violent sneezing. Prolonged exposure causes coughing and production of large quantities of froth mucus. In experimental animals, injury to respiratory tract, due to vapor exposure is similar to mustard's; however, edema of the lung is more marked and frequently accompanied by pleural fluid.

(4) Systemic Effects. L on the skin, as well as inhaled vapor, are absorbed and may cause systemic poisoning. A manifestation of this is a change in capillary permeability, which permits loss of sufficient fluid from the bloodstream to cause hemoconcentration, shock and death. In non-fatal cases, hemolysis of erythrocytes has occurred with a resultant hemolytic anemia. The excretion of oxidized products into the bile by the liver produces focal necrosis of that organ, necrosis of the mucosa of the biliary passages with periobiliary hemorrhages, and some injury to the intestinal mucosa. Acute systematic poisoning from large skin burns causes pulmonary edema, diarrhea, restlessness weakness, subnormal temperature, and low blood pressure in animals.

b. Chronic Exposure. L can cause sensitization and chronic lung impairment. Also, by comparison to agent mustard and arsenical compounds, it can be considered as a suspected human carcinogen.

EMERGENCY AND FIRST AID PROCEDURES: Always don your own protective mask and gloves before administering first aid.

INHALATION: Remove from the source immediately. If breathing has stopped give artificial respiration. If breathing is difficult, administer oxygen. Seek medical attention immediately.

EYE CONTACT: Speed in decontaminating the eyes is absolutely essential. Remove person from the liquid source, flush the eyes immediately with water for 10-15 minutes by tilting the head to the side, pulling eyelids apart

with fingers and pouring water slowly into the eyes. Do not cover eyes with bandages but, if necessary, protect eyes by means of dark or opaque goggles. See medical attention IMMEDIATELY.

**SKIN CONTACT:** Remove victim from source immediately and remove contaminated clothing. Immediately decon affected areas by flushing with 10 percent sodium carbonate solution. After 3-4 minutes, wash off with soap and water to protect against erythema. Seek medical attention immediately.

**INGESTION:** Do not induce vomiting. Give victim milk to drink. Seek medical attention immediately.

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## SECTION VI - REACTIVITY DATA

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**INCOMPATIBILITY:** Corrosive to steel at a rate of  $1 \times 10^{-5}$  to  $5 \times 10^{-5}$  in/month at 65 DEG C.

**HAZARDOUS DECOMPOSITION PRODUCTS:**

**Stability:** Reasonably stable; however, in presence of moisture, it hydrolyses rapidly, losing its vesicant property. It also hydrolyses in acidic medium to form HCl and non-volatile (solid) chlorovinylarsenious oxide, which is less vesicant than Lewisite. Hydrolysis in alkaline medium, as in decontamination with alcoholic caustic or carbonate solution or DS2, produces acetylene and trisodium arsenate ( $\text{Na}_3 \text{AS O}_4$ ). Therefore, decontaminated solution would contain toxic arsenic.

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## SECTION VII - SPILL, LEAK, AND DISPOSAL PROCEDURES

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**STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:**

Only personnel in full protective clothing will be allowed in area where L is spilled (see Section 8).

**RECOMMENDED FIELD PROCEDURES:** The L should be contained using vermiculite, diatomaceous earth, clay, or fine sand and neutralized as soon as possible using copious amounts of alcoholic caustic, carbonate, or DS2. Caution must be exercised when using these decontaminates since acetylene will be given off. Household bleach can also be used if accompanied by stirring to allow contact. Scoop up all contaminated material and place in approved DOT containers. Cover with additional decontaminant. Decontaminate the outside of the container, label IAW DOT and EPA requirements, and dispose of as specified below. Conduct general area monitoring to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

**RECOMMENDED LABORATORY PROCEDURES:** A 10 wt percent alcoholic Sodium Hydroxide solution is prepared by adding 100 grams of denatured ethanol to 900 grams of 10 wt percent NaOH in water. A minimum of 200 grams of decon is required for each gram of L. The decon/agent solution is agitated for a minimum of one (1) hour. At the end of one hour the resulting pH should be checked and adjusted to above 11.5 using additional NaOH, if required.

It is permitted to substitute 10 wt percent alcoholic sodium carbonate made and used in the same ratio as the NaOH listed above. Reaction time should be increased to 3 hours with agitation for the first hour. Final pH should be adjusted to above 10.

It is permitted to substitute 5.25 percent sodium hypochlorite for the 10 percent alcoholic sodium hydroxide solution above. Allow one hour with agitation for the reaction. Adjustment of the pH is not required.

Conduct general area monitoring to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Section 8).

**WASTE DISPOSAL METHOD:**

All neutralized material should be collected and contained for disposal IAW land ban RCRA regulations or thermally decomposed in an EPA permitted

incinerator equipped with a scrubber which will scrub out the chlorides and be equipped with an electrostatic precipitator or other filter device to remove arsenic. Collect all the arsenic dust from the electrostatic precipitator or other filter device and containerize and label IAW DOT and EPA regulations. The arsenic will be disposed of IAW land ban RCRA regulations. Any contaminated materials or protective clothing should be decontaminated using alcoholic caustic, carbonate, or bleach analyzed to assure it is free of detectable contamination (3X) level. The clothing should then be sealed in plastic bags inside properly labeled drums and held for shipment back to the DA issue point.

NOTE: Some states define decontaminated surety material as a RCRA hazardous waste.

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### SECTION VIII - SPECIAL PROTECTION INFORMATION

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#### RESPIRATORY PROTECTION:

Concentration (mg/m <sup>3</sup> )	Respiratory Protection/Ensemble Required
*0.003 (unmasked agent worker)	A full facepiece, chemical canister, air-purifying, protective mask shall be on hand for escape (the M9, M17 and M40 series protective masks are acceptable for this use).
Greater than *0.003 and less than or equal to **0.003 (masked personnel in routine operations)	A. A full facepiece, chemical canister, air-purifying protective mask (M9, M17 and M40 series protective masks and NIOSH approved, air-supplied escape devices are acceptable for this use).  B. A NIOSH-MSHA-approved pressure demand or continuous flow, full facepiece air-supplied respirator. C. A NIOSH-MSHA-approved pressure-demand full facepiece SCBA.
Greater than *0.003 or unknown	A. NIOSH-MSHA-approved, full face-piece pressure-demand respirator suitable for use in atmospheres immediately dangerous to life and health. Respirator and protective suit must be approved by the AMC Field Safety Activity prior to use.  B. For field operations or emergencies only, use full face-piece, chemical canister, air-purifying protective mask with hood (only the M9 series protective mask with M11 canister and M40 mask are acceptable for this use).

\* This represents the ceiling value determined by continuous real time monitoring (with alarm) at the 0.003 mg/m<sup>3</sup> level of detection.

\*\* Based on an 8-hr TWA measurement. The stated or permissible TWA is the concentration to which nearly all workers may be repeatedly exposed, for a normal 8-hr workday, day after day, without adverse effect. TWAs permit excursions above the limit provided they are compensated by equivalent excursions below the limit during the workday.

VENTILATION: Local exhaust - Mandatory, must be filtered or scrubbed to limit exit concentration to non-detectable level.

Special: Chemical laboratory hoods shall have an average inward face velocity of 100 linear feet per minute (1fpm) = 10% with the velocity at any point not deviating from the average face velocity by more than 20%.

Laboratory hoods shall be located such that cross drafts do not exceed 20 % of the inward face velocity. A visual performance test utilizing smoke producing devices shall be performed in the assessment of the inclosure's ability to contain Lewisite.

Other: Recirculation of exhaust air from agent areas is prohibited. No connection between agent area and other areas through the ventilation system is permitted. Emergency backup power is necessary. Hoods should be tested semi-annually or after modification or maintenance operations. Operations should be performed 20 cm inside hoods. Procedures should be developed for disposal of contaminated filters.

PROTECTIVE GLOVES: Norton, Chemical Protective Glove Set  
M3 Butyl Rubber

EYE PROTECTION: As a minimum, protective eye glasses will be worn.  
For splash hazard use goggles and face-shield.

OTHER PROTECTIVE EQUIPMENT: Full protective clothing (Level A) will consist of the M3 Butyl rubber suit with hood, M2A1 boots, M3 gloves, impregnated underwear, M9 series mask and coveralls (if desired), or the 30 mil Demilitarization Protective Ensemble (DPE) if available or NIOSH approved equivalent. For general lab work, gloves and lab coat shall be worn with M9, M17 or M40 mask readily available.

In addition, when handling contaminated lab animals, wearing daily clean smock, foot covers, and head covers is required.

MONITORING: Available monitoring equipment for agent L is the M18A2 (yellow band), Automatic Chemical Agent Detector Alarm (ACADA), bubblers (arsenic and GC method) and the M256A2 Kit.

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#### SECTION IX - SPECIAL PRECAUTIONS

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##### PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

During handling, the "buddy" (two man) system will be used. Containers should be periodically inspected for leaks, either visually or using a detector kit. Stringent control over all personnel handling L must be exercised. Chemical showers, eye wash stations, and personal cleanliness facilities must be provided; wash hands before meals and each worker will shower thoroughly with special attention given to hair, face, neck, and hands, using plenty of soap before leaving at the end of the workday. The storage or consumption of food or beverages; the storage or application of cosmetics; the smoking or storage of smoking materials, tobacco products or other products for chewing; or the chewing of such product in all laboratory areas, is prohibited. Laboratory glasswear will not be used to prepare or consume food or beverages. Decontaminating equipment shall be conveniently located. Exits must be designed to permit rapid evacuation. L should be stored in containers made of glass for Research, Development Test and Evaluation (RDTE) quantities or one-ton steel containers for large quantities. Agent shall be double contained in liquid tight containers when in storage or during transportation.

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#### SECTION X - TRANSPORTATION DATA

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PROPER SHIPPING NAME: Poisonous liquid, n.o.s.

DOT HAZARD CLASSIFICATION: Poison A

DOT LABEL: Poison Gas

DOT MARKING: Poisonous liquid, n.o.s. (Chlorovinylarsine dichloride)  
NA 1955

DOT PLACARD: POISON GAS

EMERGENCY ACCIDENT PRECAUTIONS & PROCEDURES: See Sections IV and VIII.

**PRECAUTIONS TO BE TAKEN IN TRANSPORTATION:** Motor vehicles will be placarded regardless of quantity. Driver shall be given full and complete information regarding shipment and conditions in case of emergency. AR 50-6 deals specifically with the shipment of chemical agents. Shipment of agents will be escorted in accordance with AR 740-32.

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While the Chemical Research and Development Center, Department of the Army believes that the data contained herein are factual and the opinions expressed are those of qualified experts regarding the results of the tests conducted, the data are not to be taken as a warranty or representation for which the Department of the Army or Chemical Research and Development Center assumes legal responsibility. They are offered solely for your consideration, investigation, and verification. Any use of these data and information must be determined by the user to be in accordance with applicable Federal, State, and local laws and regulations.

# APPENDIX H

## SITE SAFETY AND HEALTH PLAN

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EXPLANATORY: A generic Site Safety and Health Plan (SSHP) is provided to you on your computer diskette in a file entitled "SSHP.WP". The format of this computer document and the workbook provided in this Appendix is similar to that of the Reentry/Restoration Workbook Plan.

This Appendix contains the entire document including all the Annexes (A-F). The file "SSHP.WP" contains everything except Annex A (Agent MSDSs) which is included as a separate file entitled "MSDS.WP".

### BACKGROUND AND APPLICABILITY:

#### THE SITE SAFETY AND HEALTH PLAN WORKBOOK

This Workbook is designed to facilitate the generation of a Site Specific Safety and Health Plan in the event of a Chemical Agent Spill or Release. Though there is some duplication of information with the "Protection of Personnel" Planning Function contained in the Reentry/Restoration (R/R) Plan, it is anticipated that functions associated with safety of recovery personnel will be overseen by a specially designated individual such as the Incident Site Safety Manager/Officer. It is assumed that this individual (and associated staff) will be responsible for establishing, maintaining, and enforcing this Site Safety and Health Plan (SSHP). The Site Safety Manager/Officer will also be responsible for providing the necessary information to the (author(s)) of the R/R Plan and perhaps review the completed R/R Plan for accuracy and cohesion with procedures described in this SSHP.

Overall, however, this is a separate plan covering a single, distinct aspect of Reentry/Restoration-- that is the protection of workers who must enter risk areas in an effort to perform necessary reentry/restoration (recovery) tasks.

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**SITE SAFETY AND HEALTH PLAN**  
**FOR THE EVENT OF A**  
**CHEMICAL AGENT SPILL OR ACCIDENTAL RELEASE**

**I. GENERAL SITE INFORMATION**

**A. IMPLEMENTING ORGANIZATION:**

Organization name, office, address and phone numbers:

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**B. DOCUMENT PREPARER/POC**

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Date Prepared/Updated: \_\_\_/\_\_\_/\_\_\_

**C. BASIS FOR CSEPP OPERATIONS AT \_\_\_\_\_.**

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**II. PURPOSE**

This Safety and Health Plan (SSHP) is to be used in conjunction with the Reentry/Restoration Workplan in the occurrence of chemical agent spill or release. This Plan provides guidance in properly overseeing the health and

safety of RECOVERY personnel involved with restricted-reentry or restoration efforts (eg. environmental/field sampling activities deployed after the initial response phase when gross contamination is no longer detected, caretaker teams required to assist livestock or persons remaining in potential "hot-zones", or security personnel.) This plan details measures identified in the \_\_\_\_\_ Reentry/Restoration (R/R) Plan under "Protection of Personnel". Information contained in this plan reflect that in the R/R Plan.

**III. SAFETY/HEALTH MONITOR CENTER**

The following site is the designated central management location for health and safety operations during the incident:

<u>Health/Safety Management Location:</u>	<u>Phone#</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

The following sites are alternative locations for management of health and safety operations:

<u>Alternate Locations:</u>	<u>Phone#</u>
_____	_____
_____	_____
_____	_____

**IV. ON-SITE MONITORING STATIONS**

In the event of an incident, one or more on-site Monitoring Team Stations may be set up near the contaminated area as field operating units. These stations will be responsible for monitoring specific activities and personnel within the contaminated zone.

The following sites are field monitoring stations. The method of contacting the site and the specific POC for that site are also provided.

SITE	METHOD OF CONTACT (#)	POC

Specific personnel and equipment will be maintained at each unit unless otherwise designated. Each unit will maintain:

**Personnel**

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**Equipment**

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Specific Health and Safety operations that each monitoring station will be responsible for are as follows:

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Each station POC (as listed above) is responsible for reporting back to the Health and Safety Center at \_\_\_\_\_ intervals. The POC is also responsible for maintaining necessary documents (\_\_\_\_\_) and providing them to the Incident Site Safety Officer for record-keeping purposes.

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**V. PERSONNEL**

The following table contains a list of those persons with designated roles in the operation of this Safety and Health plan:

**A. Key Personnel and their Responsibilities.**

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**B. Other Support Personnel and Responsibilities.**

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**VI. ORGANIZATIONS/ACTIVITIES**

In the event of a spill/release incident involving chemical agent, the following organizations should be directly and immediately notified. Communication should be maintained throughout the Reentry and Restoration activities:

<u>Name</u>	<u>Number</u>	<u>Address</u>
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**VII. RESOURCES**

The following table lists the resources and equipment available during a spill incident. Appropriate POCs responsible for use of such equipment are also described.

**Equipment, Locations, and POCs.**

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**VIII. REFERENCES**

The following table lists the reference material maintained with this document to be used in conjunction with these guidelines.

**Available Reference Sources**

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**IX. HAZARD ANALYSES**

This section discusses the various dangers that the field operating unit personnel may be exposed to. During reentry/restoration activities, potential exposure to the chemical agent(s) is generally the main concern; proper PPE and air monitoring will be used to minimize /eliminate worker exposure. Workers will also be instructed on signs and symptoms and emergency procedures/first aid. Several other safety hazards will also be considered before initiating the field sampling tasks. Workers will be given precautionary instructions and emergency procedures for all foreseen dangers.

Each type of agent and the type of hazard it represents is briefly discussed below. Also describe methods/procedures/equipment etc that will be used to minimize the risk associated with this hazard.

**A. Chemical Hazards (agents, other spilled/released chemicals, breakdown products)**

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B. Physical Hazards (explosion, falling debris, etc)

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C. Temperature/Climate Hazards (heat stress, hypothermia, frostbite, )

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D. Electrical hazards (lightening, live wires, equipment usage)

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E. OTHER.....

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**X. PERSONAL PROTECTIVE EQUIPMENT (PPE)**

A. Levels of PPE

Descriptions of the designed levels of PPE are provided in Annex B. The conditions for wearing the various types of protection are also described. Finally, conditions requiring reassessment of the PPE are discussed.

B. Work Mission Duration

Before workers actually begin work in their PPE ensembles the maximum allowable duration of the work mission/task must be determined. The factors for this evaluation are listed in Annex C.

The specific types/levels of equipment that are being used during reentry/restoration activities are described below along with the associated tasks. The level(s) of protection will be reassessed by the Site Safety Manager/Officer or his representative based on changes in site conditions or findings.

TASK DESCRIPTION	ANTICIP CONTAM	LEVEL PPE

**XI. AIR MONITORING AND ALARMS.**

Various air monitoring and alarm systems will be used throughout reentry/restoration activities. All operations conducted with Level D PPE will include low-level monitoring equipment supplemented with low-level/high level alarms. The locations of these systems are indicated on the installation map (see "RESOURCES AND EQUIPMENT" and associated map).

During a field task activity, if there is an alarm or if low-level air monitoring indicates unsafe working conditions (given the Level of PPE), the field operating unit(s) will be withdrawn, decontaminated, and screened for signs/symptoms. Modifications to the PPE will be determined by the Site Safety Officer/Manager or his/her representative.

ALARM/MONITORING SYSTEM	LOCATION

**XII. FIELD MONITORING AND SITE CONTROL**

Workers will be given a safety briefing immediately before donning their PPE. The briefing will include agent exposure information (signs and symptoms), proper communication techniques, a check for PPE serviceability, and assignment of partners (a buddy-system will be used at all times in the field). A Safety Briefing Checklist (Annex D) should be signed by each field operations worker. During the safety briefing, initial information will be recorded on the Field Operations Personnel Health Form (Annex E).

After completing a field assignment and the necessary decontamination, all personnel will be examined for potential agent exposure. Monitoring personnel will refer to the signs and symptoms described in Annex A. If no ill effects are noted, the worker may sign his/her file and be dismissed and/or return to the field.

If signs or symptoms are noted or a worker has otherwise been hurt, the condition will be monitored continuously and appropriately treated (including removal off-site). All conditions and treatments will be described in the worker's health form.

All completed/signed forms will be filed alphabetically and maintained. Once all reentry/restoration activities have been completed, the files will be forwarded to and maintained by the Site Safety Manager. These files should ultimately be placed in the installation's permanent files.

### **XIII. PERSONNEL DECONTAMINATION**

Annex F summarizes the standard decontamination procedures described in DA Pamphlet 50-6, "CAIRA Personnel Decontamination Station." The purposes are to provide a boundary line marking the edge of the restricted area(s) - or "hot line(s)", a controlled entry and exit point to the contaminated area, and a systematic means to decontaminate personnel and equipment leaving the site.

All personnel will be explained the proper decon procedures during the safety briefing. The list of decontamination procedures in Annex F will be posted in the Decontamination zone and the individual stations clearly marked.

ANNEX A

Material Safety Data Sheets (MSDS)  
Chemical Hazard Information

- Lethal Nerve Agent (GA)
- Lethal Nerve Agent (GB)
- Lethal Nerve Agent (GD)
- HD and THD
- HT
- VX
- Lewisite

## ANNEX B

### PERSONNEL PROTECTIVE CLOTHING AND EQUIPMENT

This Annex describes the general requirements of the designated Levels of Protection as described in Appendix F of DA Pamphlet 50-6, CAIRA Operations, and the specific levels of protection required for REENTRY/REAUTHORIZATION operations.

NOTE: These procedures have been established for military and certain Army civil-service employees. Therefore these procedures and use of specified equipment must be qualitatively reviewed and perhaps altered when applying to personnel not meeting either of these criteria. All additional requirements/procedures applying to such personnel will be described in an addendum to this Annex.

#### Levels of Protection

Conditions for the wearing and composition of various levels and types of protection are described below. Table (F-1, pg 80 CAIRA) gives guidelines for proper protective clothing and equipment for personnel.

LEVEL A: Should be worn when personnel will be in proximity to spilled agent, in an area of known liquid contamination, and during decontamination operations. Level A consists of:

- M3 toxilogical agent protective (TAP) suit
- M9-series mask w/ M3-series TAP hood \*
- TAP boots
- TAP gloves \*\*
- explosive handler's coveralls for GB/VX operations
- impregnated underwear for mustard operations
- \*\* plus surgical gloves for GB and VX operations
- \* M40-series mask and appropriate hood can also be used

LEVEL B: Should be worn when contact with a suspect item (i.e., contaminated) is required and when performing operations may result in release of agent vapors, but there is no contact with

liquid agent anticipated and no liquid agent is present. Level B consists of:

- TAP apron
- M17-series/M9-series mask (M40-series when available) with appropriate hood
- TAP boots
- TAP gloves
- explosive handler's impregnated coveralls for GB or VX operations
- impregnated underwear for mustard operations

\*\*\* NOTE: FOR OPERATIONS WHERE MUSTARD MUNITIONS (H, HD, HT, or Lewisite) ARE HANDLED, LEVELS A AND B ARE THE ONLY APPROPRIATE LEVELS OF PROTECTION.

LEVEL C: Should be worn by personnel who must be in agent areas where handling or contact with agent-filled items is involved and if low-level monitoring is not being performed. Level C consists of:

- TAP apron
- M40-/M17-/M9-series mask
- TAP boots
- TAP gloves
- unimpregnated underwear/explosive handler's coveralls

LEVEL D: Should be worn by personnel in clean areas where handling or contact with agent-filled items is involved and if low-level monitoring (see section 5.5) is being performed with negative results. Level D consists of:

- TAP apron
- M40-/M17-/M9-series mask in slung position
- TAP boots
- TAP gloves
- unimpregnated underwear/explosive handler's coveralls

LEVEL E: Should be worn by operating personnel who may be supervising or observing the operations and who would not likely be in contact with the agent. Level E consists of:

- unimpregnated clothing
- M40-/M17-/M9-series mask in the slung position

LEVEL F: Is limited to casual or transient personnel who may be required to visit a "clean" area (as determined through low-level monitoring). Level F consists of:

- street clothing
- M40-/M17-/M9-series mask in the slung position

**MOPP CLOTHING AND EQUIPMENT:** Mission-oriented protective posture (MOPP) clothing and equipment may be used in place of levels C, D, E, and F TAP clothing and equipment except where the M2 TAP apron would be required for levels C and D. The MOPP-4 ensemble is not suitable for use where level A or B TAP clothing or equipment is required and must not be used in place of level A or B. The MOPP gear is acceptable in a (CAIRA) situation as an alternate form of protection for personnel are not likely to be exposed to liquid agent contamination. The level of protection MOPP gear provides must be borne in mind when determining where individuals that are dressed out in MOPP-4 are to be deployed.

#### Reassessment of Protection Program

When a significant change occurs in site conditions or tasks of personnel, the hazards should be reassessed. Some indicators of the need for reassessment are:

- o Commencement of a new work phase, such as the start of indoor sampling or work that begins on a different portion of the site.
- o Change in job tasks during a work phase.
- o Change of season/weather.
- o When temperature extremes or individual medical considerations limit the effectiveness of PPE.
- o Contaminants other than those previously identified are encountered.
- o Change in ambient levels of contaminants.
- o Change in work scope which effects the degree of contact with contaminants.

## ANNEX C

### WORK MISSION DURATION

The following factors will be evaluated in determining the maximum permissible work duration for field operating personnel.

#### -EQUIPMENT LIMITATIONS

##### Air supply consumption (SCBA use)/filter life.

Estimated\* maximum time:

\* [\_\_\_\_] minutes (check with manufacture)

##### Suit/Ensemble permeation and penetration rates for chemicals.

Estimated\* maximum time:

\* [\_\_\_\_] minutes (will vary according to material, manufacturer, and chemical agent; ref: "Currently available permeability and breakthrough data characterizing chemical warfare agents and their simulants in civilian protective clothing materials", Journal of Hazardous Materials, 30 (1992) 243-267, Elsevier Science Publishers B.V., Amsterdam.

#### -OTHER FACTORS AFFECTING WORK MISSION DURATION

##### Ambient temperature and weather conditions (heat/cold stress).

While all types of temperature and weather effects on personnel should be considered, one of the most important is heat stress. Even when the climatic temperature is comfortable, the PPE clothing can often create almost unbearable working conditions, especially if a lot of physical activity (walking, moving heavy equipment) is being performed.

##### Capacity of personnel to work in PPE.

Worker fatigue may be an additional limitation to the work duration. Workers who are overworked will perform less efficiently and perhaps less carefully. The weight of the equipment and the types of activities that will be performed should be considered.

IN ALL CASES, IT IS BEST TO BE CONSERVATIVE. OVER-WORK/OVER-EXPOSURE MUST BE AVOIDED AT ALL COSTS.

ANNEX D

**SAFETY BRIEFING CHECKLIST**

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This checklist is for use with Field Operating Personnel (FOP) for Reentry/restoration activities prior to field work. This form can be used to ensure that individuals entering potentially contaminated sites that require the use of protective equipment have been appropriately trained and informed of their duties, responsibilities, and the risks that they may be subject to.

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- FOP Health Form
- Training Requirements and Medical Surveillance
- Health Hazards (agents, fire/explosion, heat stress)
- Signs and symptoms of exposure
- PPE limitations and serviceability
- Buddy-system [name of buddy: \_\_\_\_\_]
- Maximum time in field
- Communications (methods, frequency, POCs)
- Emergency procedures
- Decon (procedures, locations)

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NOTES/COMMENTS:

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The subjects listed above have been fully explained in accordance with the information provided in the Site Safety and Health Plan (SSHP).

**PRESENTER'S SIGNATURE** \_\_\_\_\_ **DATE:** \_\_\_/\_\_\_/\_\_\_

The subjects listed above and the associated task responsibilities are fully understood and agreed to by the undersigned.

**FOP SIGNATURE** \_\_\_\_\_ **DATE:** \_\_\_/\_\_\_/\_\_\_

ANNEX E  
FIELD OPERATING PERSONNEL HEALTH FORM

NAME: \_\_\_\_\_ DATE: \_\_\_\_/\_\_\_\_/\_\_\_\_  
          last           first           mi

SEX: M/F   AGE: \_\_\_\_   ORGANIZATION/EMPLOYER \_\_\_\_\_

PRE-BRIEFING CHECKLIST

	TASK NO.			
	1st	2nd	3rd	4th
- Attended pre-briefing	_____	_____	_____	_____
- Have had required training	_____	_____	_____	_____
- No medical problems; can wear respirator/mask	_____	_____	_____	_____
- Visually checked PPE serviceability	_____	_____	_____	_____
TYPE/LEVEL OF PPE: (A-F)	_____	_____	_____	_____

Signature of FOP: \_\_\_\_\_ DATE \_\_\_\_/\_\_\_\_/\_\_\_\_

-----  
-BRIEF DESCRIPTION OF TASK: (include Task No. and duration)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

-AGENT SIGNS AND SYMPTOMS: YES\* / NO (\* If yes describe below; include duration, severity, and any treatment provided)

\_\_\_\_\_  
\_\_\_\_\_

-OTHER HEALTH PROBLEMS: (describe task-related health conditions (such as burns/smoke inhalation/bleeding) and treatment provided)

\_\_\_\_\_  
\_\_\_\_\_

ADDITIONAL COMMENTS: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

SIGNATURE OF HEALTH MONITORING PERSONNEL:

\_\_\_\_\_

DATE: \_\_\_\_/\_\_\_\_/\_\_\_\_

ANNEX F

PERSONNEL DECONTAMINATION PROCEDURES

- STATION 1 - EQUIPMENT DROP. NO DECON/CLEANING; LEAVE EQUIPMENT FOR REUSE OR LATER DECON
- STATION 2 - OUTER FOOTWEAR DECON. LIQUID DECON BOOTS (NO STB!); DO NOT USE HANDS!!!
- STATION 3\* - BOOT COVER REMOVAL. \*FOR TEU, EOD, OR DESIGNATED PERSONNEL ONLY!
- STATION 4 - OUTER CLOTHING WASH. SOAPY WATER/BLEACH SOLUTION ON ALL IMPERMEABLE CLOTHING; COLLECT ALL RUNOFF!
- STATION 5 - OUTER CLOTHING RINSE COLLECT RUNOFF!
- STATION 6 - ROLL MASK, HOOD, AND OUTER CLOTHING REMVL. ROLL OR CUT OFF HOOD AND MASK; SEGREGATE PERM & IMPERM CLOTHING
- STATION 7 - INNER CLOTHING REMVL. COLLECT CLOTHING WORN UNDER PERM/IMPERM OUTERWEAR; CUT OFF UNDERSHIRTS
- STATION 8 - MASK REMOVAL INDIVID SHOULD HOLD BREATH WHILE STAT. ATTENDANT REMOVES HOOD; CONT. HOLDING BREATH TO SHOWER
- STATION 9 - SHOWER HOLD BREATH WHILE RINSING HEAD HEAD AND UPPER BODY; RESUME BREATHING AND WASH W/ SOAP & WATER
- STATION 10 - CHECK USE MONITORING EQUIPMENT TO CHECK FOR HOT-SPOT CONTAMINATION; ALSO CHECK FOR SIGNS/SYMPTOMS; DECONTAMINATE WITH A 3% BLEACH SOLUTION
- STATION 11 - FIRST AID & REDRESS MONITOR & TREAT FOR ANY INJURIES, ETC.; REDRESS & MOVE TO A "HOLDING" AREA AND OBSERVE FOR AGENT SYMPTOMS

**APPENDIX I**

**PLANNING GUIDELINES FOR  
RECOVERY PHASE ACTIVITIES  
FOR THE  
CHEMICAL STOCKPILE EMERGENCY PREPAREDNESS PROGRAM**

## APPENDIX I

# PLANNING GUIDELINES FOR RECOVERY PHASE ACTIVITIES

### Preface

The potential for off-post agent contamination during any stage of agent storage and disposal is considered remote. Nevertheless, prudence dictates, and the public deserves, thorough contingency planning. Such advance planning is particularly appropriate for the persistent "terrain denial" agents sulfur mustard and V X. These guidelines have been developed to provide experience-based guidance for assisting community and installation planners in developing recovery phase plans specific to local needs.

This appendix provides guidelines on how to plan

- (1) for decontamination in the post-acute phase of 1 chemical warfare agent emergency as well as
- (2) for reentry to, and restoration activities within, agent-suspect or agent-confirmed areas in the event of a significant chemical warfare agent release.

This appendix addresses priorities and procedures for planning regarding these issues. Both restricted reentry (caretaker or monitoring teams with specific missions and appropriate protective equipment) and unrestricted reentry (unlimited access by the general public) are included.

This appendix is not concerned with the specification of agent control limits. Separate efforts<sup>1</sup> of the CSEPP are underway to define these limits, which will specify the concentrations of chemical agent that may remain in or on various environmental media without presenting a significant risk to human health. Effective planning for recovery phase decontamination and for reentry and restoration can take place while these control limits are being developed. In the absence of agent control limits, emergency plans can be developed to

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<sup>1</sup>See Friel 1993; Kerr 1992; Kistner et al. 1992; Opresko et al., in review; Reutter et al. 1994; US DHHS 1990; Watson et al. 1992a, b.

## APPENDIX J

**CLEANUP PROCEDURE UNDER CERCLA AND RCRA****I. OVERVIEW**

This section describes and compares procedures, rules, and responsibilities for environmental cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (42 USCS § 9601 et seq.), and the Resource Conservation and Recovery Act of 1976 (42 USCS § 6901) (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984. Both statutes are designed to ensure that the environmental impacts associated with the release are thoroughly investigated, and that timely remedial action is taken to protect the public health, welfare, and the environment. Both statutes would potentially apply to cleanup of a chemical accident or incident (CAI), which results in overlapping requirements. Both statutes allow and encourage states to administer cleanup, with EPA's approval, and many states have done so; the EPA retains direct authority in other states. The issue of conflicting requirements is currently an open legal question.

Below is an overview of each statute and its principal provisions regarding roles and responsibilities for environmental cleanup. A more detailed breakdown of federal responsibilities under each statute follows.

**A. CERCLA**

Pursuant to Executive Order 12580 (January 23, 1987), the U.S. Department of Defense (DOD) is authorized to act, consistent with the National Contingency Plan (NCP), to remove or arrange for the removal of, and provide for remedial action relating to such release, or to take any other response measure consistent with the NCP that the DOD deems necessary to protect the public health or welfare or the environment (CERCLA Section 104(a)). The DOD is authorized to investigate, monitor, survey, test, and gather other information as it may deem necessary or appropriate to identify the existence and extent of the release, the source and nature of the contamination involved, and the extent of danger to the public health or welfare or to the environment, including such planning, legal, fiscal, economic, engineering, architectural, and other studies or investigations as it may deem necessary or appropriate to plan and direct response actions (CERCLA Section 104(b)). The DOD has

additional responsibilities set forth in Section 211 of CERCLA, under the Installation Restoration Program (IRP) (Defense Environmental Restoration Program). The IRP includes the "correction of environmental damage (such as detection and disposal of unexploded ordnance) which creates an imminent and substantial endangerment to the public health or welfare or to the environment."

Under CERCLA Section 120, the affected site is to be evaluated for inclusion on the National Priorities List (NPL) under the same guidelines as a nonfederal facility. If the site is listed on the NPL, within six months thereof, the DOD, in consultation with the EPA and the appropriate state authorities, must commence a remedial investigation/feasibility study (RI/FS) for the site. The Agency reviews the RI/FS, and within 180 days thereafter, the DOD shall enter into an interagency agreement with the EPA for the expeditious completion of all necessary remedial actions. Substantial continuous physical on-site remedial action shall be commenced at the site not later than 15 months after completion of the RI/FS (CERCLA Section 121(e)(2)). A model interagency agreement, which includes the state environmental agency as a party, is found in Appendix K.

If the site is placed on the National Priorities List, the DOD and the EPA select the final remedial action to carry out in accordance with Section 121 (relating to cleanup standards) (CERCLA Section 104(c)(4)). If the site is not on the list, the DOD carries out the remedial action consistent with SARA Section 211 and the IRP guidance; the DOD, as the lead agency, selects the final remedial action.

Section 121 requires the remedial action to be in accordance with the NCP, to the extent possible, and cost-effective, taking into account the total short- and long-term costs of such alternative actions, including the costs of operation and maintenance for the entire period during which such activities will be required, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Under Section 121, the remedial action selected shall attain a degree of cleanup that assures the levels of contaminants remaining at the site meet any ARAR, criteria, or limitation under any federal environmental law (ARARs), including, but not limited to, the Toxic Substances Control Act; the Safe Drinking Water Act; the Clean Air Act; the Clean Water Act; the Marine Protection, Research, and Sanctuaries Act; or the Solid Waste Disposal Act or any promulgated standard, requirements, criteria, or limitation under a state environmental or facility siting law that is more

stringent than any federal standard, requirement, criteria, or limitations (and which has been identified to the DOD in a timely manner by the affected state) (CERCLA Section 121(d)). The DOD must work with the appropriate state environmental agency and the EPA to determine which such standards, requirement, criteria, or limitations are applicable or relevant and appropriate to the release site location, the contaminant, or the proposed method of cleanup.

## B. RCRA

If the release is from a CSDP agent disposal facility, a corrective action under either RCRA Sections 3004(u) or (v) or Section 3008(h) may be required. If the state has authorization to implement the corrective action provisions of HSWA, the DOD would negotiate with the state for an amendment to its existing permit. If the state is not so authorized, DOD would negotiate with the EPA. If the release is not from a discernible, permitted solid waste management unit, the DOD may have to negotiate a consent order with the EPA under RCRA Section 3008(h). The law and regulations are still unclear concerning the interface of CERCLA remedial actions and RCRA corrective actions; therefore, the DOD, the state, and the EPA must work together to prevent duplicate efforts. If possible, the DOD, the state, and the EPA should enter into an interagency agreement that determines in advance that CERCLA would be the appropriate vehicle for restoration and remediation and that, as adopted in the model consent agreement (See Appendix K of this workbook) compliance with the consent agreement under CERCLA is compliance with a corrective action under RCRA. This will preclude jurisdictional problems at the time of the remediation and prevent duplicate efforts.

Under EPA proposed regulations (55 Fed. Reg. 30788, July 27, 1990), if the regional administrator of the EPA or the authorized state agency (appropriate authority) determines there has been a release from a solid waste management unit at a permitted facility, DOD would be required to investigate and characterize such releases, including characterization of the environmental setting at the facility, characterization of the release, descriptions of humans and environmental systems that have been or may be exposed to the release, information concerning risks to human health and the environment from the release, extrapolations of future movement, degradation and fate of contaminants, potential treatment or remedies, and sampling methodologies (40 CFR 264.512).

DOD would develop and submit a plan for conducting any RIs for review by the appropriate authority, meeting the requirements set forth in the proposed regulations (Proposed Rule 40 CFR 264.512). If the authority determines that concentrations of hazardous constituents in groundwater exceed an action level (as defined in the regulations), the DOD must perform a corrective measure study. The authority may also determine that even if a constituent is below an action level, it may pose a threat to human health or the environment, and the DOD would have to perform a corrective measure study. The authority may also determine that even if an action level is exceeded, the release poses no threat to human health and the environment and requires no action from DOD (Proposed Rule 40 CFR 264.520).

If a corrective measure study is ordered, DOD would develop and submit a plan for conducting such a study for review and approval or modification by the appropriate authority, meeting the requirements set forth in the proposed regulations (Proposed Rule 40 CFR 264.523). On the basis of the results of the corrective measure study, the appropriate authority will select a remedy that, at a minimum, meets the standards set forth in the regulations, including long-term reliability and effectiveness, reduction of toxicity, mobility, or volume; implementability; schedule; and media cleanup standards (Proposed Rule 40 CFR 264.525). The appropriate authority will then modify the DOD's existing permit to incorporate the remedy selected, setting forth the technical requirements of the remedy; the media cleanup standards established; requirements for removal, decontamination, closure, or postclosure of units, equipment, devices or structures that will be used in the remedy; a schedule for implementation; and reporting requirements. The permit modification may require DOD to prepare detailed construction plans and specifications to implement the approved remedy, subject to review and approval by the appropriate authority (Proposed Rule 40 CFR 264.527). The appropriate authority will periodically review the progress of the remedy and may modify the permit schedule for compliance to require additional remedial measures to ensure prompt completion, safety, effectiveness, protectiveness, or reliability of the remedy (Proposed Rule 40 CFR 264.530). Upon completion of the remedy and compliance with all media cleanup standards, the DOD shall submit to the appropriate authority a request for termination of the permit amendment.

If, at any time, the appropriate authority determines that a release poses a threat to human health or the environment, it may specify in the permit that DOD must initiate interim measures to abate, minimize, stabilize, mitigate, or eliminate the release. Such actions shall be implemented as soon as practicable, in accordance with a schedule specified by the appropriate authority (Proposed Rule 40 CFR 264.540). Interim measures should, to the extent practicable, be consistent with the objective of, and contribute to the performance of, any final remedy that may be required.

## II. ASSIGNMENT OF RESPONSIBILITIES

### A. U.S. DEPARTMENT OF THE ARMY, AS LEAD AGENCY

#### 1. CERCLA

- Work with the Agency of Toxic Substances and Disease Registry in the Department of Health and Human Services or the State Health Department to develop toxicological profiles of the constituents potentially released in a CAI; work with the EPA in developing health advisories on the constituents potentially released in a CAI.
- Develop sampling and analysis plans, including quality assurance project plans to ensure there is no lag in conducting an engineering evaluation/cost analysis or its equivalent, including environmental sampling to obtain data of sufficient quality and quantity to satisfy data needs to perform a removal site evaluation or remedial site evaluation.
- Contact the appropriate state environmental agency to notify it that a remedial action is to be performed under CERCLA.
- Evaluate the removal site, including preliminary assessment and if warranted, a site inspection.
- Document the results of the removal site evaluation.
- If the removal site evaluation indicates that removal action is required, perform such removal actions, as required.

- If the removal site evaluation indicates that removal action is not required, but that remedial action may be necessary, initiate a remedial site evaluation.
- If natural resources are or may be affected by the release, notify the state and federal trustees of the natural resources so affected.
- Contact the EPA for an evaluation of the site to determine whether it should be listed on the NPL.
- If the site is listed on the NPL, negotiate and enter into an interagency agreement with the EPA pursuant to CERCLA Section 120 and with the state, if appropriate.
- If the site is not listed on the NPL, proceed with a voluntary restoration and remediation, possibly including negotiation of an interagency agreement with the state and/or the EPA.
- Develop a community relations plan setting forth public participation.
- Conduct an RI/FS for the affected site.
- Develop an administration record in conformance with CERCLA and the NCP.
- If the site is not on the NPL, select a remedial action to be implemented at the site, in conformance with CERCLA, the NCP, and any applicable CERCLA guidance.
- Publish a notice and brief analysis of the proposed plan to implement the chosen remedial action and make such plan available to the public and provide a reasonable opportunity for submission of written and oral comments and an opportunity for a public meeting at or near the facility at issue regarding the proposed plan and regarding any proposed findings under CERCLA Section 121(d)(4) (relating to cleanup standards).
- Publish an explanation of any significant differences between the final plan and the proposed plan, if necessary.

- Perform the remedial action in conformance with the plan.

2. RCRA

- If the release is from a discernible, permitted solid waste management unit, notify the appropriate authority under RCRA.
- If served with an administrative order under RCRA Section 3004(u) or (v) or Section 3008(h), DOD may have to:
  - Submit a plan to perform a remedial investigation;
  - Perform such investigation;
  - Submit a plan to perform a corrective measure study;
  - Perform such corrective measure study;
  - Negotiate with the appropriate authority to amend the existing RCRA permit to provide for a corrective action;
  - Perform such corrective action pursuant to the permit modification; and
  - Provide such notifications as necessary under the EPA proposed regulations.

B. U.S. ENVIRONMENTAL PROTECTION AGENCY

1. CERCLA

- Evaluate the site to determine whether it should be listed on the NPL.
- If the site is listed on the NPL, consult with the DOD and the appropriate state authorities on implementation of an RI/FS process.
- If the site is listed on the NPL, review the RI/FS.
- If the site is listed on the NPL, negotiate and enter into an interagency agreement with the DOD pursuant to CERCLA Section 120.

- If the site is listed on the NPL, review the alternative remedial actions and select the final remedial action in consultation with the DOD.
- If the site is listed on the NPL, identify requirements, standards, and criteria applicable or relevant and appropriate to the release or remedial action contemplated.
- If the site is listed on the NPL, select the final remedial action in conjunction with the DOD, or if agreement with the DOD cannot be reached independently.

2. RCRA

- Determine if the release is from a discernible solid waste management unit and if so, if the state has been authorized to implement the corrective action provisions of HSWA.
- If the state has been so authorized, determine if an administrative order should be issued under RCRA.
- Participate in negotiations of the modification of the existing permit to provide for a remedial investigation, a corrective measures study, and a corrective action. If the state has no corrective action authority, participate, as requested by EPA, to offer expertise and recommend media cleanup standards.
- Periodically review the corrective action progress and, upon completion of the corrective action, issue an order of termination of the permit.

APPENDIX K

MODEL INTERAGENCY AGREEMENT

Below is a model interagency agreement for cleanup of hazardous material contamination pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). As explained in Section H, an interagency agreement between the U.S. Department of Defense (DOD) and the U.S. Environmental Protection Agency (EPA), which also includes the state as a party, is the preferred method of specifying roles, responsibilities, and procedures for the cleanup effort. This model form is intended to illustrate the types of issues and considerations that should be taken into account in drafting such an agreement.

IN THE MATTER OF: )
UNITED STATES DEPARTMENT OF DEFENSE ) CONSENT AGREEMENT UNDER CERCLA SECTION 120 and 106(a)
THE DEPARTMENT OF THE ARMY )

CONSENT AGREEMENT

WHEREAS, the U.S. Department of Defense (DOD) was directed by Congress in December 1985 to destroy the U.S. stockpile of lethal unitary chemical weapons in such a manner as to provide maximum protection to the environment, the general public, and the personnel involved in the destruction (Public Law 99-145, DOD Authorization Act of 1986).

WHEREAS, the Federal Emergency Management Agency (FEMA) and the U.S. Department of the Army (Army) have entered into a Memorandum of Understanding dated August 3, 1988, establishing the framework of cooperation between the FEMA and the Army for developing and implementing plans and programs for hazardous materials emergency preparedness in connection with the storage and ultimate disposal of chemical warfare materials.

WHEREAS, in conjunction with handling such stockpile of chemical weapons, there was an unintended release of chemical agent and emergency responses have been undertaken.

WHEREAS, the Army now is commencing recovery, reentry, and restoration procedures to ensure that the environmental impacts associated with the release are thoroughly investigated and that a timely remedial action is taken to protect the public health, welfare, and the environment in conformance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (42 USCS § 9601 et seq.) (CERCLA) and CERCLA guidance and policy regulations, the Resource Conservation and Recovery Act of 1976 (42 USC § 6901) (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), the \_\_\_\_\_ of the State of \_\_\_\_\_, (the State) the National Environmental Policy Act of 1969 (42 USCS § 4321 et seq.) (NEPA) and the National Oil and Hazardous Substances Pollution Contingency Plan (55 Fed. Reg. 8666, March 8, 1990) (NCP).

#### I. PURPOSE AND SCOPE OF THIS CONSENT AGREEMENT

The purpose of this document is to establish the roles, responsibilities, and relationship between the United States Environmental Protection Agency (USEPA), the State, and the Army, hereinafter collectively referred to as the "Parties," regarding the implementation of a remedial action at \_\_\_\_\_ (Site). This Agreement establishes a procedural framework between the Parties in order to facilitate interagency cooperation, the exchange of information, and participation in implementing the remedial action.

Specifically, the purpose of this Agreement is to:

- a) identify remedial alternatives for the release site, on and off post, prior to the implementation of final remedial action for the Site;
- b) establish requirements for the performance of a Remedial Investigation (RI) to determine fully the nature and extent of the threat to the public health or welfare or the environment caused by the release at the Site; establish requirements for the performance of a Feasibility Study (FS) for the Site to identify, evaluate, and select alternatives for the appropriate remedial action to mitigate or abate the release at the Site in accordance with CERCLA and applicable State law;
- c) identify the nature, objective, and schedule of the remedial action to be taken at the Site, and the applicable or relevant and appropriate standards of cleanup to be attained at the Site;
- d) implement the selected remedial action in accordance with CERCLA, NCP, NEPA, and applicable State law and meet the requirements of CERCLA § 120 for a federal facility;
- e) coordinate remedial action at the Site with the emergency response actions already taken at the Site;
- f) expedite the cleanup process to the extent consistent with protection of human health and the environment; and

- 
- g) provide for operation and maintenance of any remedial action selected and implemented pursuant to this Agreement.

## II. JURISDICTION

The USEPA enters into this Agreement pursuant to its authorities as set forth in Sections 106(a) and 120(a) and (e) of CERCLA, Sections 6001, 3008(h), 3004(u), and (v) of RCRA, and Executive Order 12580.

The Army enters into this Agreement pursuant to its authorities as set forth in Executive Order 12580, Sections 120 of CERCLA, and the Defense Environmental Restoration Program (DERP), 10 USC § 2701 *et seq.* The Army is a responsible party within the meaning of CERCLA Section 107 with respect to the release of chemical agent at the Site. The Department of the Army is authorized to act on behalf of the Secretary of Defense for all functions which are relevant to this Agreement delegated by the President through Executive Order 12580.

The State enters into this Agreement pursuant to its authorities as set forth in Sections 120 and 121(f) of CERCLA, Subpart F of the NCP, Subpart G of the NCP as a Natural Resource Trustee, Sections 6001, 3004(u), and (v) of RCRA, and applicable State statutes and regulations governing the Army's RCRA permit for the \_\_\_\_\_ facility.

## III. DEFINITIONS

The terms used in this Agreement shall have the same meaning as defined in Section 101 of CERCLA, the NCP, Section 1004 of the Resource Conservation and Recovery Act of 1976 (42 USCS § 6904) (RCRA), and 40 CFR Parts 260-66 and 268. In addition, the following terms shall be defined as follows:

"Days" shall mean calendar days, unless business days are specified. Any submittal or written statement of dispute that under the terms of this Agreement would be due on a Saturday, Sunday, or federal holiday shall be due on the next business day.

"Deadlines" means schedules as well as that work and those actions which are to be completed and performed in conjunction with such schedules established pursuant to this Agreement.

"Force Majeure" means any event arising from causes beyond the control of a Party that causes a delay in or prevents the performance of any obligation under this Agreement, including, but not limited to, Acts of God, fire, war, insurrection, civil disturbance, explosion, unanticipated breakage or accident to machinery, equipment or lines of pipe despite reasonably diligent maintenance, technological impracticability or inability, adverse weather conditions that could not be reasonably anticipated, unusual delay in transportation, restraint by court order or order of public authority, inability to obtain, at reasonable cost and after exercise of reasonable diligence, any necessary authorizations, approvals, permits or licenses due to action or inaction of any governmental agency or authority other than the Army, delays caused by compliance with applicable statutes or regulations governing contracting, procurement or acquisition procedures, despite the exercise of reasonable diligence, and insufficient availability of appropriated funds, if the Army shall have made timely request for such funds as part of the budgetary process as set forth in Part XIII of this Agreement.

A Force Majeure shall also include any strike or other labor dispute, whether or not within the control of the Parties affected thereby. Force Majeure shall not include increased costs or expenses of Response Actions, whether or not anticipated at the time such Response Actions were initiated.

"Site" means the \_\_\_\_\_ site, as defined in Part V.

"Submittal" means every document, draft, report, schedule, deliverable, work plan, or other item to be submitted to USEPA or the State by the Army pursuant to this Agreement.

#### IV. PARTIES

The Parties to this Agreement are the USEPA, the Army, and the State. The terms and conditions of this Agreement do not and shall not be construed to inure to the benefit of any other natural person, corporation, association, governmental agency, or entity not a signatory hereto. The terms of this Agreement shall be binding upon the Parties.

#### V. STATEMENT OF FACTS

\_\_\_\_\_ is located in \_\_\_\_\_, \_\_\_\_\_ is owned by the United States and operated by the Army in part as a chemical weapons storage facility. The Site constitutes a "facility" within the meaning of that term as defined in CERCLA Section 101(9) and is a federal facility under CERCLA Section 120. On \_\_\_\_\_, 19\_\_, an unintended release of chemical agents occurred. This accident resulted in the release of \_\_\_\_\_ into the

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environment. [Insert specific facts of dispersal, pathways, characterization, etc.]

On \_\_\_\_\_, 19\_\_, the following emergency response was initiated:

[Insert specific sequence of events following the accident.]

On \_\_\_\_\_, 19\_\_, the Site was listed on the National Priorities List (NPL).

#### VI. WORK TO BE PERFORMED

The Parties agree that the Army shall plan and conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Site leading to the development and implementation of a Remedial Action Plan in accordance with USEPA regulations and guidance documents. Work specifically required for remediation of the site, including delineation of operable units, development of a Scope of Work, a RI/FS Work Plan (including a Sampling and Analysis Plan, Health and Safety Plan, and Quality Assurance Project Plan), Community Relations Plan, RI Report, Initial Screening of Alternatives Report, FS Report, Remedial Action Plan, Record of Decision, Remedial Design/Remedial Action Work Plan, and if necessary, a plan for restoration, rehabilitation, replacement, or acquisition of natural resources pursuant to Section G of the NCP, will be based on available and acceptable data and other information, including information and data collected prior to the effective date of this Agreement. Schedules for completing each document will be set forth in the Scope of Work, which will be provided within \_\_\_\_\_ (\_\_) days of the effective date of this Agreement.

The RI and FS investigations will be conducted consistently with Executive Order 12580, the NCP, DERP and the USEPA document entitled *Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA Interim Final* (EPA/540/G-89/004, Washington, D.C.). The RI/FS process shall also meet the requirements of NEPA in assessing the impacts of various remedial actions which are considered, and in developing the Remedial Action Plan.

#### VII. STATUTORY COMPLIANCE AND RCRA/CERCLA INTEGRATION

The Parties intend to integrate into this comprehensive Agreement such RCRA and CERCLA obligations as the Army may have regarding the Site. Therefore, the Parties intend that activities covered by this Agreement will achieve compliance with CERCLA and the NCP; will satisfy the State's responsibilities under Subpart G of the NCP regarding restoration of natural resources; and will satisfy the corrective action requirements of Sections 3004(u) and (v) and 3008(h) of RCRA.

Based on the foregoing, the Parties intend that any remedial action selected, implemented, and completed under this Agreement shall be deemed by the parties to be protective of human health and the environment such that remediation of releases covered by this Agreement shall obviate the need for further corrective action under RCRA. The parties agree that with respect to releases of hazardous waste and hazardous waste constituents covered by this Agreement, RCRA, the applicable State Act and the regulations adopted thereunder may be considered as applicable or relevant and appropriate requirements pursuant to Section 121 of CERCLA and the NCP.

The Parties recognize that the requirement to obtain permits for response actions undertaken pursuant to this Agreement shall be as set forth in CERCLA and the NCP. The Parties further recognize that on-going hazardous waste management units or activities remaining at the Site after completion of the remedial action taken hereunder may require the issuance of permits (e.g., RCRA Facility Operating Permits) under applicable Federal and State laws. This Agreement does not affect the requirements, if any, to obtain such permits.

## VIII. REPORTING, REVIEW, AND EXTENSIONS OF TIME

### A. Reporting

The Army shall provide written monthly progress reports to USEPA and the State concerning the work performed under this Agreement. The reports shall address technical progress during the reporting period, variances from previously planned activities, planned activities for the coming reporting period, work schedules, and issues related to implementation of work plans and work progress. In addition, the Army, USEPA, and the State shall maintain necessary communications to maintain work progress and the timely exchange of information.

### B. Review of Submittals

Review of a Submittal by USEPA and the State shall concern all aspects of the Submittal (including completeness) and shall include, but not be limited to, technical evaluation of any aspect of the Submittal, and consistency with CERCLA, the NCP, other applicable laws, regulations, and any other pertinent guidance or policy promulgated by USEPA or the State. Comments by USEPA or the State shall be sufficiently specific and in such detail so that the Army can reasonably respond to the comments and, if appropriate, make revisions to the relevant Submittal. Comments shall refer to any pertinent sources of authority or references upon which the comments are based. Upon request of the Army, USEPA or the State shall provide a copy of the cited authority or reference. Authorized representatives of the Army shall make themselves readily available to USEPA or the State during the comment period for purposes of informally responding to questions and comments on draft Submittals.

#### 1. Primary Submittals

Primary Submittals include all documents that are major and discrete portions of the required activities covered by this Agreement. Primary Submittals include:

- a. Scope of Work;
- b. RI/FS Work Plan, including:
  - Quality Assurance Project Plan;
  - 
  - Health and Safety Plan;
  - 
  - Sampling and Analysis Plan(s);
- c. Community Relations Plan;
- d. RI Report;
- e. Initial Screening of Alternatives Report;
- f. FS Report;

- g. Remedial Action Plan;
- h. Record of Decision; and
- i. Remedial Design/Remedial Action Work Plan.

USEPA or the State shall review and comment on draft Submittals directly to the Army. Following receipt of comments on a Submittal, the Army shall issue responses to the comments received and issue a draft final primary Submittal reflecting any appropriate revisions in accordance with such comments. A draft final primary Submittal shall become the final primary Submittal, unless the Submittal is revised pursuant to Section X.

## 2. Secondary Submittals

Secondary Submittals include, but are not limited to, monthly reports, environmental monitoring data reports, and other documents that are in support of primary Submittals. Secondary Submittals shall be provided by the Army subject to review and comment by USEPA and the State. Although the Army may respond to the comments received, secondary Submittals are not expected to undergo revisions. Secondary Submittals may be revised, in the Army's sole discretion, in the context of the corresponding final primary Submittal, if appropriate to be issued.

## 3. Identification and Determination of Potential ARARs

For those primary Submittals or secondary Submittals that consist of or include ARAR determinations, the Project Managers shall meet to identify and propose, to the best of their ability, all potential ARARs pertinent to the report being addressed. Draft ARAR determinations shall be prepared by the Army in accordance with Section 121(d)(2) of CERCLA, the NCP, and the pertinent guidance issued by USEPA and the State, which is not inconsistent with CERCLA and the NCP.

In identifying potential ARARs, the Parties recognize that actual ARARs can be identified only on a site-specific basis and that ARARs depend on the specific hazardous substances, pollutants, and contaminants at a site, the particular actions proposed as a remedy, and the characteristics of a site. The Parties recognize that ARAR identification is necessarily an iterative process and that potential ARARs must be re-examined throughout the RI/FS process until a ROD is issued.

### C. Extensions of Time

A deadline set forth in any primary final Submittal shall be extended upon receipt of a timely request for extension for good cause. Any request for extension shall be submitted to the other Party in writing and shall specify the deadline sought to be extended, the length of the extension sought, any other related deadlines that would be affected if the extension is granted, and the cause for the request. Good cause includes, but is not limited to:

1. An event of *force majeure*;
2. A delay caused by another Party's failure to meet any requirement of

- this Agreement or any primary final Submittal;
3. A delay caused by the good faith invocation of dispute resolution or the initiation of judicial action;
  4. Any work stoppage ordered pursuant to this Agreement, federal or state statute or regulations or court order; or
  5. A factor outside of the reasonable control of a Party.

## **IX. REMEDIAL PROJECT MANAGERS**

### **A. Designation**

The USEPA, the State, and the Army shall each designate a Remedial Project Manager (RPM). Except as provided otherwise in this Agreement, RPMs are responsible for implementing the duties of their respective agencies under this Agreement. Within ten (10) days of the effective date of this Agreement, the Parties shall notify each other of the name, address, and telephone numbers of their respective RPMs. Any Party may change its designated RPM by notifying the other Party, in writing, within five (5) days after the change. To the maximum extent possible, communications between Parties concerning the terms and conditions of this Agreement shall be directed through the RPM.

### **B. Communications**

Each RPM shall be responsible for assuring that all communications from the other RPMs are appropriately disseminated and processed by the Party the RPM represents.

### **C. Imminent and Substantial Endangerment and Removal Actions**

Whenever a RPM discovers or becomes aware of a situation that is likely to present an imminent and substantial endangerment to the public health, welfare, or the environment at or near the Site that is directly or indirectly the result of any work related to implementation of this Agreement, he/she shall immediately orally notify the other Party's RPM and shall immediately orally notify the responsible person that immediate correction or attention must take place. All contracts and subcontracts with respect to the Site shall contain a clause requiring such contractor or subcontractor to notify all RPMs of any such situation. If the responsible person is unable or unwilling to correct the situation, any RPM may take appropriate action. If the endangerment occurs as a result of actions performed pursuant to the implementation of this Agreement, the Army shall take immediate action to notify appropriate federal, state, and local authorities.

Notwithstanding any other provision of this Agreement, the Army retains the right, consistent with Executive Order 12580, to conduct a removal action to abate an imminent and substantial endangerment to human health or the environment

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from the release or threat of release of hazardous constituents, hazardous substances, pollutants, or contaminants at or from the Site. Such actions may be conducted at any time, either before or after the issuance of a ROD.

The Army shall provide the USEPA and the State with adequate opportunity for timely review and comment after the Army makes any proposal to carry out such removal actions and before it initiates any such removal action.

#### **D. Field Modifications**

The RPMs may agree to make field modifications to the work to be performed pursuant to this Agreement. Modifications may be related to techniques, procedures, or design utilized during field activities that are necessary to complete the investigation and remediation of the site. Field modifications proposed by any Party pursuant to this section must be approved orally by the other Party's RPM to be effective. The RPM suggesting the modification shall document it and its approval.

#### **E. Oversight**

The Army's RPM or his/her authorized representative shall be on-site or on call to supervise all work performed at the Site during implementation of the work performed pursuant to this Agreement. The USEPA or the State RPM or his/her authorized representative shall supply a telephone number where he/she can be reached in an emergency. Absence of the USEPA or the State RPM or his/her authorized representative shall not be cause for work suspension.

### **X. RESOLUTION OF DISPUTES**

A dispute is any disagreement between the Parties regarding any interpretation of this Agreement, any schedule, any document, any work to be performed, any procedure, any reimbursement, or any legal requirement or guidance. If a dispute arises under this Agreement, the procedures of this section shall apply, except as provided otherwise in this Agreement. Any resolution of a dispute pursuant to this section may include amendment of any pertinent document. All Parties shall abide by all terms and conditions of any resolution of a dispute.

#### **A. Informal Dispute Resolution**

All Parties shall make reasonable efforts to informally resolve disputes through their respective RPMs or authorized representatives. During informal dispute resolution, the RPMs or their authorized representative(s) shall, as appropriate, confer, meet, and exert their best efforts to resolve the dispute within thirty (30) days. If no resolution can be reached during this informal dispute process, the Parties shall follow the process set forth below. Pursuant to the SMOA or other agreement, the USEPA will act as the State's agent in the process set forth in Subsections B, C, and D below. [If such agreement does not exist, the State may be made a participant in the formal dispute resolution process.] This Part does not apply to disputes concerning the restoration,

rehabilitation, replacement, or acquisition of equivalent natural resources pursuant to the State's responsibilities as a natural resource trustee under Subpart G of the NCP. Such disputes, if they cannot be resolved informally, are governed by the recourse set forth in the NCP for natural resource trustees (40 CFR 300.615(e)).

**B. Dispute Resolution Committee**

The Dispute Resolution Committee (DRC) shall consist of the Commanding Officer at the Site and the USEPA Deputy Regional Administrator. The DRC shall attempt to resolve disputes that the RPMs cannot resolve pursuant to Section VIII(A). The RPM of a disputing Party shall submit to the DRC a written Statement of Dispute setting forth the nature of such dispute, the work affected by the dispute, the Party's position with respect to the dispute, the information the Party is relying upon to support its position, and a proposed resolution. The DRC shall, as appropriate, confer, meet, and exert its best efforts to issue a written decision unanimously resolving the dispute within twenty-one (21) days of receiving the Statement of Dispute.

**C. Senior Executive Committee**

The Senior Executive Committee (SEC) shall consist of the Assistant Secretary of the Army Installations, Logistics, and the Environment and the USEPA/Region V Administrator. The SEC shall attempt to resolve disputes that the DRC cannot resolve pursuant to Section VIII(B). The DRC shall submit to the SEC the Statement of Dispute, along with any recommendations of any DRC member. The SEC shall, as appropriate, confer, meet, and exert its best efforts to issue a written decision unanimously resolving the dispute within twenty-one (21) days of receiving the Statement of Dispute.

**D. Administrator of USEPA**

The Administrator of the USEPA shall resolve disputes that the SEC cannot resolve pursuant to Section VIII(C). The SEC shall submit to the Administrator the Statement of Dispute, along with any recommendations of any SEC member. Following such procedures as he/she may deem appropriate, the Administrator shall issue a written decision resolving the dispute within twenty-one (21) days of receiving the Statement of Dispute.

**E. Extension of Work Schedules Pending Dispute Resolution**

Except as provided in this section, all work under this Agreement shall continue pending resolution of such dispute, and shall be completed in accordance with applicable schedules. The schedule for completing work that is affected by such dispute shall be extended for a period usually not to exceed the actual time taken to resolve such dispute.

**F. Suspension of Work Pending Dispute Resolution**

The Army shall cause work under this Agreement that is affected by a dispute to be immediately discontinued if the USEPA Waste Management Division Director or the State \_\_\_\_\_ requests in writing that such work be suspended because, in his/her opinion, such work is inadequate or defective, and its continuation is likely to result in an adverse effect on human health or the environment, or is likely to have an adverse effect on the selection or implementation of a remedial action. USEPA or the State shall give the Army reasonable prior notification that such a request is forthcoming. If the Army believes that the request is inappropriate, the Army may meet with the USEPA Waste Management Division Director or the State \_\_\_\_\_ to discuss the suspension after suspending the work in accordance with the request. Following this meeting, the Director shall issue a written final decision with respect to the suspension within fifteen (15) days. Such decision may, in the sole discretion of the Army, be immediately referred to the DRC or SEC for dispute resolution.

## XI. ADMINISTRATION

### A. Access and Confidentiality

At all reasonable times following notification to the Army RPM, and for the purposes of inspecting conditions, activities, records, operating logs, or other documents related to this Agreement, USEPA and the State or their authorized representatives may:

1. enter and freely move about all property at the Site and off-site areas where work, if any, is being performed or where documents are generated or stored;
2. conduct such tests as the USEPA or the State RPM deems necessary or appropriate;
3. use a camera, sound recording device, or other documentary equipment;  
or
4. verify any data provided to USEPA or the State by the Army.

The results of any such test, or copies of such photographs, sound recordings, or other products of documentary equipment, or results of such data verification shall be provided to the Army as soon as practicable after its creation or analysis. All parties with access to the Site shall comply with the Health and Safety Plan. Nothing herein shall be interpreted as limiting or affecting any right of entry or inspection authority of USEPA or the State under applicable law.

To the extent that this Agreement requires access to property not owned and controlled by the Army, the Army shall, if necessary, use its best efforts to obtain site access agreements from the present owner(s) of such property. The Army agrees to exercise its authorities pursuant to Section 104(e) of CERCLA when necessary to obtain access from the present owners and/or lessees. With respect to property not owned or controlled by the Army and upon which any monitoring

wells or other response actions are to be located, any access agreements obtained by the Army shall provide for written notice to the Army before a conveyance of title, easement, or other interest in the property is consummated. In the event that property to which the Army has obtained access is subsequently conveyed or leased to a third party, the Army shall use its best efforts to obtain access from the new owner/lessee so that delays or disruptions in work or other response actions are minimized. In the event that agreements for site access are not obtained, the Army shall notify the USEPA.

**B. Notifications**

All written material under this Agreement shall be delivered via the most expeditious method desirable under the circumstances, and shall be addressed to:

Assistant Secretary of the Army Installations, Logistics, and the Environment  
U.S. Environmental Protection Agency  
Office of Superfund  
State

**C. Administrative Record**

Pursuant to the delegation of authority under Section 2(e)(2) of Executive Order 12580 and in accordance with the provision of Subpart I of the NCP, the Army shall establish an Administrative Record upon which to base the selection of a remedial action. The Administrative Record shall be made available to the public at or near the site. The Army shall maintain the administrative record for ten years from the date of the termination of this Agreement. After this ten-year period, each Party shall notify the other parties at least forty-five (45) days prior to destruction or disposal of any such documents or records. Upon request, the requested Party shall make available such records or documents or copies of any such records or documents to the requesting Party.

**D. Public Participation and Comments**

Pursuant to its authority under Executive Order 12580, the Army will develop and implement a Community Relations Plan to provide for public participation and comment in accordance with Sections 113(k) and 117 of CERCLA, Sections 300.415, 300.430, and 300.435 of the NCP, applicable State RCRA statutes and regulations, and NEPA.

**E. Permit Acquisition**

Pursuant to Section 121(e) of CERCLA, no federal, state, or local permit shall be required for any portion of this remedial action conducted entirely on-site, where such action is selected and carried out in compliance with the requirements of Section 121 of CERCLA. The Army intends to comply with all substantive requirements of all federal, state, or local statutes, ordinances, and properly promulgated rules and regulations in the conduct of this remedial action.

## **XII. FUNDING AND REIMBURSEMENT**

It is the expectation of the Parties to this Agreement that all obligations of the Army arising under this Agreement shall be fully funded. The Army agrees to seek sufficient funding through the DOD budgetary process to fulfill its obligations under this Agreement. Any such payments or obligations of funds by the Army shall be subject to the availability of appropriated funds and no provision herein shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act (31 USCS § 1341) nor shall the lack of appropriated funds be construed as a violation of this Agreement. In cases where a payment or obligation of funds would constitute a violation of the Anti-Deficiency Act, the dates established requiring the payment or obligation of such funds shall be appropriately adjusted.

Funds authorized and appropriated annually by Congress under the "Environmental Restoration, Defense" appropriation in the Department of Defense Appropriation Act and allocated by the DASD(E) to the Army will be the source of funds for activities required by this Agreement consistent with SARA § 211. However, should the Environmental Restoration, Defense appropriation be inadequate in any year to meet the total Army CERCLA implementation requirements, the DOD shall employ and the Army shall follow a standardized DOD prioritization process which allocates that year's appropriations in a manner which maximizes the protection of human health and the environment.

## **XIII. STIPULATED PENALTIES**

In the event that the Army fails to submit a primary document to USEPA pursuant to the appropriate timetable or deadline in accordance with the requirements of this Agreement, or fails to comply with a term or condition of this Agreement which relates to an interim or final remedial action, USEPA may assess a stipulated penalty against the Army. A stipulated penalty may be assessed in an amount not to exceed \$5,000 for the first week (or part thereof), and \$10,000 for each additional week (or part thereof) for which a failure set forth in this Part occurs.

Upon determining that the Army has failed in a manner set forth above, USEPA shall so notify the Army in writing. If the failure in question is not already subject to dispute resolution at the time such notice is received, the Army shall have fifteen (15) days after receipt of the notice to invoke dispute resolution on the question of whether the failure did in fact occur. The Army shall not be liable for the stipulated penalty assessed by USEPA if the failure is determined, through the dispute resolution process, not to have occurred. No assessment of a stipulated penalty shall be final until the conclusion of dispute resolution procedures related to the assessment of the stipulated penalty.

The annual reports required by CERCLA § 120(e)(5) shall include, with respect to each final assessment of a stipulated penalty against the Army under this Agreement, each of the following:

- (a) The facility responsible for the failure;
- (b) A statement of the facts and circumstances giving rise to the failure;
- (c) A statement of any administrative or other corrective action taken at the relevant facility, or a statement of why such measures were determined to be inappropriate;
- (d) A statement of any additional action taken by or at the facility to prevent recurrence of the same type of failure; and
- (e) The total dollar amount of the stipulated penalty assessed for the particular failure.

Stipulated penalties assessed pursuant to this Part shall be payable to the Hazardous Substances Response Trust Fund only in the manner and to the extent expressly provided for in the Acts authorizing funds for, and appropriations to, the DOD.

In no event shall this Part give rise to a stipulated penalty in excess of the amount set forth in CERCLA § 109.

This Part shall not affect the Army's ability to obtain an extension of a timetable, deadline or schedule pursuant to Part \_\_\_ of this Agreement.

Nothing in this Agreement shall be construed to render any officer or employee of the Army personally liable for the payment of any stipulated penalty assessed pursuant to this Part.

#### XIV. RESERVATION OF RIGHTS AND OTHER CLAIMS

In consideration for the Army's compliance with the provisions of this Agreement, and based on the information known to the Parties on the effective date of this Agreement, the USEPA and the State agree that compliance with this Agreement shall stand in lieu of any administrative, legal and equitable remedies against the Army available to them regarding the currently known release or threatened release of hazardous substances, including hazardous wastes, pollutants, or contaminants at the Site which are the subject to the RI/FS and which will be addressed by the remedial action provided for under this Agreement; except that nothing in this Agreement shall preclude the USEPA or the State from exercising any administrative, legal, and equitable remedies available to them to require additional response actions by the Army in the event that: (1) conditions previously unknown or undetected by USEPA or the State arise or are discovered at the Site; or (2) USEPA or the State receives additional information not previously available concerning the premises which they employed in reaching this Agreement, and the implementation of the requirements of this Agreement are no longer protective of public health and the environment. However, USEPA and

the State shall not exercise such remedies until they have made a good faith effort to remediate any such conditions affecting the public health and environment in the course of this Agreement.

Notwithstanding any provision of this Agreement, the State may obtain judicial review of any final decision of the USEPA on selection of the final remedial action, and may invoke its authority under Sections 121(e)(2) and (f). Nothing in this Agreement shall constitute or be construed as a bar or release from any claim, cause of action, or demand in law or equity by or against any person not a Party hereto for any liability such person may have arising out of or relating in any way to this Agreement or the activities undertaken hereunder. USEPA and the State shall not be held as a Parties to any contract entered into by the Army to implement the activities under this Agreement or by virtue of its entering into this Agreement. This Agreement shall not restrict the Parties from taking any legal or response action or asserting any defense for any matter not specifically covered herein.

Nothing contained in this Agreement shall constitute an admission of any liability by the Army for any matters contained herein nor shall anything in this Agreement constitute an admission by the Army with respect to any finding of fact or any legal determination noted herein.

#### **XV. RECOVERY OF EXPENSES**

Nothing in this Agreement shall be construed as a restriction or waiver of any rights USEPA, the State, or the Army may have against other potentially responsible parties under CERCLA (including, but not limited to, any rights under Sections 108, 122(h) or 122(j)).

#### **XVI. EXEMPTIONS**

The Parties recognize that the President may issue an Executive Order, as needed to protect national security interests, regarding response actions at the Site (or at any other areas therein), pursuant to CERCLA Section 120(j). Such an Executive Order may exempt such area(s) from the requirements of CERCLA for a period of time not to exceed one (1) year after the issuance of the Order. The Army shall obtain access to and perform all actions required by this Agreement within all areas inside the Site, which are not the subject to any such Executive Order issued by the President.

#### **XVII. TERMINATION AND SATISFACTION**

When the Army determines that the work governed by this Agreement has been completed in accordance with the requirements sets forth herein, it shall so advise USEPA in writing that this Agreement is terminated. This Agreement shall thereby be deemed satisfied and terminated unless USEPA gives written notice of disagreement, setting forth the nature of its position including a specific description of what work, document, or other responsibility of the Army has not met the requirements of this Agreement, including the data, information, authority, or other basis therefore.

In the event of a dispute regarding the termination and satisfaction of this Agreement, notwithstanding Section X(D), the Administrator of USEPA, shall submit the dispute to the Director of the Office of Management and Budget pursuant to Executive Order 12088, Section 1-602, and Executive Order 12580, Section 10.

#### **XVIII. FIVE-YEAR REVIEW**

If a remedy is selected for the Site which results in any hazardous substances, pollutants, or contaminants remaining on the Site, the Army agrees that USEPA shall, consistent with Section 121(c) of CERCLA, and in accordance with this Agreement, review the remedial action no less often than each five years after the initiation of such Remedial Action to assure that human health and the environment are being protected by the Remedial Action implemented. If upon such review it is determined by USEPA or the State that additional action or modification of the Remedial Action is appropriate in accordance with Section 104 or 106 of CERCLA, such additional action or modification of the Remedial Action shall be implemented pursuant to the provisions of this Agreement.

#### **XIX. EFFECTIVE DATE**

The effective date of this Agreement shall be the date on which it is published in the Federal Register.

#### **XX. AMENDMENTS**

The Parties may amend this Agreement from time to time. A Party may seek such modification by submitting a concise written request to the signatory on behalf of the other Party. The request shall specify the requested modification and the reason the modification is being requested. In the event of agreement of the Parties, the modification will take effect in accordance with its terms.

**EXECUTED AND AGREED TO:**

## APPENDIX L

# DISASTER ASSISTANCE AND MILITARY CLAIMS PROCESSES

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### I. FEDERAL AID PROCESS

#### A. TYPES OF ASSISTANCE AVAILABLE

Assistance under the Stafford Act depends on a presidential declaration of necessity. The Act establishes two categories of presidential declarations: emergency and major disaster, with corresponding levels of federal assistance.

An *emergency declaration* can be requested by the governor or initiated by the president if the emergency situation is "one for which the primary responsibility rests with the federal government." Federal assistance for emergencies is limited to short-term efforts to protect lives, health, and property, including temporary housing assistance and removal of debris; expenditures are limited to \$5 million. According to the Federal Emergency Management Agency (FEMA), "no long-term or permanent restorative assistance is authorized" under an emergency declaration.

Conversely, a *major disaster declaration* authorizes long-term assistance of various kinds, including long-term housing, disaster unemployment assistance, individual and family grant programs, grants to restore public facilities, community disaster loans, and others, with no overall financial limit. Unlike a declaration of emergency, the president may not initiate a declaration of major disaster; the governor must request it. Procedures for this request are outlined below. However, the Stafford Act defines "major disaster" to include only natural disasters and "any fire, flood or explosion...." Therefore, a chemical accident or incident may not meet the definition of a major disaster unless it is associated with a fire, flood, or explosion. A release stemming from a purely mechanical failure (e.g., a ruptured container) apparently would not fit within the definition.

#### B. PROCEDURE FOR REQUESTING RELIEF ASSISTANCE

FEMA regulations outline the procedure for requesting relief assistance. Procedures for requesting a presidential declaration of emergency are found in 44 CFR 206.35. A request may come from the governor or, for emergencies where the primary responsibility rests with the federal government, from the FEMA regional director, or another federal agency acting through the FEMA regional director. In general, the request must be made within 30 days of the causative event and must include the following:

- Information on the state, local, and federal resources that have been or will be applied to the response effort and the type and extent of aid needed.
- A statement to the effect that the governor has activated the state response plan, but the emergency is beyond the state's capabilities to effectively respond, and federal assistance is needed.

Procedures for requesting a presidential declaration of a major disaster are found in 44 CFR 206.36. A request for a major disaster declaration must come from the governor and should be submitted to the appropriate FEMA regional director. In general, the request must be made within 30 days of the causative event and must include the following:

- A statement to the effect that the governor has activated the state response plan, but the disaster is beyond the state's capability to effectively respond, and federal assistance is needed.
- An estimate of the impact of the disaster on the public and private sector in terms of damage and losses.
- A description of the state and local response efforts.
- An estimate of the nature and amount of federal assistance needed.
- A commitment to fulfill cost sharing requirements under the Act.

When a request is made for a declaration of emergency or major disaster, the FEMA regional director will

acknowledge receipt of the request and forward it to the FEMA associate director along with a regional analysis of the situation. The FEMA director will forward the request to the president, along with a recommendation as to whether it should be granted. FEMA's analysis will be based on the factors listed in 44 CFR 206.37, including the severity of the disaster; threats to public safety; effect on affected individuals, states, and local governments; availability of local resources for response; and actual or expected response efforts under other federal programs. Restorative actions under the Stafford Act may be deferred or limited if it is determined that effective restoration is already being conducted under environmental response programs such as CERCLA or RCRA. Those programs are described below.

It is important to note the implementation of the Individual and Family Grant (IFG) program is not automatic. In the request to the president for a major disaster declaration, or separately, by letter to the regional director within seven days of the declaration, the governor must express the intention to implement this program and include additional information, as described in FEMA Publication No. 207.<sup>1</sup>

### C. COORDINATION OF RELIEF AND ASSISTANCE

After the president declares a major disaster, the FEMA director will appoint a federal coordinating officer (FCO), who will then establish a Disaster Field Office (DFO) in the area for the purpose of coordinating relief efforts. Representatives of federal agencies will coordinate their relief efforts through the State Coordinating Office, appointed by the governor. A FEMA-state agreement is then prepared that identifies the areas eligible for assistance; the division of costs among federal, state, and local governments; and conditions of assistance.<sup>2</sup>

FEMA may also establish disaster application centers (DACs) where individuals can register with, and obtain assistance from, representatives of federal, state, and

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<sup>1</sup> Federal Emergency Management Agency, *Individual and Family Grant Program Handbook*, Draft, FEMA-207, Washington, D.C. (Dec. 1990).

<sup>2</sup> Federal Emergency Management Agency, *Disaster Assistance Programs: A Guide to Federal Aid in Disasters*, DAP 19, Washington D.C. (June 1990).

local relief agencies as well as private and volunteer relief organizations. FEMA may send in mobile teams, as well, if the situation requires.<sup>3</sup>

#### **D. IFG PROGRAM**

##### **1. State Responsibilities**

The state is responsible for the following activities:

- Develop an administrative plan.
- Administer the program, which means to--
  - Verify expenses.
  - Determine eligibility of applications.
  - Resolve appeals.
  - Comply with federal requirements.
  - Disburse payments.
- Coordinate benefits with other agencies to avoid duplication.
- Train staff and make preparations necessary for administering the IFG program.
- Ensure that recipients comply with any conditions accompanying grants.
- Return excess benefits to the federal government.
- Repay advance of the state's share of funds.
- Complete the program within required time.
- Comply with all other applicable requirements and regulations, including the Disaster Relief Act of 1974.

##### **2. Federal or FEMA Responsibilities**

The regional director will generally delegate the program authorities to the disaster recovery manager who is responsible for the following:

- Provide assistance to the state in preparation of the administrative plan.
- Review and approve the administrative plan.
- Monitor and evaluate plan implementation.
- Authorize obligations and drawdowns.
- Process state applications for time extensions.
- Oversee benefits coordination.
- Take applications from disaster victims and follow up.

The FCO is responsible for the following:

- Coordinate all assistance programs, including IFG.
- Establish DACs and ensure adequate staffing.
- Ensure that disaster victims have access to all applicable assistance.
- Open a DFO for centralization and coordination of programs.
- Promote cooperation and problem resolution among agencies.

## II. ARMY CLAIMS PROCESS

The policies, procedures, and responsibilities for investigating, processing, and settling claims against the Army are set forth in Army regulations found in 32 CFR 536, and Army Regulation 27-20. Pursuant thereto, the Commander of the U.S. Army Claims Service (USARCS) is responsible for the administrative settlement of claims. The commander, USARCS, should assist in developing a disaster claims plan for each chemical weapons stockpile facility (AR 27-20, Section 1-7(b)(14)).

This plan should provide for an advance party to assess the need for the presence of a special claims processing office to be established at or near the site of the CAI (AR 27-20, Section 1-8(d)(11)). The plan should designate a location for such a special claims processing office and preappoint a claims judge advocate or claims attorney. Trained personnel should be designated to ensure adequate investigatory, administrative, and

logistics support, including damage assessment (i.e., predesignated independent appraisers and physicians or other medical specialists) and finance and accounting support (AR 27-20, Section 1-8(4)(c)). These special claims processing offices should be established for the investigation of all potential and actual claims arising within their jurisdiction. The plan should set forth procedures for investigating all claims resulting from the CAI, including information on the potential health advisories, contaminant pathways, emergency procedures (i.e., relocation, stock and crop destruction or impoundment, provisions of alternative potable water, etc.), and estimated costs of remediation.

The plan should also contain procedures for notifying the affected population of the process of filing a claim at the special claims processing office, including who may file, who may be eligible for advance payments for immediate hardship, and where to obtain the necessary forms, necessary evidence, and documentation to be included and the statute of limitations on each type of claim. The USARCS is responsible for monitoring and settling all claims. A direct liaison between the special claims processing office and the USARCS should be established (32 CFR 536.5(g)(1)). Regardless of the usual delegation of approval authority<sup>4</sup> set forth in AR 27-20, for a CAI, no claims arising from a CAI should be paid without the concurrence of the commander, USARCS. Therefore, each claim will be investigated by the special claims processing office and forwarded to the USARCS for finalization of any settlement agreement and/or payment, unless the commander, USARCS, has, pursuant to the special disaster plan, predelegated approval authority for specific types of claims (i.e., claims under a specified dollar amount).

Claims following a CAI may arise from the legislation described in the following sections.

**A. The Military Claims Act (10 USC 2733) (32 CFR 536.20-34)**

Claims for death, personal injury or damage, loss or destruction of property caused by an act or omission determined to be negligent, wrongful, or otherwise involving fault of military personnel or civilian employees of the U.S. Department of the Army (DA) acting within the scope of their employment incident to

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<sup>4</sup> Currently, area claims offices are delegated authority to approve and pay, in full or in part, to disapprove and to make final offers on claims for \$15,000 or less. Claims processing offices with approval authority are delegated authority to approve and pay, in full or in part, claims presented for \$5,000 or less, provided that the total value of all claims and potential claims arising from a single incident does not exceed \$25,000.

noncombat activities of the DA, provided such claim is not for personal injury or death of a member of the Armed Forces or a civilian officer or employee whose injury or death is incident to service. Claims are not payable for reimbursement for medical or hospital expenses furnished at the expense of the United States; claims based on a contractual relationship; claims based solely on compassionate grounds; claims for rent, damage, or other payments involving the acquisition, use, possession, or disposition of real property or interest thereby and for the DA; claims found not to be in the best interest of the United States or contrary to public policy; or claims not payable under the Federal Tort Claims Act (FTCA). Claims should be considered under this Act only if the FTCA is not applicable. It is advisable to research local law with regard to the determination of liability and the effect of contributory negligence on claimant's rights to recover damages in the preparation of the plan.

- B. Federal Tort Claims Act (28 USC 2671-2680), as amended by the Act of 18 July 1966, P.L. 93-253, March 16, 1974, and P.L. 97-124, December 29, 1981, and as implemented by the Attorney General's Regulations (28 CFR 14.1-14.11) (32 CFR 536.50)

Claims for death, personal injury, or damage to or loss of property (real or personal) caused by the action of military personnel or civilian employees of the DA or U.S. Department of Defense (DOD) within the line of military duty. Joint venture situations are likely to occur when the military personnel or civilian employees of the DA or DOD are performing federally assigned duties but are under actual direction and control of a nonfederal entity (i.e., the state emergency response team); therefore, local law concerning the principles of *respondeat superior* should be researched to determine if the actions taken in the line of military duty were within the Act's definition of scope of employment. Examples of claims that are not payable are those:

- Based on an act or omission of an federal employee, exercising due care, in the execution of a statute or regulation (whether or not such statute or regulation is value), where no negligence is shown and the only ground for the claim is the contention that the same conduct by a private individual would be tortious;
- Based on the exercise or performance or the failure to exercise or perform a discretionary function or duty on the part of DA or DOD or an

employee of DA or DOD, whether or not the discretion involved was abused;

- For damage caused by the imposition or establishment of a quarantine by the United States;
- Arising out of an assault or battery;
- Based on false imprisonment or false arrest;
- Arising out of interference with contract rights;
- Based on the personal injury or death of a member of the Armed Forces incurred incident to service, or for damage to a member's property incurred incident to service;
- Based on the taking of property, as by technical trespass, or of a type contemplated by the Fifth Amendment or otherwise (see the Tucker Act for takings without compensation), Civil Defense Act negligence;
- Arising by virtue either of U.S. ownership of an inherently dangerous commodity or of engaging in extrahazardous activity; or
- For damage to property or for any death or personal injury arising out of the provisions of the Federal Disaster Relief Act of 1954. (The Act requires the local beneficiary to hold the government harmless and to assume the defense of all claims arising from the removal or debris and wreckage from public and private property.)

A claim filed under this Act may have to be brought to the attention of the assistant attorney general in charge of the Civil Division in accordance with Department of Justice regulations if payments thereunder would exceed \$100,000, or related claims in excess of \$100,000 would be compromised, or if, in the opinion of the Secretary of Defense, the claim presents a new precedent or point of law or is a point of policy (28 CFR 14.6, Appendix to Part 14, Delegation of Settlement Authority - Secretary of Defense). Claims requiring such consultation will be forwarded to the commander, U.S. Army Claims Service (USARCS).

- C. **Claims Involving Government Vehicles and Property Not Cognizable under Other Law (76 Stat. 767, 10 USC 2737) (32 CFR 536, Subpart D)**

Claims, limited to \$1,000, for damage or loss of property, or for personal injury or death caused by military personnel or civilian employees of the DA or by civilian employees of the DOD incident to the use of a U.S. vehicle at any location or incident to the use of other U.S. property on a government installation. Claims may be made even when employee was not acting within the scope of employment. Settlement is the responsibility of the commander, USARCS, or the designated senior JA.

- D. Claims Arising from Activities of the Army National Guard (32 USC 715, the National Guard Claims Act) (32 CFR 536, Subpart C)**

Claims for death, personal injury or damage, loss or destruction of property caused by noncombat activities of members or employees of the ARNG, except when engaged in duties at the call of the governor of a state maintaining the unit (such claims should be returned or referred to the authorities of the state). The commander, USARCS, should develop a plan to set forth procedures to ensure that local authorities, the Army, and the ARNG do not issue conflicting instructions for processing claims, and to reach a mutual arrangement for disposition of such claims, in accordance with the governing local and federal law.

- E. Claims under Article 139, Uniform Code of Military Justice (10 USC 939) (32 CFR 536.40)**

Claims for property willfully damaged, destroyed, or wrongfully taken by members of the Armed Forces. Willful damage is damage inflicted intentionally, knowingly, and purposefully without justifiable excuse, as distinguished from damage caused inadvertently or thoughtlessly through simple or gross negligence. Wrongful taking is any unauthorized taking or withholding of property, not involving the breach of a fiduciary or contractual relationship, with the intent of temporarily or permanently depriving the owner or person lawfully in possession of the property. The commander, USARCS, is responsible for publicizing the Article 139 program and maintaining a log of Article 139 claims. Claims hereunder are to be determined by a special court-martial convening authority, and the payment is taken from the soldiers' pay.

- F. Tucker Act (28 USC 1491 et seq.)**

Claims founded upon the Constitution (i.e., taking of property without compensation) or for liquidated or unliquidated damages in cases not sounding in tort.

These claims are filed in the U.S. Claims Court or in a U.S. District Court of competent jurisdiction. The jurisdiction of the Claims Court founded upon express or implied-in-fact contract may occasionally be used for a case excluded from recovery under the FTCA. Although these claims are not processed under AR 27-20, the plan developed by the commander, USARCS, should include procedures for informing the affected population of claims that may be payable under this Act.

**G. Claims by Local Governments**

Local governments are not barred from claiming against the Army, except for the activities of its own ARNG called out by the state governor. Hospital, physicians, and ambulance services furnished in emergencies to service members may be payable under AR 40-3, Chapter 15. Claims for local fire department services provided on-cost may be processed on a small purchase basis under procurement procedures. Claims for fire suppression costs (costs of extinguishing fires off-post caused by Army activities) should be processed in accordance with 15 USC 2210. Such costs are not considered to be money damages under the FTCA.

**H. Claims for Real Estate**

Claims for damage to real property and incidental personal property damage during noncombat activities of the Army are payable under either AR 405-15 or Claims Cognizable under the Military Claims Act. Claims payable under AR 405-15, Chapters 3, 5, and 10, must be founded upon tort. Claims arising during civil emergencies normally should be processed under AR 405-15, and the plan developed by the commander, USARCS, should include adequate funding provisions. (See 50 USC 2296 for real property acquired during an emergency, as defined by the Federal Civil Defense Act.)

**I. Claims Due to Contractor Operations**

If a contractor (i.e., an emergency provider) does not dispose of the claim within a reasonable time, it should be determined whether the Army is legally liable to the third party. This liability may occur if the Army had sufficient control over the contractor's operations that could cause such damage. If it is determined after a claim investigation that the Army could be liable, a request should be made of the contracting officer to withhold funds due to the contractor until the special claims processing investigation is complete and the matter has closed.

APPENDIX L IS CURRENTLY (JULY 1994) UNDER REVIEW BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY AND IS NOT YET FINALIZED.

## PLANNING STANDARDS FOR EVACUEE SUPPORT

Evacuee support involves all activities designed to process and accommodate evacuees from both on-post and off-post areas. There are two primary components of an evacuee support system: reception and mass care. The number of evacuees involved and the availability of adequate facilities will determine which of the following approaches will be used in developing an effective evacuee support system. The first approach requires both on- and off-post evacuees to report to a reception center located directly along an evacuation route, go through medical screening, register, have their needs assessed, and be referred to a mass care facility that is located some distance from the reception center. The second approach is identical, except that the reception area and mass care facility are collocated. This approach may be appropriate if a relatively small number of evacuees is involved, particularly if all evacuees can be accommodated at a single mass care facility.

Both short-term and long-term evacuee support mechanisms must be addressed in the planning phase of the operation. Short-term care applies to those needs (e.g., food, water, shelter, medical care, etc.) that must be met immediately after a chemical accident. Long-term evacuee support mechanisms involve providing adequate housing and basic necessities (clothing, food, shelter, etc.) to evacuees who are unable to return to their residences for an extended period of time. During the planning phase, all aspects of short-term evacuee support must be addressed; agreements must be formalized, and all pertinent resources must be identified and made available for emergency use. Planning for long-term support will probably be considerably less detailed because such support is more unlikely to be required, the degree of support needed could vary widely, and adequate time will be available for finalizing long-term support arrangements at the time of the emergency. During the planning phase, the jurisdiction should inventory available long-term support resources for evacuee support. The Department of the Army may rely on the Corps of Engineers to relocate installation residents.

Planning for a successful evacuee support program requires a high degree of interagency cooperation. Local and national chapters of the American Red Cross (ARC), other support organizations, and the Army installation should participate in planning for aspects of the evacuee support program that they will be involved in implementing. Interagency cooperation is especially appropriate in choosing facilities for reception and mass care centers, ensuring the

availability of all necessary resources, and establishing staffing needs and providing qualified personnel. Participation of the ARC is particularly important because of the high level of expertise and capability this agency has developed in its long history of assisting people affected by emergencies. The ARC and Federal Emergency Management Agency (FEMA) have executed formal agreements at the federal level assigning the ARC responsibility for operating mass care centers during natural and technological disasters. Evacuee support planning for Chemical Stockpile Emergency Preparedness Program (CSEPP) should include determining what arrangements have been made for implementing these national agreements at the state and local level.

Interjurisdictional cooperation in evacuee support planning is imperative. Evacuee support activities will almost certainly involve resources and personnel from multiple jurisdictions, including the Army installation. The planning effort must identify the responsibilities of each affected jurisdiction and establish mechanisms for coordinating the employment of all resources and personnel during an emergency. The plans should incorporate appropriate mutual aid agreements. The necessary coordination can probably be achieved most effectively if the state leads the local jurisdictions in preparing a comprehensive evacuee support plan for the entire emergency planning zone (EPZ). In some cases, coordination of the plans of two states may also be necessary.

The following standards incorporate some provisions found in three FEMA publications: *Sheltering and Care Operations* (CPG 2-8), *Life Support Operations in Shelters* (CPG 2-20), and *Habitability and Human Problems in Shelters* (CPG 2-21). An overview of the ARC mass care program can be found in *Mass Care—Preparedness and Operations* (ARC 3031). Additional information pertaining to animal care and protection during a disaster may be found in *Emergency Animal Relief and Disaster Planning: Operational Guide for Animal Care and Control Agencies* by the American Humane Society.

## STANDARDS

Each jurisdiction will incorporate provisions for evacuee support into the hazard-specific appendix of its emergency operations plan. These provisions will

1. Identify the official and at least one alternate official authorized to coordinate all of the evacuee support activities, including coordination with Army installation officials to

accommodate potential evacuees from the installation. This official should be assigned to the jurisdiction's emergency operating center (EOC) during an emergency.

2. Describe the equipment to be used and procedures to be followed in two-way communications between the EOC and each evacuee support facility (reception center and mass care center).
3. Specify what evacuee support services will be provided and identify the agency responsible for providing each. Written and signed agreements are required for all services to be provided by agencies, private organizations, or individuals that are not a part of the jurisdiction's governmental structure.
4. Identify facilities that will serve as reception centers in the event of a chemical agent release. A reception center should be located along each major evacuation route leading out of the immediate response zone (IRZ). Each reception center should be
  - a. located outside the PAZ;
  - b. directly accessible from the evacuation route it serves;
  - c. capable of providing sufficient parking and storage areas (so as not to slow or backup traffic on the evacuation routes);
  - d. capable of expeditiously processing the population using the designated major evacuation route on which the reception center is located; and
  - e. clearly depicted on maps provided through the public education program and maps distributed by traffic control personnel.
5. Assign responsibility and identify resources for providing the following services at reception centers:
  - a. medical screening and treatment, incorporating procedures and protocols described in *General Guidelines for Medically Screening Mixed Population Groups Potentially Exposed to Nerve or Vesicant Agents* (Watson, et al. 1992), and including
    - (1) medical screening of all evacuees arriving at the reception center,
    - (2) emergency or other first-aid medical treatment of evacuees who require it,
    - (3) documentation, for each evacuee, of the results of medical screening and all treatment administered, and

- (4) emergency transportation to hospitals for evacuees requiring medical treatment beyond the capabilities of the reception center;
  - b. registration of each evacuee, including, at a minimum,
    - (1) name,
    - (2) address, and
    - (3) family members' names;
  - c. assessment of the needs of each evacuee, including needs for
    - (1) medical treatment (physical and emotional),
    - (2) housing,
    - (3) family reunification, and
    - (4) transportation to appropriate support facilities as needed;
  - d. assignment of evacuees to mass care centers or other facilities that can meet their critical needs.
  
6. Identify at least two facilities, located in contrasting directions from the Army installation, that will be used as mass care centers in the event of a chemical agent release. The total capacity of all mass care centers must equal between 15% and 30% of the population of the entire IRZ plus the most highly populated quarter of the protective action zone (PAZ). The capacity, within this range, to use for planning purposes should be determined based on the findings of "Toward an Explanation of Mass Care Shelter Use in Evacuations" (Mileti, et al. 1991). (This study concludes that the age and socio-economic status of evacuees are the primary determinants of shelter use. A shelter use rate of approximately 15% is likely to be appropriate if the age and income characteristics of the evacuating population resemble those of the general population. Higher shelter use rates are appropriate if the evacuees are older or poorer than the general population.) Each mass care center should
  - a. be located outside the IRZ and, where possible, outside the PAZ, and not situated in low-lying areas where an agent plume may accumulate;
  - b. be located within easy access of evacuation routes;
  - c. be capable of handling between 15% and 30% of the population of the area served by the evacuation routes leading to the center. The findings of Mileti, et al. (1991) should be used to determine the capacity, within this range, to use for planning purposes;
  - d. provide the following

- (1) at least 40 square feet of sleeping space for each individual in the shelter,
  - (2) a constant temperature between 60° F (15.6° C) and 80° F (26.7° C),
  - (3) adequate parking for all evacuee vehicles;
- e. provide separate areas adequately sized and equipped to provide the entire mass care center population with the following services
- (1) administration,
  - (2) food and water storage,
  - (3) food preparation,
  - (4) medical care (including mental health),
  - (5) sanitation facilities,
  - (6) living/sleeping areas, and
  - (7) decontamination of any mass care center residents whose contamination may have escaped detection at the reception center;
- f. be clearly identified on maps provided in the public education program and maps distributed by traffic control personnel.
7. Assign responsibility for and identify all resources required to ensure that all mass care facilities are capable of providing the following services. (Written agreements are required for all services to be provided by agencies, organizations, or individuals that are not part of the jurisdiction's governmental structure.)
- a. water
- (1) arrangements (e.g., written agreements) must be in-place to ensure the provision of a safe and adequate supply of water for each mass care facility,
  - (2) water should meet all applicable drinking water standards and should be adequate to provide at least 5 gallons of water per person per day for the population of the mass care centers;
- b. food
- (1) written agreements must be executed to ensure the provision of a safe and adequate supply of food (including baby food and formula) for evacuees during their stay in the mass care center,
  - (2) the supply of food should be adequate to provide 2500 calories per person per day of nutritionally balanced food for the entire population of the mass care centers,
  - (3) the food supply should allow for special diets (e.g., soft foods, vegetarians, low salt or cholesterol, etc.), and

- (4) all needed cooking equipment and eating and drinking utensils for both adults and infants must be provided;
- c. sanitary facilities
- (1) facilities should be provided for washing, bathing, toileting, diaper disposal, general cleaning (e.g., washing dishes), and for the collecting and disposing of waste and refuse,
  - (2) sanitation facilities must be capable of handling the maximum number of evacuees each mass care center will support,
  - (3) a minimum of one toilet should be provided for every 40 occupants of shelter capacity,
  - (4) chemical or other portable toilets, not dependent on the normal water supply, should be available on the basis of one toilet for every 50 shelter occupants, and
  - (5) an adequate supply of diapers should be available for all infants housed at the shelter;
- d. prior arrangements should be made with local Goodwill, Salvation Army, or similar organizations to obtain clean, used clothing in a wide variety of sizes;
- e. medical services
- (1) each mass care center must provide space for medical screening and treatment,
  - (2) each mass care center must be capable of providing emergency medical care including documentation of all medical actions taken,
  - (3) medical care providers in the mass care center must be familiar with procedures for obtaining transportation to a hospital for any shelter occupants who require medical treatment that cannot be provided at the mass care center, and
  - (4) mass care center staff must be knowledgeable of the symptoms of chemical agent poisoning, and at least two staff members must be on duty at all times in each shelter who have been trained in procedures for
    - effectively treating and assisting the contaminated individual and
    - decontaminating the environment with which the individual was in contact;
- f. social services
- (1) qualified personnel should provide individual and family counseling to shelter evacuees,
  - (2) children's recreational activities should be provided, and
  - (3) communication between evacuees and family members residing in unaffected areas should be facilitated by providing an adequate number of telephones to be used for both incoming and outgoing communications;

- g. provide adequate law enforcement and protection for each mass care center;
  - h. provide adequate fire protection for each mass care center;
  - i. management
    - (1) provide adequate space for a shelter manager and associated staff to function 24 hours per day, including separate stations for receiving evacuees, checking decontamination certification, and registering evacuees,
    - (2) provide a public information officer who, in coordination with the joint information center, will provide updated information, at least once per day, to each mass care center population on the status and scope of the chemical emergency and response efforts, and
    - (3) develop an accurate record keeping system to track evacuees, assist in locating missing persons and assist in the reunification of family members who become separated during the evacuation period.
8. Identify the official(s) authorized to order the activation of evacuee support facilities and describe the procedures to be followed to bring the facilities to operational status in a timely fashion, including
- a. assign responsibility for and identify the procedures to be followed for the timely call-up of personnel who will staff evacuee support facilities;
  - b. identify the agencies responsible for
    - (1) removing unneeded items from each facility,
    - (2) transporting needed equipment and supplies to each facility, setting it up, and
    - (3) posting signs to direct evacuation traffic to the support facilities and to clearly identify each facility.
9. Identify the procedures to be followed for expanding the evacuee support services if warranted by the situation. Procedures should address methods to obtain
- a. increased shelter capacity (e.g., opening additional mass care centers);
  - b. additional support staff as needed;
  - c. additional supplies (e.g., food, water, clothing).
10. Address the provision of temporary housing and relocation services in the event that evacuees are displaced from their homes for an extended period. The plan should

- a. identify the agency(ies) responsible for providing relocation services;
  - b. identify resources (e.g., hotels, motels, apartment complexes, trailer parks) that could potentially provide temporary housing furnished with basic life necessities (e.g., beds, bed linens, towels, dishes, cookware, food, and water). (Food and water may be supplied by rations obtained from mass care centers.)
11. Describe arrangements, consistent with protective action response plans developed under Appendix E, for handling companion animals brought by evacuees. (Handling of companion animals should not interfere with or delay reception and treatment of human evacuees.) These arrangements should be developed with the involvement of local chapters of humane societies, veterinary associations, and similar organizations and should include identification of
- a. local animal care facilities and personnel (e.g., veterinary offices, humane shelters) that agree to provide shelter and shelter services for evacuated animals, including:
    - (1) treatment of injuries, illness, or other chronic conditions,
    - (2) administration of antidotal treatment, or
    - (3) euthanasia of severely injured animals (to be performed only by qualified personnel with a witness present to confirm the necessity of euthanasia);
  - b. staff responsible for and the procedures to be followed in taking custody of the animals from their owners at reception centers, tagging the animals with the owner's name and address, decontaminating them (if necessary), placing them in a holding area separated from human evacuees, and if necessary, transporting them to a designated sheltering facility;
  - c. sources of food and water, and any other resources required to sustain the animals while they are sheltered.
12. Identify evacuee support issues to be addressed by public education and information materials, including, but not limited to, the following:
- a. locations of evacuation routes, reception centers and mass care facilities;
  - b. procedures to be followed if personal contamination occurs (i.e., what to do, where to go for assistance) (see Appendix L);
  - c. services that will be provided to evacuees;

- d. items that evacuees should take with them during evacuation (e.g., medicines, toilet kits, clothes, etc.);
- e. procedures to be used to protect and evacuate day care and school children, including:
  - (1) where the children will be taken,
  - (2) who will care for the children, and
  - (3) the procedures for reunifying parents with their children;
- f. methods of communication to be used to locate evacuees, including:
  - (1) the process to be followed by local non-evacuees to determine the whereabouts of family members,
  - (2) the process to be followed by evacuees to determine the whereabouts of family members, and
  - (3) the process to be used by family members outside the emergency area to determine the whereabouts of evacuated family members.

## REFERENCES

- Mileti, D. S., Sorensen, J. H., and O'Brien, P. W. 1991. "Toward an Explanation of Mass Care Shelter Use in Evacuations," unpublished draft. Dennis S. Mileti, Hazards Assessment Laboratory, Colorado State University, Ft. Collins, Co.; John H. Sorensen, Oak Ridge National Laboratory, Oak Ridge, Tenn.
- Watson, A. P., Sidell, F. R., Leffingwell, S. S., and Munro, N. B. 1992. *General Guidelines for Medically Screening Mixed Population Groups Potentially Exposed to Nerve or Vesicant Agents*, ORNL/TM-12034, Oak Ridge National Laboratory, Oak Ridge, Tenn.

# APPENDIX N

## PLANNING STANDARDS FOR PUBLIC EDUCATION AND INFORMATION

### INTRODUCTION

#### Purpose

The purpose of this document is to provide a rationale and standards to guide local, State and Department of the Army public affairs and information officers in the implementation of the Public Information and Education elements of the Chemical Stockpile Emergency Preparedness Program (CSEPP).

In two sections, Pre-Emergency Public Education and Emergency Public Information, operational concepts are presented (the rationale), which are followed by standards.

Staff from the Federal Emergency Management Agency will utilize this document and other guidance from FEMA and the Department of the Army, as a basis for evaluating the adequacy and effectiveness of Pre-Emergency Public Education and Emergency Public Information programs developed to deal with potential or actual chemical agent emergencies.

#### Preamble

An aggressive public education and information campaign is an essential ingredient of an effective emergency preparedness program. The pre-emergency public education program raises public awareness of the hazards associated with the chemical agent stockpile and advises citizens of actions they can take, both before and during an emergency, to reduce risks to themselves and their property. Public education also informs individuals of the progress of Chemical Stockpile and Chemical Demilitarization activities as they relate to emergency preparedness. The emergency public information program identifies the information that will need to be communicated to the public in the event of a chemical agent release and a strategy for disseminating this information rapidly.

Both pre-emergency public education and emergency information must dovetail with and support other elements of a community's emergency preparedness program. Decisions made

throughout the program and incorporated into the emergency operations plan and other documents will influence the information needed by the public as well as the way the information should be communicated. The design of the protective action decision system and the alert and notification system, for example, will directly affect the recommendations and instructions to be included in the public education and information materials as well as the dissemination strategy.

It is important to recognize that the CSEPP public education and information programs are fundamentally different from typical public affairs and public information efforts. The primary goal of the emergency programs is to promote public actions that will reduce casualties in the event of a chemical release. (An important secondary goal of the CSEPP public information/education programs is to support other efforts to enhance the public's understanding of the Chemical Stockpile and Chemical Demilitarization programs and maintain or develop public confidence in the Government's ability to protect public health and safety.) Other public information activities (e.g., cultivating a positive image for the program) are appropriate only insofar as they contribute to that goal. Recognition of this distinction is particularly important since it is likely that many jurisdictions<sup>1</sup> will assign responsibility for the emergency public education and information functions to their public affairs officials.

Selection of qualified Public Affairs or Public Information Officers (PIOs) is critical to the development and implementation of a successful CSEPP public education and emergency information program. A list of public relations/information skills and experience levels follows. The list may be used to assist in the identification and hiring of qualified individuals is provided as Attachment 1 for your consideration. Use of this attachment is not mandatory.

## PRE-EMERGENCY PUBLIC EDUCATION

In addition to the quality of a community's emergency preparedness system, successful response to a chemical agent emergency ultimately depends on individual citizens' taking appropriate actions to protect themselves. Under some accident scenarios, the time available to implement protective actions would be quite limited for people near the source of the chemical agent emergency. For these adjacent populations, evacuation, the most common and (possibly) most

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<sup>1</sup>The term "jurisdiction(s)" used throughout this document is intended to refer to cities, counties, States, and Army installations participating in the Chemical Stockpile Emergency Preparedness Program (CSEPP).

natural defensive action, would not be prudent under some conditions. Individuals can protect themselves, then, only if they understand what protective actions will be most effective and have the knowledge and motivation to implement those actions quickly. Consequently, pre-emergency public education is a necessary component of an effective emergency preparedness program.

The fundamental goal of emergency preparedness is to minimize casualties in the event of an emergency. The pre-emergency public education program supports this goal through two principal objectives: (1) to encourage people to take appropriate pre-emergency protective measures, and (2) to promote quick and appropriate response during an emergency by informing the public about the emergency warning process and the procedures for implementing appropriate protective actions.

The effort to ensure that all people living, working, or traveling through a community at the time of a chemical agent emergency have access to the information they need to protect themselves is a complex and ambitious undertaking. This effort requires the development and use of strategies similar to those employed in other public awareness programs. Program personnel responsible for public information must divide the community into target audiences based on the type of information required and on the audience's need for information to be presented in particular ways. CSEPP PIOs must then develop public education strategies according to exactly what information will be presented to each audience and what methods of presentation will be most effective in communicating that information to them. Finally, PIOs must design and disseminate the public education materials (brochures, television and radio spots, newspaper ads, public presentations, etc.). Furthermore, since research indicates that repetition is an important ingredient in emergency public education efforts, the entire process must be repeated periodically.

Consideration must be given to significant program dates and milestones. Certain events at the installation and in the community should be anticipated. Examples include the installation of sirens in the community, ground-breaking ceremonies for new buildings or the demilitarization plant, public scoping meetings, hazardous materials accidents in other locations, etc. Public education activities should be planned and executed to meet the community's need for information which such events will create. Coordination should occur, as appropriate, with the Army Installation and Public Affairs Office, Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Maryland.

## Operational Concepts

### Identification of Target Groups

The identification of target audiences is a crucial step in developing an effective public education program. Information needs and communication methods cannot be selected with confidence until decision makers have considered critical characteristics of the affected public. Two types of characteristics are important in identifying target audiences: (1) characteristics which indicate special needs regarding the ways in which information is presented, and (2) characteristics indicating a need for specific types of information.

People who require that general public education information be presented in specific ways include those with perceptual difficulties as well as transients and visitors to the area who would not be exposed to information provided through normal channels. Groups to be considered include the hearing-impaired, visually-impaired, mentally handicapped, non-English-speaking, as well as migrant workers, tourists, and visiting travelers.

Different segments of the community will need different types of information to guide their response to an emergency. For example, different responses may be appropriate for people in different emergency planning zones; people who are physically handicapped will often need special information about the protective actions they should take and how to implement them, and some people may require instructions on actions they should take that go beyond personal protection. An effective public education program will recognize varying information needs within the community and try to provide appropriate information for all groups.

### Identification of Information To Be Presented

The specific types of information to be communicated to each target audience should be identified, preferably with the involvement of representatives of the target audience. Information needs that are common to all audiences can be addressed in general public education materials, and special materials or presentations can be developed to meet the specific needs of some groups.

Three basic types of information may be included in the public education program: (1) general educational information, (2) general public information, and (3) protective action instructions.

Clearly the most important information is that which informs recipients how to protect themselves from a release of chemical agent. Protective action instructions should address both actions that can be taken before a chemical agent emergency occurs and actions that should be taken upon receipt of an emergency warning. Instructions for actions to be taken during an emergency must be compatible with messages prepared for dissemination at that time (see Emergency Public Information). General educational information should be provided to inform the public of the nature of the hazard posed by the chemical stockpile and disposal program. General public information, explaining the role of the emergency management agency and the on-going emergency preparedness capabilities and safety measures in place at the stockpile and demilitarization site, must be included to increase the credibility of the emergency information materials, foster confidence in the storage and demilitarization processes and encourage the public to implement appropriate protective actions when required.

#### Identification of Media

A variety of methods are available to communicate emergency information to the identified target groups, including electronic media, print media, special purpose publications, specialized media, and community outreach programs. In selecting the media to be used to reach each target audience, program planners should consider (1) the information to be communicated to that audience, and (2) any characteristics of the audience that may indicate that particular media are likely to be more effective in reaching them. If possible, selection of media should be made in consultation with representatives of the target audience involved. It is desirable to use more than one media type for each target audience because different media reinforce each other, increasing both the credibility and memorability of the emergency information.

Special purpose publications (e.g., pamphlets) will likely play an important role in most pre-emergency public education efforts. Such publications offer an opportunity to provide detailed information focusing specifically on emergency preparedness related to the chemical agent stockpile. Program planners should consider the possibility of using more than one such publication for each target audience. It may be advisable, for instance, to devote one pamphlet to protective action instructions and to provide one or more additional publications containing background information on the nature of the chemical agent hazard and the emergency preparedness program.

## Format and Style Considerations

While a few standards are appropriate regarding the format and style of pre-emergency education materials, these issues are largely subjective and judgmental in nature. In general, questions regarding format and style can be decided by applying two principles that are fundamental to an effective education program. First, the primary goal of the pre-emergency public education program is to increase the likelihood that individuals will take appropriate actions to protect themselves from a release of chemical agent. Consequently, protective action instructions must occupy the central point in the program. Other types of information, such as descriptions of the nature of the threat and material about the emergency preparedness program, must be subordinate to and must support the single principal purpose of promoting the timely implementation of protective actions by the public.

The second principle that should guide decisions on format and style is that all materials must be effective in communicating their information to the public. Each element of the public education program should be carefully designed to present information that is clear, specific, accurate, consistent, and conveyed with certainty. The chemical agent stockpile hazard, and the associated emergency response program, are inherently complex, and care must be taken to avoid apparent inconsistencies in the descriptions of these programs. In addition, all materials should match the comprehension level of their respective target audiences. This requirement presents a considerable challenge, since it often means that very complex issues must be described in simple terms. Ideally, the educational/comprehension level of each audience should be determined through research, polling of state and local organizations, or analysis of census data. Since these techniques often involve skills not readily available at the local, state or installation level, assistance in securing such data may be available via technical assistance from the CSEPP Public Affairs staff at the Federal Emergency Management Agency. In the absence of such an audience analysis, some experts suggest that public education materials should be designed for a grade 7 through 9 reading level. An alternative strategy would be to develop public information materials that are tiered to reach a variety of reading levels.

## Standards

- 1 Each jurisdiction will provide a coordinated, periodic (at least annual) dissemination of information to the public telling them how they will be notified in the event of a chemical agent emergency and what actions they should take to protect themselves.

(See Attachment 2 for additional guidance on public affairs activities related to public alert and notification systems.)

- 2 Each jurisdiction shall prepare a description of the methods used to systematically identify all relevant target audiences for the pre-emergency public education effort.
- 3 Target audiences to be considered for inclusion in the pre-emergency public education program include, but are not necessarily limited to, the following:
  - a. People who live or work in different segments of the Emergency Planning Zones (EPZs)
  - b. People with movement impairments (physically handicapped, elderly, and life-support-hindered)
  - c. People with sensory impairments (hearing and visually-impaired)
  - d. People with mental or emotional impairments (retarded, emotionally disturbed, senile, acute alcoholic/drug-abuse cases)
  - e. Non-English-speaking people
  - f. Illiterate people
  - g. Farmers and stockmen
  - h. Managers of food-processing facilities
  - i. Transients
  - j. Recreational visitors
  - k. Migrant workers
  - l. Different age groups
  - m. Groups with specific ethnic or cultural characteristics that require special sensitivities
  - n. Elected officials at the local, state, and federal levels.
  - o. Institutionalized persons (i.e., prison inmates)
  - p. School children and staff
- 4 Whenever possible, target audiences or their representatives should be involved in determining the information that they need and the media that are appropriate for communicating with them. Where feasible, professionally-conducted focus group discussion should be used to elicit such information. Assistance may be available from state offices or from the CSEPP Public Affairs staff at FEMA.

- 5 Specific information that should be communicated to all people in the Immediate Response Zone (IRZ) and Protective Action Zone (PAZ) includes
- a. A clear statement of the purpose of each publication or presentation.
  - b. A clear discussion of notification methods and emergency action levels, including how the notification will be made. The materials should indicate what the recipient should expect to hear or see and in what order. The recipient should also be told where to turn for additional instruction during an emergency, including any radio or television stations participating in the Emergency Broadcast System.
  - c. Instructions on implementation of protective actions, telling the recipient what actions, in order of priority, should be taken in response to an emergency notification. Publications containing this information should include a highly visible statement advising the recipient to save the document for use during an emergency. All materials and information developed and disseminated must be in compliance with protective action guidance developed for this program (see Appendix E).
    - (1) Where in-place sheltering has been identified as a possible protective action, the materials should inform recipients of what actions they should take to achieve the protection offered by this option (e.g., closing and sealing doors and windows, turning off ventilation systems).
    - (2) Where evacuation has been identified as a possible protective action, evacuation routes and the location of reception centers and shelters should be indicated, using both maps and written directions. Information should also be included regarding critical items that should be taken when evacuating.
    - (3) Where the use of personal protective gear has been identified as a part of a possible protective action strategy, the materials should inform the recipient how to use and maintain the equipment. Materials for dissemination to the public must be developed in accordance with relevant guidance documents.
  - d. Descriptions of any pre-emergency steps that recipients can take to increase the effectiveness of protective actions or to minimize the time required to implement them (e.g., development of a household emergency plan; pre-positioning materials for sealing a room; pre-packing an evacuation supply kit).
  - e. Provision for the recipient to notify emergency planners of special needs. Such provision could consist of a pre-paid, tear-off postcard or, in the case of booklet-type publications, a bound/stapled pre-paid card.

- f. An emergency assistance phone number and instructions on its use. (This point depends on whether the local emergency plan calls for an emergency phone number or makes other provisions.) 'Hotline' numbers for use during emergencies should be distinguished from information numbers to be used during non-emergency times. At least one Telecommunications Device for the Deaf (TDD) should be installed by the jurisdiction at this point to permit hearing-impaired people with such devices to communicate with the jurisdiction.
  - g. Description of plans for transporting students in public and private schools and people without access to private transportation.
  - h. Some blank space in the emergency procedures section for personal notes.
  - i. Date of issue and name of issuing agency.
  - j. Explanations of the significance and effectiveness of emergency procedures and protective actions. This is particularly important in instructions relative to school children and personal property.
  - k. Educational information on the sources and health effects of chemical agents, including the nature of the hazard, the range of possible accidents, possible consequences of accidents, the risk of accidents, and the geographic distribution of the threat.
- 6 "Promotional material", including letters and quotes from political, agency, or Army officials, may be included if they contribute to the credibility of the message or the organization.
- 7 Each jurisdiction must be prepared to demonstrate that its public information program has given consideration to the use of a variety of methods of communicating with the public, which may include but not necessarily be limited to
- a. Electronic Media (Radio and TV)
    - (1) News or public affairs programs
    - (2) Public service announcements
    - (3) Video news releases
    - (4) TV specials
  - b. Visual Media
    - (1) Films/videos
    - (2) Slide shows

- c. Aural Media
  - (1) Recordings
- d. Print Media
  - (1) Ads
  - (2) Feature stories
- e. Special Publications
  - (1) Pamphlets
  - (2) Comic Books
  - (3) Instructional Books
  - (4) Flyers
  - (5) Phone book inserts
  - (6) Newsletters
- f. Specialized Media
  - (1) Signs, bulletin boards in parks, highway rest areas, and other public places
  - (2) Stickers
  - (3) Magnets
  - (4) Calendars
  - (5) Phone book covers
- g. Community Outreach

*NOTE: Community relations standards are being developed and will be added.*  
*Until such standards are adopted and disseminated, community outreach to each of the target audiences should include the following types of activities.*
- h. Community meetings
  - (1) Presentations at civic meetings, business and professional group meetings, and other assemblies (including medical society meetings, public and private school staff and students)
  - (2) Door-to-door canvassing
  - (3) Information center
  - (4) Displays in public buildings, (e.g., city hall, hospitals, schools)
  - (5) Hotlines
  - (6) Agricultural Extension Service (USDA)
  - (7) For school children:
    - infield trips and/or Depot Visitor Center orientations
    - incorporation of educational materials, or additions to science class syllabus for grades 6 through 12.

- 8 Signs or other measures (e.g., decals, posted notices, or other items, placed in hotels, motels, gasoline stations, highway rest areas, parks, recreation areas, docks and boat ramps, and phone booths) shall be used to disseminate to any transient population within the EPZ appropriate information that would be helpful if an emergency or accident occurred. Such notices should refer the transient to the telephone directory or to other sources of local emergency information and guide the visitor to appropriate radio/television frequencies.
- 9 Each jurisdiction shall conduct coordinated programs at least annually to acquaint news media with emergency plans, information concerning chemical agents and the disposal program, and points of contact for release of public information. In addition, procedures will be developed to ensure that local news media will be notified of significant emergency preparedness activities (e.g., training activities and exercises) or significant changes in the local CSEPP.
- 10 The purpose of each publication or presentation should be clearly stated. If the publication or presentation is not intended to present protective action instructions, it should refer the recipient to other items that do contain such information.
- 11 For publications containing emergency response instructions,
  - a. Emergency information should be positioned in a prominent place in the front of the document.
  - b. Background educational information, if included, should be placed after the emergency information. Many organizations put the bulk of educational information in a separate document to ensure the effectiveness of the emergency message.
  - c. Public relations passages, including letters and quotes from political, agency, or installation officials, should be examined for their overall contribution to the objectives of the publication before they are included. If included because they contribute to the credibility of the message, they should be placed so as to not distract the reader from important emergency information.
- 12 To ensure the public's full comprehension of the information presented, all pre-emergency educational materials should conform to the following guidelines:

- a. The vocabulary used should be simple and appropriate to the audience. General documents and presentations should be prepared for either (a) a reading level of grade 7 or below, as characterized by the Dale-Chall readability formula (Dale and Chall, 1948), or (b) a different reading level that analysis has determined to be appropriate for the target audience. Special publications and sidebars can be designed to reach a more advanced reading level.
  - b. Sentences should be brief and concise.
  - c. Typography should be legible and easy to read.
  - d. For documents, the layout should be such that the text is easy to follow from paragraph to paragraph and from page to page.
  - e. Information should be presented in such a way that there is a logical sequence of topics. The 'flow' of information should be smooth and not disjointed.
  - f. Document covers should encourage one to open the publication to read what it contains. The title should indicate the purpose of the document, and, for documents including protective action instructions, the cover should indicate that the document should be retained for use in an emergency.
  - g. Documents should be large enough to be easily located during an emergency. In addition, documents which contain evacuation maps and directions should be sized so that they can be easily handled and read in a moving vehicle.
  - h. Photographs, maps, charts, tables, and artwork should be used in ways that effectively enhance the text and are not distracting.
  - i. The various elements of graphic design should work together harmoniously to achieve the desired effect.
  - j. Color should be used effectively to enhance and highlight important details relative to the emergency information. Color selection must consider the needs of visually-impaired ("color blind") individuals.
  - k. The format should encourage retention.
  - l. Publications containing protective action instructions should be durable enough to withstand the wear and tear of typical household storage places.
- 13 All public education materials (brochures and safety messages) will be translated into a non-English language if the state determines through survey or other means that the non-English language speaking minority population of exceeds one percent of a IRZ or PAZ county's population. If minority language individuals in the IRZ or PAZ counties do not exceed one percent of the population and there are no foreign language materials

provided, other efforts must be made to afford them information equivalent to that provided the general population. Examples of acceptable methods are periodic public meetings announced and conducted in the minority language and presented with the cooperation of minority language community members; providing qualified translators at public meetings conducted in other languages; and making provision with language banks to answer inquiries made by minority language speakers. NOTE: The 1 percent figure above refers to one non-English language; it is not a cumulative figure of all non-English languages.

- 14 Jurisdictions must install at least one Telecommunications Device for the Deaf (TDD) so that hearing-impaired people already possessing TDD's may communicate with the jurisdiction. A dedicated phone line for the TDD must be installed and efforts made to publicize the phone number among hearing-impaired people.

15. *THIS SECTION RESERVED FOR COMMUNITY RELATIONS STANDARDS*

## EMERGENCY PUBLIC INFORMATION

The principal objective of the emergency public information program is to minimize casualties and property damage by ensuring that appropriate instructions are distributed to the public in a timely manner during an chemical agent emergency. Planning is necessary to accomplish this objective. Before an emergency occurs, communities must consider what information will be needed by the public and develop a strategy for disseminating that information quickly.

In the interest of a coordinated planning process, it is suggested that the state emergency management agency initiate Joint Information Center (JIC) planning in close cooperation with all other jurisdictions.

It should be noted that the primary means established for emergency alert and notification of the public in the Immediate Response Zone (IRZ) are tone alert radios and voice-capable sirens. Communities must develop pre-scripted, pre-tested messages for transmission via these media. The FEMA CSEPP Public Affairs staff are developing and testing such messages for use and appropriate modification by local or state officials. The Joint Information Center's activities must be supportive of and coordinated with information provided via tone alert radios, sirens, and the Emergency Broadcast System (EBS). A community emergency is naturally a confused

scene; carefully prepared and carefully timed public information can reduce the confusion and minimize the community's loss.

## Operational Concepts

### Interagency and Interjurisdiction Coordination

Since the effectiveness of the CSEPP depends on the public's taking appropriate protective actions, it is imperative that the public information presented during a chemical agent emergency be clear, accurate, and consistent. Considering the variety of agencies and jurisdictions that are likely to be involved in responding to a chemical agent incident, these qualities can be ensured only through careful coordination among the agencies and jurisdictions involved. In the pre-emergency phase, each agency's or jurisdiction's procedures for disseminating public information should be coordinated and made compatible with the strategies developed by all other agencies and jurisdictions who may be affected by a chemical agent event.

During an emergency, a Joint Information Center (JIC) should be established in a timely manner to support information provided via the alert and notification (A & N) systems (and in recognition of the requirement that outdoor A & N be accomplished within eight minutes of the decision to alert.) The JIC must facilitate the coordination and compatibility of the information disseminated by the various agencies and jurisdictions. The coordinated public information strategies and the organization and operation of the JIC should be tested and refined through CSEPP exercises.

It should be recognized that non-surety events, such as smokey on-post fires not involving chemical agents, may be responsible for creating considerable public interest and concern. Therefore, plans should provide for either *partial* or *full* JIC activation. Partial activation will take place when it is apparent to the Army and/or the county(s) that public perception either has or will create significant public interest or concern.

### Organization for Emergency Public Information

As a part of its planning activities, each jurisdiction must establish an organization to handle the emergency public information function. Each jurisdiction will appoint a spokesperson and

alternate spokesperson. The spokesperson should be involved in planning activities for public education and public information, including the coordination of the public information strategy with other jurisdictions and agencies. Each jurisdiction will also identify staff resources that will be available to the spokesperson at the time of a chemical agent emergency. The staff will be responsible for assisting the spokesperson by providing secretarial services, communications with other officials, and communications with the public.

#### Emergency Public Information Procedures

Each jurisdiction will develop emergency public information procedures to ensure that clear, accurate, appropriate, timely and consistent information is provided to all people directly affected by the chemical agent emergency. The procedures should be coordinated with other jurisdictions and agencies and should indicate what types of information will be provided to which groups in which order of priority. The strategy should recognize the needs of some groups for specialized information or for generic information presented in specific ways. The procedures should also specify how prescribed information (e.g., protective action recommendations) and news briefings will be handled.

The JIC should be activated at the earliest possible time during the emergency to provide a single location for coordinated emergency information. Activities in the initial phase of the chemical event will be dominated by dissemination of protective action recommendations. The JIC will support the dissemination of protective action information via the alert and notification system; the latter shall at all times be considered the first medium to be used for the dissemination of protective action information.

Methods for disseminating these recommendations in support of alert and notification include the EBS, other TV and radio stations, and cable TV. Recommendations should complement and be consistent with pre-emergency public education materials and with messages disseminated via the alert and notification system. Whenever possible, the messages should refer recipients to pre-emergency educational materials that are likely to be available for more complete instructions and should provide a telephone number for contacting authorities for additional information or instructions.

As the chemical agent emergency progresses, the emphasis of efforts at the JIC will shift from protective action recommendations to informing the public about the nature of the emergency

and its causes and response and recovery activities. All information regarding Department of the Army actions in connection with the emergency—its causes and direct actions to contain and control it—should be provided by the Army Public Affairs Officer (PAO). The Army Public Affairs Officer will also be responsible for coordinating information about the on-base activities of other federal agencies and departments which are operating in support of the Army as the Lead Federal Agency. The Army Public Affairs Officer will coordinate and consult with local, state, and volunteer organizations (e.g., Red Cross, Salvation Army, etc.) public information officers, but will exercise no control over their actions. The Army PAO will also coordinate his information activities with those of federal agency public affairs officers operating off-site.

Local, state, and federal agency spokespersons should communicate instructions to the public; describe completed, ongoing, and planned activities to respond to the emergency and recover from it; and advise the public of likely outcomes (e.g., expected duration of exclusion from evacuated areas) to the extent this can be done with reasonable reliability.

#### Rumor Control

Events following the release of a chemical agent are likely to be confusing to the public, and, partly because of the nature of the hazard, inaccurate accounts are likely to circulate. Yet, the public's well-being depends on their understanding and properly responding to the recommendations made by emergency management officials. Inappropriate action based on erroneous information could be disastrous. Consequently, the control of rumors is a critical aspect of the public information program. Rumor control includes two steps: (1) recognizing the existence of a rumor, and (2) providing information to correct the rumor. Both steps can be accomplished on an individual basis, in part by advertising a telephone number that citizens can call for answers to questions about the emergency or perceived emergency. *(It is important that sufficient telephone lines and operators be connected to this number to avoid undue delays in answering incoming calls).*

Emergency responders can also be trained to report any significant rumors they encounter to the EOC and JIC. Rumors that are widespread or particularly troublesome should be corrected through an official information release.

The JIC should also actively monitor broadcast and print media coverage to identify erroneous information or indications that some members of the public may be reacting to the emergency inappropriately.

## Standards

- 16 Each jurisdiction shall appoint a spokesperson and alternate spokesperson. The spokesperson will report to the Emergency Manager and will have the following responsibilities:
  - a. to be the sole source for the dissemination of official emergency public information and instructions through the media to the public;
  - b. to participate in the development of the emergency public information strategy;
  - c. to coordinate the public information strategy with other affected jurisdictions and agencies, including the Army installation.
  
- 17 Sufficient staff to support the spokesperson during an emergency will be identified, procedures for making them available will be set forth, and any training needs will be identified. At a minimum, staff will be required for secretarial assistance, communications with on-post and off-post EOC's and other officials, and telephone communications with the public and the media.
  
- 18 Each jurisdiction shall prepare pre-scripted messages containing the protective action recommendations to be disseminated to the public in an emergency. These messages will be disseminated via the alert and notification system, EBS, and other broadcast media. A range of pre-scripted messages shall be prepared based on the most likely and alternative actions identified in the jurisdiction's analysis of protective actions (see Appendix D). A clear method of distinguishing among the alternative sets (e.g., printing on different colored paper) will be adopted. Appropriate messages will be prepared for all groups identified in the emergency public education program as having special needs regarding the content or presentation of emergency information. At a minimum, protective action recommendation messages will be prepared meeting the specific needs of the following groups:

- a. people located in specific sectors of different emergency planning zones at the time the emergency occurs;
  - b. people who are mobility-, hearing-, or visually-impaired. Jurisdictions will operate equipment such as Telecommunications Devices for the Deaf (TDD's) to permit communication with hearing-impaired individuals;
  - c. non-English-speaking people; and
  - d. institutions (e.g., schools, hospitals, nursing homes, jails/prisons).
- 19 The protective action recommendation messages will be as clear and succinct as possible. The messages must be written so that they may be read in three minutes or less. At a minimum each message will contain the following information:
- a. the time the message was authorized for release;
  - b. the name of the agency authorizing the release and other sources contributing information which led to the authorization;
  - c. a brief description of the reason for the protective action recommendation, including the nature of the threat;
  - d. a clear identification of the individuals or groups and areas to whom the message is addressed, and identification of who is not at risk;
  - e. a clear statement of the recommended protective action;
  - f. an indication of the time period available for implementing the recommended action,
  - g. a reference to relevant public information materials that are readily available and would provide more detail regarding implementation of the recommended protective action; and
  - h. a repetition of detailed instructions for implementing the recommended action.
- 20 Each jurisdiction shall develop procedures for disseminating the protective action recommendation messages keyed to the jurisdiction's protective action decision-making process to ensure that each message will be issued at the earliest possible point in the process. The procedures will establish dissemination procedures that are consistent with alert and notification procedures naming tone alert radios as the primary means of delivering protective action messages within the IRZ, and which address the following issues:

- a. identification of officials authorized to issue protective action recommendation messages;
  - b. identification of the radio and TV stations (including EBS) through which the messages are to be disseminated;
  - c. requesting participating radio and television stations to broadcast the messages, including procedures for activation of the EBS (see item 7 below);
  - d. the order, based on urgency, in which messages will be issued;
  - e. the method by which the messages will be communicated to the distributing media in an accurate and timely manner (e.g., pre-positioning the pre-scripted messages at the media broadcast offices); and
  - f. obtaining and supplying to the media any incident-specific information necessary to complete the protective action recommendation messages.
- 21 Each jurisdiction will document the arrangements that it has made for disseminating protective action recommendation messages in a manner that has been coordinated and is compatible with the plans of other local jurisdictions in the EPZ, state emergency management officials, and the Army installation.
- 22 Each jurisdiction will document the arrangements that have been made for effective distribution of protective action recommendation messages to broadcast media serving the community, including
- a. that a local operational area plan for the EBS has been developed with the participation of local broadcasters and state officials and that the plan will provide an effective response in the event of a chemical agent release;
  - b. that a list of the persons authorized to activate the EBS and the explicit procedures to be followed have been made available to all concerned parties;
  - c. copies of written agreements which the jurisdiction has executed with the broadcast media (e.g., radio stations, TV stations, cable TV, educational TV) serving the jurisdiction to receive and disseminate warning messages and emergency information; and
  - d. indications that reliable and redundant communications links are available linking the jurisdiction's Emergency Operations Center (EOC) with the EBS system and with other local broadcast stations.

23 A single JIC permits the most efficient gathering, coordination and dissemination of emergency information. Therefore, only one JIC will be established and operate in connection with perceived or real chemical agent emergencies described in this document. The principles of the Joint Information System requiring on-going coordination and consultation among responding organizations shall be followed [see Federal Preparedness Circular #8 (FPC #8), "Public Affairs in Emergencies", issued by the Federal Emergency Management Agency and approved by the Office of the White House Press Secretary]. The principles of FPC-8 are incorporated throughout this document. Each jurisdiction will develop agreements and procedures, in cooperation with all affected local jurisdictions, state emergency management officials, and the Army installation, that will be followed to ensure the coordinated release of information during an emergency. Specifically, these items will include

- a. arrangements for timely exchange of information with the designated spokespersons of all jurisdictions and agencies involved, and
- b. the jurisdiction's commitment to participate in a JIC that will provide a single location for the release of official information from all jurisdictions and agencies regarding the chemical agent emergency and response activities.

24 Each jurisdiction will prepare, as part of its Emergency Response (or Operations) Plan, a JIC plan, developed in cooperation with all affected local jurisdictions, state emergency management officials, and the Army installation, which describes the location, facilities, and operational procedures for the JIC. For an example, reference is made to the federal government's draft Joint Information Center standard operating procedures (Interagency Committee for Public Affairs in Emergencies, March 14, 1990 or subsequent revisions). The plan will include

- a. the name and street address of the facility to be used as the JIC. As a general rule, the JIC should be located outside the IRZ.
- b. reference to an agreement with the facility's owner for use of the facility as a JIC, including any restrictions or provisions regarding such use.
- c. an estimate of the maximum number of public information, Congressional relations/legislative affairs personnel, and media representatives expected to be present in the JIC.

- d. confirmation that the facility includes adequate and suitably-arranged space and basic equipment for the following functions:
- (1) work areas for official public information personnel separated from media areas and other ordinary traffic;
  - (2) work areas for news media representatives that are separated from public information personnel and other ordinary traffic;
  - (3) a conference area large enough to accommodate all anticipated media and other participants for news briefings and conferences;
  - (4) two or more separate areas where media can conduct personal interviews with response force personnel;
  - (5) space for telephones for receiving calls from the public;
  - (6) sufficient electrical power and outlets to satisfy the surge from typewriters, computers, lights, cameras, microphones, radio equipment, telex, and other equipment, plus a stand-by, back-up power capability;
  - (7) adequate parking for the expected maximum number of governmental public information personnel and media representatives;
  - (8) adequate restroom facilities for the maximum expected number of participants; and
  - (9) an area where media representatives and other participants can obtain food and beverages at cost or on a reimbursable basis.
- e. a list of equipment not currently available in the facility that will be required for functioning of the JIC along with the jurisdiction and agency responsible for supplying each item at the time of an emergency. The equipment list should include
- (1) bulletin, message, and picture boards along with tables for press releases and handouts;
  - (2) a minimum of ten telephones for media representatives (arrangements may be made with the phone company to permit only local, credit card and collect long distance calls), and at least one telephone line for each person assigned media or Congressional relations responsibilities. Each JIC organization shall have at least one dedicated phone line available for data or facsimile transmission.
  - (3) office furniture, equipment, and supplies;
  - (4) equipment allowing adequate and reliable communications with the on-post EOC, the off-post EOC's of all jurisdictions represented at the JIC, and with any public information officials who are unable to report to the JIC;

- (5) equipment allowing adequate and reliable communications with the all media serving the EPZ; and
  - (6) sufficient telephones with a common number for receiving calls from citizens seeking more information or instructions. At least one line must be dedicated to a Telecommunications Device for the Deaf (TDD);
  - (7) provisions for rapid activation of back-up communications, including voice and or data (packet) radio systems.
- f. procedures for activating the JIC, including
- (1) a list of people authorized to activate the JIC;
  - (2) a list of the individuals to be contacted upon activation of the JIC, including public information officials and critical support staff, and the news media; and
  - (3) procedures for converting the facility from its current use into a JIC, including the location of needed equipment and the identification of individuals responsible for moving the equipment to the JIC and setting it up.
- g. procedures for conducting periodic, timely news briefings to keep the media informed of updated or changing activities and to communicate additional information/instructions to the public after protective action recommendations have been issued. These procedures will address
- (1) the required coordination of information among public information representatives before its release;
  - (2) any division of responsibilities among public information representatives for the release of specific types of information (e.g., release of information regarding the accident site only by the Army representative; release of information regarding a single jurisdiction only by that jurisdiction's designated spokesperson);
  - (3) the method of resolving any disagreements regarding information to be released or the priority of information; and
  - (4) the organization and format of press conferences.
- h. a program for detecting and correcting rumors. The program will include (but will not necessarily be limited to)
- (1) the use of a bank of telephones with a common number which the public can call to ask questions regarding the emergency;
  - (2) procedures for logging all calls received and noting any rumors reported by the callers;

- (3) review of telephone logs by public information officials.
  - (4) monitoring of media coverage of the event for any inaccuracies that might reflect or encourage inappropriate action by the public;
  - (5) timely analysis of "rumors" or erroneous information circulating among members of the media or public by officials who are charged with evaluating the information and determining the need for action in response to it.
- i. provisions for restricting access to the JIC to persons who can best help in disseminating information to a large segment of the public (e.g., public officials and media representatives).
  - j. procedures for deactivating the JIC, including designation of officials authorized to deactivate and conditions under which deactivation is allowed or required.
  - k. identification of the location of, and procedures for activating, a JIC at an alternate location should relocation of the JIC be required. The plan should ensure that the alternate JIC will be available on short notice. The alternate JIC should be equipped with enough equipment to permit a rapid transfer of operations to it from the primary JIC. At a minimum, stand-by phone lines should be available to permit immediate activation of the stand-by facility. Other equipment may be transferred from the primary JIC.
- 25 The emergency public information program will be evaluated as a part of each CSEPP full-scale exercise. Exercise activities may include (1) timely and adequate activation, staffing, and equipping of the JIC. (Timely *partial* activation of the JIC will take place within two hours after the event triggering activation; *full* activation shall take place within two to four hours); (2) timely and adequate communications with the on-post EOC, off-post EOC's of the affected jurisdictions, and participating radio and television stations and print media; (3) mock dissemination of emergency information appropriate to the exercise scenario; and (4) timely and appropriate coordination of emergency public information among all responding jurisdictions and organizations.

Every effort must be made to enlist the participation in the exercise of actual news media. In any event, adequate and realistic play must be ensured by supplementing actual media with qualified media "players."

Within one month following the exercise, all participating public information officials will meet to evaluate and consider improvements in the public information program.

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## ATTACHMENT 1

### QUALIFICATIONS FOR PUBLIC INFORMATION AND PUBLIC AFFAIRS OFFICERS

The proper execution of CSEPP public education and information programs requires implementation by qualified personnel. Included among the suggested knowledge and skills for personnel implementing this program are

- 1-1 A B.A. degree in journalism, public relations, communications, advertising or related fields OR significant prior experience with the news media, public relations, advertising or related fields.
- 1-2 Experience in conducting community awareness programs.
- 1-3 Knowledge of the organization and functions of the mass media, with particular attention to news functions.
- 1-4 Experience in reporting on, or managing public affairs/information activities connected with, sensitive or controversial issues.
- 1-5 Knowledge of the organization and inter-relationship of the civil and military branches of the federal government, and similar knowledge of local, and state government.
- 1-6 Ability to successfully carry out assignments during stressful situations.
- 1-7 Successful completion of Basic and Advanced Public Information Officers courses at the Emergency Management Institute (EMI) is encouraged. If hired without completion of the courses, attendance is encouraged as soon as possible thereafter. Public information officers are also encouraged to apply for, and if accepted, attend the Joint Information System Conference held at EMI. (Attendance at the Conference is normally by invitation only).

The CSEPP Public Information/Affairs Officers carrying out Public Information/Education responsibilities likely will have both emergency and non-emergency assignments. They must help design and implement the pre-emergency education and information tasks, and they will likely perform those functions alone, with support from other personnel from their agency or jurisdiction, or those from other CSEPP jurisdictions. Assistance may also be available from FEMA or Army public affairs personnel, or from experts provided by them.

Emergency public information tasks will without a doubt require assistance from others. The CSEPP Public Information/Affairs Officer must expect to recruit, brief and train other qualified people to help him or her carry out his jurisdiction's responsibilities under these standards.

## APPENDIX O

### PLANNING STANDARDS FOR TRAFFIC AND ACCESS CONTROL

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In the event of a chemical agent emergency, access to the affected area must be controlled to prevent additional persons from becoming endangered by the hazard and to protect property within the area and the area must be evacuated as soon as this can be accomplished safely.

Access control encompasses all actions taken to control entry into a restricted area (i.e., preventing the general public from entering the restricted area while permitting entry by emergency workers with essential missions). Traffic control includes all actions taken to facilitate evacuation of the population in vehicles along specific routes. These planning standards incorporate some provisions found in three FEMA publications: *Transportation Planning Guidelines for the Evacuation of Large Populations* (CPG 2-15), *Objectives for Local Emergency Management* (CPG 1-5), and *Guide for Development of State and Local Emergency Operations Plans* (CPG 1-8). Supplemental information on the implementation of a National Defense Area (NDA) by the Department of Defense (DOD) can be found in DOD Directive 5200.8, *Security of Military Installations and Resources*, and in Title 30 USC 787.

During an emergency, access control must be established as quickly as possible to prevent additional people from entering the hazardous area. Once access control has been achieved, available resources should be assigned to traffic control functions to expedite evacuation of people from the affected area. These planning standards address traffic and access control in the early stages of a chemical emergency. As the traffic and access control functions evolve in the course of an emergency, decision makers and managers will find themselves with progressively more time to give individual attention to problems that arise. It is in the early stages of an emergency, when demands on managers are high and the time available to react is scarce, that the existence of pre-established procedures is critical.

These standards deal solely with the traffic and access control functions. Other emergency response issues, which are incidental to traffic and access control, are not addressed in these standards. For example, many traffic control personnel must be equipped and trained to protect themselves from exposure to chemical agent. This issue is addressed in Appendix H. Traffic and access control personnel may encounter situations where an evacuee needs decontamination or medical attention. The personnel should be prepared to solicit aid that will be available as prescribed by Appendices I and L. However, the personnel should not neglect the traffic or access control function to provide such aid directly.

## STANDARDS

1. The emergency operations plan for each jurisdiction must incorporate an access control plan for restricting entry into emergency areas. The access control plan must
  - a. Identify methods to be used to restrict access to emergency areas. The methods may include barricades on transportation routes (roadways, railways, waterways, and airways), full perimeter control, or other methods. If appropriate, alternative methods of access control may be specified for use depending on the nature and scope of the emergency.
  - b. Assign responsibility for and identify procedures to be followed in providing security within the restricted area.
  - c. Identify and provide for the timely availability of and access to all facilities, equipment, and personnel that may be needed to implement the access control plan, including
    - (1) procedures for maintaining a current inventory of all facilities, equipment, and personnel, and
    - (2) procedures for obtaining outside resources, if the required facilities, equipment, and personnel exceed those normally available to the jurisdiction. Arrangements for obtaining all outside resources should be formalized through interagency agreements, federal-state-local arrangements, interjurisdictional agreements, agreements with the private sector, etc.
  - d. Identify the procedures necessary to implement the access control plan, including
    - (1) identification of all access control points (ACPs);
    - (2) procedures for calling up additional personnel (if necessary);
    - (3) provisions for timely access to all material and equipment needed to implement ACPs;
    - (4) procedures for transporting personnel and equipment to each ACP;
    - (5) procedures for providing needed security vehicles to access control personnel;
    - (6) provisions for communications between each ACP and the emergency operating center (EOC)
    - (7) identification of the process to be used to accomplish orderly shift changes at each ACP.
  - e. Provide for the distribution to all emergency personnel of detailed maps, depicting all ACPs, traffic control points (TCPs), evacuation routes, reception centers, and mass care facilities.
  - f. Identify the procedures to be followed for controlling entry into restricted areas, including
    - (1) clear identification of the criteria that will be applied in deciding who is permitted to enter a restricted area;
    - (2) identification of the methods to be used to assure that only authorized personnel are allowed to enter restricted areas, including
      - procedures for communicating authorization to access control personnel (from EOC or from individual seeking entry),
      - specification of the types or methods of enforcement to be used by access control personnel to prohibit unauthorized entry into a restricted area, and
      - specification of the types or methods of enforcement to be used by access control

personnel to apprehend and remove individuals who have entered a restricted area without authorization;

- (4) identification of the criteria that access control personnel will use to determine whether people authorized to enter restricted areas are using appropriate self-protective equipment;
  - (5) identification of the record-keeping responsibilities of access control personnel (e.g., logging authorized entry and exit, recording information on attempts at unauthorized entry);
  - (6) description of the process by which people not initially identified as essential emergency workers can gain authorization to enter the restricted area, including
    - identification of the official(s) responsible for authorizing entry,
    - description of the required process for applying for authorization to enter restricted areas, and
    - definition of the criteria which will be used to decide whether to authorize entry; and
  - (7) identification of procedures that access control personnel will follow in the event that persons who have entered the restricted area do not exit within the allotted time.
- g. Identify additional measures that will be required if a NDA is declared by the DOD, including the following:
- (1) procedures for coordinating actions of the state/local jurisdiction's personnel and Army personnel, including
    - coordination of access control policy through the provision of a representative from all participating local law enforcement agencies to the security operations center or command post established by the Army,
    - identification of any changes in the jurisdiction's chain of command, including methods the Army will use to request the jurisdiction's assistance, and
    - provisions, coordinated with the Army installation, for the orderly transfer of responsibility when the NDA is being reduced or disestablished;
  - (2) additional resources (e.g., personnel and equipment) that would be required to provide necessary assistance to the Army personnel (e.g., for the apprehension and arrest of civilians violating the security requirements of the NDA); and
  - (3) any special training that the jurisdiction's personnel will require to perform responsibilities associated with the NDA.

2. The emergency operations plan for each jurisdiction must incorporate a traffic control strategy based on the evacuation plan prepared by federal, state, and/or local emergency planning agencies. The strategy must address the following functions:

- a. Identify and provide for the timely availability of all facilities, equipment, and personnel that may be needed to implement the traffic control strategy, including:
  - (1) procedures for maintaining a current inventory of all facilities, equipment, and

- personnel, and
- (2) procedures for obtaining outside resources in a timely manner, if the required facilities, equipment, and personnel exceed those normally available to the jurisdiction. Arrangements for obtaining outside resources should be formalized through interagency agreements, federal-state-local agreements, interjurisdictional agreements, agreements with the private sector, etc.
- b. Identify procedures for implementing the traffic control strategy, including
- (1) identification, by title, of the individual responsible for coordinating and directing implementation of the strategy;
  - (2) identification of all TCPs along each evacuation route;
  - (3) procedures for calling up additional personnel (if necessary);
  - (4) provisions for a centralized work/control/dispatch area to manage traffic control, resources, and personnel and to maintain contact with the EOC during an emergency situation;
  - (5) provision of adequate and timely access to materials and equipment needed to implement TCPs;
  - (6) identification of methods to be used to control and expedite the flow of traffic (e.g., soil barriers, pylon, plastic cones or barrels, parked vehicles, pre-prepared signs, visuals, personnel, etc.)
  - (7) assignment of responsibility for implementing the traffic control measures (e.g., placement of soil barriers, plastic cones, etc.) at each TCP;
  - (8) procedures for transporting personnel and equipment to the TCPs;
  - (9) procedures for providing needed vehicles for traffic control personnel;
  - (10) provisions for the distribution to TCP personnel of detailed maps (including sufficient extra copies for distribution to evacuees as needed) depicting all evacuation routes, TCPs, ACPs, reception centers, and mass care facilities; and
  - (11) provisions for adapting the traffic control strategy in response to changes in road conditions (due to construction, inclement weather, etc.) and changes in the nature of the emergency (due to changes in the amount of agent released, direction of plume travel, etc.)
- c. Specify the procedures to be followed by TCP personnel during an evacuation, including
- (1) their responsibilities for setting up and maintaining traffic control equipment (e.g., barriers, cones, barrels, etc.)
  - (2) the methods used to handle emergency and special population vehicles (e.g., priority of movement, alternative routing patterns);
  - (3) procedures to follow for removing any disabled vehicles that hinder the flow of evacuation traffic. Prior written agreements are required for any outside resources (e.g., pre-positioned private tow-trucks) to be used for vehicle removal;
  - (4) procedures for regular and emergency communications with the central work/control/dispatch area, including
    - specification of a standard timetable (e.g., staggered 10-, 15-, or 30-minute intervals) for TCP personnel to provide and receive informational updates in

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- communications with central work/control/dispatch area, and definition of emergency situations requiring immediate communication with the central work/control/dispatch area and specification of procedures for such communications;
- (5) methods for providing directions and evacuation information to evacuees either verbally or by passing on the maps to those who need them (requires that TCP personnel be knowledgeable of evacuation routes and locations of reception centers and mass care facilities).
- d. Be coordinated with the Army installation and with all other jurisdictions affected by the traffic control strategy (e.g., those through which evacuation routes pass and those with populations that might normally be traveling into or through the emergency area).