Rapid Recon/Rescue in Chemical Agent Environments (The 3/30 Rule)

Financial Management

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ABSTRACT

This research project analyzed the threat level to the United States of a chemical agent (CA) terrorism incident, and the development of procedural guidelines for first responders performing rapid reconnaissance and rescue (recon/rescue) of live victims from chemical agent (CA) hot zones.

The problem identified for this applied research project was that the Lubbock Fire Department (LFD) did not have adequate procedural guidelines or operating procedures for responding to mass causality CA terrorism incidents.

It was the purpose of this project to develop a Standard Operating Procedure (SOP) for use in responding to acts of terrorism involving chemical agents.

This research employed evaluative research methodology to: (1) identify if the United States is vulnerable to chemical agent terrorism; (2) Identify what is chemical agent terrorism; (3) assess the 3/30 Rule and how will it result in fewer fatalities in the event of a CA terrorism incident.

Procedures that were used to complete this research included a literature review of magazines, journals, fact sheets and prior EFO applied research projects obtained from the National Fire Academy's Learning Resource Center. Informal interviews were also conducted with a Certified Hazardous Materials Specialist and a Certified Industrial Hygienist.

The results of this applied research project indicated that the inevitable attempt by terrorists to use chemical agents to intimidate or coerce the United States requires that emergency first responders be prepared to manage the consequences of such an incident. The expected result of developing and utilizing a rapid recon/rescue
procedure based on the 3/30 Rule would result in fewer fatalities in the event of a mass casualty CA terrorism incident.

The recommendations resulting from this research include: (1) the LFD incorporating the attached written procedure (Appendix A) *Rapid Recon/Rescue in Chemical Agent Environments (The 3/30 Rule)* into its SOP manual; (2) the LFD obtaining the identified equipment and resources (Appendix C) needed for a sustained response to a CA terrorism incident; and (3) all LFD personnel being fully trained in the tactical and strategic implementation of this new procedure.
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INTRODUCTION

The FBI fact sheet: *Terrorism in the United States* (1997) defines terrorism as “the unlawful use of force against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in the furtherance of political or social objectives” (p.1).

In March of 1996, Fire Chief Lamont Ewell, who was then the president of the International Association of Fire Chiefs (IAFC), told the U.S. Senate Permanent Subcommittee on Investigations that "it would be the responsibility of local firefighting, police and emergency medical units to cope with a terrorist attack that used nuclear, chemical or biological weapons" (n.p). Ewell (1996) also stated "Fire/Police/EMS services, collectively, were not prepared for the challenge" (n.p).

On Sept. 11th, 2001 suicidal terrorists attacked the World Trade Center in New York City and exacted an enormous toll on the civilian populace and emergency responders. According to accounts, the New York Fire Department lost 343 people of its 11,400-member force; one out of every 33-fire personnel is listed as dead or missing. While the September 11th attack did not utilize the traditionally recognized weapons of mass destruction (WMD) such as nuclear, chemical or biological (NBC) weapons, it demonstrated an increased escalation to more spectacular mass casualty terrorist attacks in order to attract attention.

According to the FEMA Publication *Emergency Response to Terrorism* (p.8), "Experts generally agree that there are five categories of terrorist incidents". The acronym B-NICE is a simple way to remember the listed five categories:

- Biological
• Nuclear
• Incendiary
• Chemical
• Explosive

The Sept. 11th attacks were a combination of explosive/incendiary attacks and were designed to demonstrate that the U.S. is vulnerable to terrorist threats of all kinds. The pressing question for emergency responders is "what type of weapon or agent will terrorist use next"? According to The Emergency Response and Research Institute (1996) a threat assessment analysts suggests that the possibility of a chemical attack would appear very likely, due to the easy availability of many of the necessary substances needed to construct chemical weapons. Additionally, the rudimentary technical knowledge needed to build a working chemical device is taught in every college level chemistry course in the world.

In the event of a terrorist attack involving a chemical agent (CA) in the City of Lubbock, the Lubbock Fire Department (LFD) will play a key role in first responder rescue efforts. Presently the LFD is, at best, marginally prepared to manage a CA attack. The LFD HAZMAT Team has some detection and protection capabilities and also has some CA MSDS information. However, the LFD does not currently have a general plan for incident commanders indicating when and how they should commit personnel into a contaminated scene to perform rescue operations of non-ambulatory victims.

Waiting for up to sixty minutes to get the LFD HAZMAT team on scene, suited up and into the hot zone, almost assures that non-ambulatory victims will become fatalities.
However, the test findings of the U.S. Army SBCCOM Guidelines for Incident Commander’s Use of Firefighter Protective Ensemble with Self Contained Breathing Apparatus For Rescue Operations During A Terrorist Chemical Agent Incident (1999), commonly called the 3/30 Rule, indicates that these types of deaths can be avoided by implementing rescue operations with on-scene firefighters to immediately assist or rescue injured people.

**Problem statement:** The problem identified for this applied research project was that the Lubbock Fire Department (LFD) did not have adequate procedural guidelines or operating procedures for responding to mass causality CA terrorism incidents.

**Purpose statement:** The purpose of this project is to develop a Standard Operating Procedure (SOP) for use in responding to acts of terrorism involving chemical agents (Appendix A).

**Research Questions:** As part of the purpose of this study, three research questions were developed. The evaluative research method was employed to answer the following research questions:

1. **Is the United States vulnerable to chemical agent terrorism?**
2. **What is chemical agent terrorism?**
3. What is the 3/30 Rule and how will it result in fewer fatalities in the event of a CA terrorism incident?

**BACKGROUND AND SIGNIFICANCE**

The City of Lubbock is located in the Texas panhandle and has a population of 200,000 in an area covering 130 square miles with 267 firefighters located at 14 fire stations. The department responds to approximately 15,000 incidents per year and
provides fire, heavy rescue, water rescue, hazardous material response, and first responder's services to its citizens.

In the event of a terrorist attack utilizing a chemical agent the fire department will be the primary first responder agency to respond. As a result, the LFD must make a commitment to prepare and protect its personnel. The effectiveness of LFD personnel arriving at the scene of a CA terrorism incident will be influenced by how well they are prepared and how long those personnel must conduct operations before specialized help arrives. The next closest major metropolitan center to Lubbock is three hundred miles away.

In case of a CA terrorism incident, LFD responders would face extraordinary crisis control and consequence management problems for several hours before specialized state and federal resources were available. Therefore, LFD responders must be prepared to react rapidly, competently, and instinctively during and after a CA terrorism incident.

Terrorism is a technique of war used to inflict casualties, disrupt lives, and create panic within the general populace of a targeted enemy. Although terrorism has been utilized throughout history, it has only recently been used against the civilian population of the United States of America.

Until the contamination of restaurant food by the Rajneesh cult in Oregon with salmonella, which resulted in the poisoning of 750 people (but no fatalities), there were no reported cases of the use of chemical or biological agents by terrorists in a mass-destruction attack on civilians in the U.S. However, there had been previous reports of terrorist threats to use CA weapons in mass-destruction attacks, as well as both failed
and successful attempts to acquire such agents. Among the most serious incidents reported in the past was a threat by the "Alphabet Bomber" to kill the American President utilizing nerve gas, the theft of a large quantity of mustard gas from an American military base in West Germany in 1975, followed by threats by the Baader-Meinhof Gang to use the gas in a terrorist attack.

Recipes for preparing homemade agents are readily available and reports of military arsenals of CA weapons raise the possibility that terrorists might have access to highly dangerous agents, which have been engineered for mass dissemination. In addition there has been an increase in religiously inspired violence, with few humanitarian inhibitions, combined with the availability of materials and weapons expertise provided through state-sponsored terrorism.

The United States Department of State, *Patterns of Global Terrorism -2000* (April 2001), lists the following statistics:

- There were 423 international terrorist attacks in 2000, an increase of 8 percent from the 392 attacks recorded during 1999.
- The number of casualties caused by terrorists also increased in 2000. During the year, 405 persons were killed and 791 were wounded, up from the 1999 totals of 233 dead and 706 wounded.
- The number of anti-US attacks rose from 169 in 1999 to 200 in 2000.
- Nineteen US citizens were killed in acts of international terrorism in 2000. Seventeen were sailors who died in the attack against the USS Cole on 12 October in the Yemeni port of Aden.
These recent terrorist events against the United States demonstrate that the U.S. is vulnerable to terrorist attacks. As evidenced by the September 11th attack on the World Trade Center Towers and the following anthrax attacks, there is an increasing escalation to more spectacular mass-casualty terrorist attacks in order to attract attention. Many professionals believe that the likelihood of future use of CA's by terrorists is considerable and growing due to their extreme toxic nature and their potential to produce a mass-casualty media event.

Jenkins (1999) wrote, "Attacks involving chemical agents seem more likely than biological attacks. Readily available substances are more likely to be used than exotic, difficult-to-manufacture substances" (n.p).

Responding to large-scale release of a chemical agent will require rapid mobilization and rescue actions by emergency first responders. Due to the relative isolated location of Lubbock and the time lag before outside assistance arrives, the LFD must rely on its own day-to-day response capabilities and equipment. For the most part, this will be conventional firefighting turnout gear and SCBA.

Currently the LFD has a designated HAZMAT Response Team that is equipped with level A and B Chemical protective suits, also all members of the Team have received training in chemical agent recognition, signs and symptoms of chemical exposure, and methods of self-protection. The rest of the front line personnel are trained to the HAZMAT operations level. Currently the LFD does not have an operational plan that provides guidance for managing rescue operations and personal protective equipment requirements at mass casualty CA terrorism incidents.
With adequate preparation, first responders need not become casualties when facing a CA terrorism incident. Since they may be dealing with mass casualties, potential fatalities, and a substantial risk to themselves, the key to effectiveness will be the capability to conduct rapid reconnaissance and rescue (recon/rescue) activities supported with gross decontamination operations. Preparedness will allow these first responders to reduce their risk of becoming casualties while working to save others. They must be able to take an active role in mitigating the emergency instead of waiting for specialized resources to arrive. Protective clothing, SCBA's, time and approved response procedures are critical elements for survival.

The key to utilizing first responding units and personnel in rescuing non-ambulatory victims in CA hot zones is to temporary seal the openings to standard turnout gear, thereby affording enough protection to first responders to conduct reconnaissance or rescue operations in a CA environment. Eversole & Hunt (2001), state “taped-up turnouts are the key to rescuing victims from WMD hot zones, but look to the 3/30 Rule for guidance” (p.26).

The test findings of the U.S. Army SBCCOM Guidelines for Incident Commander's Use of Firefighter Protective Ensemble with Self Contained Breathing Apparatus For Rescue Operations During A Terrorist Chemical Agent Incident (1999), provide guidance on rapid rescue of viable non-ambulatory victims from a lethal environment. These guidelines are commonly called "The 3/30 Rule" (Appendix A). The 3/30 Rule in its simplest form finds that a first responder utilizing taped-up turn out gear with SCBA has sufficient protection for a 3 minute reconnaissance (Appendix B) in
an unknown nerve agent environment and sufficient protection for 30 minutes to conduct rescue operations in areas containing known live victims.

The 3/30 Rule provides guidance to on-scene incident commanders on how to direct rapid recon/rescue operations of viable non-ambulatory victims in a contaminated environment. According to Eversole & Hunt (2001), (p.28), the two primary findings of the full 60-page report are:

- Standard turnout gear with SCBA provides a first responder with sufficient protection from nerve agent vapor hazards inside interior or downwind areas of the hot zone to allow 30 minutes of rescue time for known live victims.

- Self-taped turnout gear with SCBA provides sufficient protection in an unknown nerve agent environment for a three-minute reconnaissance to search for living victims (or a two-minute reconnaissance if HD — distilled sulfur mustard agent — is suspected).

Eversole & Hunt (2001), state, "Although the 3/30 Rule was released in August 1999, most fire departments have not formalized response plans or exercised first responder capabilities to handle rapid extraction of potentially contaminated victims. However, several departments around the country have implemented the 3/30 Rule, among them the Chicago Fire Department and Montgomery County (Md.) Fire and Rescue Services" (p.28).

The 3/30 Rule is a simple tool that provides incident commanders with a response option to conduct rapid reconnaissance of the scene and rescue viable victims in situations requiring the need for immediate rescue. While each incident will be
different, a fire department that develops a formalized response plan that provides for rapid recon/rescue tactics followed up with gross decontamination operations will set the stage for its personnel to handle the initial response to a mass casualty CA terrorism incident.

The National Fire Academy (NFA) Financial Management course was instrumental in the research and development of this applied research project. Unit six's "Analysis" module was used as the guide to examine the benefit-cost of implementing a strategic change in departmental operations (Appendix C). Unit three’s module "Presentation" provided the direction needed to evaluate organizational and political environments in order to develop an operational procedure that will address the anticipated needs and concerns of the community when introduced in a budget related presentation. A key parameter to the success of this research project was to provide LFD personnel a written operational procedure that will support a level of confidence that the LFD can handle the response to a chemical agent incident.

LITERATURE REVIEW

A literature review for this project was conducted to analyze the threat level of terrorist actions resulting in a CA terrorism incident and the development of procedural guidelines for first responders performing rapid recon/rescue of viable victims from CA hot zones. Many documents have been published regarding Weapons of Mass Destruction (WMD) and for the most part these documents are centered on Nuclear, Biological and Chemical (NBC) weapons with the biological threat being by far the most researched subject. However, there is substantial nationwide concern about chemical agent terrorism and the need for domestic preparedness of emergency responders.
The literature was divided into three areas: (1) U.S. vulnerability to chemical agent terrorism; (2) chemical agent terrorism; (3) and the 3/30 Rule and how will it result in fewer fatalities in the event of a mass casualty CA terrorism incident.

**U.S. Vulnerability to Chemical Agent Terrorism**

The FBI fact sheet: *Terrorism in the United States* (1997) defines terrorism as “the unlawful use of force against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in the furtherance of political or social objectives” (p.1). This definition includes three elements:

- Terrorist activities are illegal and involve the use of force.
- The actions intend to intimidate or coerce.
- The actions are committed in support of political or social objectives.

In 1999, Louis J. Freeh, Director of the Federal Bureau of Investigation, stated:

"To adequately understand the terrorist threat currently facing the United States, we must appreciate the unique position America occupies in the world today. As the sole superpower, the politics of the United States are viewed with intense interest by nations around the world. To some individuals and groups who feel powerless to affect their own destinies through legal means, the breadth of influence and power wielded by the United States represents a stunning contrast -- and an attractive target for their frustrations (n.p).

In 1996, Theodore Jarboe wrote, “terrorism is a growing concern in the United States” (p.7). Jarboe also wrote that the bombings of the World Trade Center in 1993,
and of the Alfred P. Murrah Building in 1995, significantly increased both public and fire
service awareness of the devastating consequences of terrorism and “they also sent a
message that the United States is no longer safe from acts of carnage and devastation”
(p.7).

Clark Staten (1997) related that Central Intelligence Agency Director John
Deutch warned that the threat of chemical and/or biological attack in the U.S. is "the
most urgent, long-term pressing intelligence challenge we face. The materials and
expertise necessary to build chemical and biological weapons are more readily
available today than ever before" (n.p).

In 1996, Staten reported in the Emergency Net News that when discussing the
subject of terrorism, Georgia Senator Sam Nunn said that the United States had a
"remarkable lack of domestic preparedness" and "an attack of this kind is not a question
of if but when (n.p). Eversole and Hunt, in November of 2001, confirmed Senator
Nunn’s remarks when they wrote "Since the recent terrorist attacks, the potential for
further biological or chemical attacks against the United States has risen dramatically"
(p.26).

In reviewing the lessons learned from The Oklahoma City bombing, Jarrett
Murphy (2000) reports "among the casualties was America’s sense of security - a belief
that it was immune from terrorist attacks". In the same report Jarrett Murphy lists a
history of major terrorist incidents on American soil:

• 1920—A bomb placed in a wagon parked on Wall Street explodes, killing
  35. Bolshevik or anarchist terrorists are blamed.
• **1950**—Gun fight erupts outside of Blair House in Washington, D.C., between Puerto Rican nationalists and Secret Service agents protecting President Harry Truman. One D.C. cop is killed.

• **1954**—Puerto Rican nationalists wound five members of Congress when they open fire in the chamber of the U.S. House of Representatives.

• **1975**—Croatian nationalists detonate a bomb in New York City's LaGuardia airport, killing 11.

• **1975**—Bomb explosion at Fraunces Tavern in New York City kills four and injures 50. Puerto Rican nationalist group FALN claims responsibility.

• **1976**—Former Chilean ambassador Orlando Letelier and an aide are killed by a car bomb in Washington allegedly planted by agents of Chile's Pinochet regime.

• **1993**—Six die and 1,040 are injured when a bomb explodes in a basement garage of Manhattan's World Trade Center. Six men are convicted of planting the bomb to exact vengeance for Palestinians.

• **1995**—Car bomb destroys the Alfred P. Murrah Federal Building in Oklahoma City, killing 168, including 19 children. Timothy McVeigh and Terry Nichols are convicted in a plot designed to avenge the 78 lives lost in the 1993 Branch Davidian complex siege and fire.

• **1996**—Two killed, more than a hundred injured, when a pipe bomb explodes at Centennial Olympic Park in Atlanta. Security guard Richard Jewel is suspected but then cleared. Eric Robert Rudolph, charged with the crime, is still at large.
• 1997—One person is killed and another seriously injured in bombing of Birmingham, Ala. abortion clinic. Eric Robert Rudolph is wanted for this bombing as well.

In summary, recent threats and use of chemical agents against civilians have exposed the United States vulnerability to terrorist acts involving chemical agents. Local emergency responders must be prepared to respond to chemical terrorism or the consequences could be devastating. The CDC recommendation report: Biological and Chemical Terrorism: Strategic Plan for Preparedness and Response (2000) finds that “Terrorist incidents in the United States and elsewhere involving bacterial pathogens, nerve gas, and a lethal plant toxin (i.e., ricin), have demonstrated that the United States is vulnerable to biological and chemical threats as well as explosives” (p.2).

Chemical Agent Terrorism

The Organization for the Prohibition of Chemical Weapons (OPCW), in 1997, reported, “The Chemical Weapons Convention (Article 2, paragraph 1) defines chemical weapons as including not only toxic chemicals but also ammunition and equipment for their dispersal. Toxic chemicals are stated to be any chemical which, through its chemical effect on living processes, may cause death, temporary loss of performance, or permanent injury to people and animals” (n.p).

The United Nations report (1969) entitled Chemical and Bacteriological Weapons, and the Effect of Their Possible Use, states “chemical weapons are chemical agents of warfare taken to be chemical substances, whether gaseous, liquid, or solid, which might be employed because of their direct toxic effect on man, animals, and plants” (n.p). Chemical agents as defined by the FEMA Fact Sheet: TERRORISM
are “poisonous gases, liquids or solids that have toxic effects on people, animals or plants. Most chemical agents cause serious injuries or death” (p.1).

Lawlor in 2000, stated “For our purposes, a WMD incident is defined as a deliberate or unintentional event involving a nuclear, biological, chemical, radiological weapon or device, or a large conventional explosive, that produces catastrophic loss of life or property” (n.p).

Smithson (2001) states, "Chemical weapons are super toxic liquid and gaseous substances that can be dispersed in bombs, rockets, missiles, artillery, mines, grenades, or spray tanks" (n.p). Smithson list four basic types of chemical agents:

- Nerve agents that cause the nervous system to overload, resulting in respiratory failure and death (e.g., tabun, sarin, soman, and VX).
- Blister agents that destroy exposed skin tissue (e.g., mustard gas and lewisite).
- Blood agents that, when inhaled, block oxygen circulation within the body (e.g., hydrogen cyanide and cyanogen chloride).
- Choking agents that inflame the bronchial tubes and lungs, possibly causing asphyxiation (e.g., phosgene and chlorine).

According to the FEMA Publication *Emergency Response to Terrorism* (p.12), chemical agents fall into five classes:

- Nerve agents, which disrupt nerve impulse transmissions.
- Blister agents, also called vesicants, which cause severe burns to eyes, skin, and tissues of the respiratory tract.
- Blood agents, which interfere with the ability of blood to transport oxygen.
• Choking agents, which severely stress respiratory system tissues.
• Irritating agents, which cause respiratory distress and tearing designed to incapacitate. They also can cause intense pain to the skin, especially in moist areas of the body. They are often called Riot Control Agents.

According to the Chemical/Biological/Radiological Incident Handbook (1998), "are chemical substances that are intended for use in military Chemical agents operations to kill, seriously injure, or incapacitate people through physiological effects" (section g). The handbook lists the following five classes of chemical agents:

• Nerve Agents are substances that interfere with the central nervous system. Exposure is primarily through contact with the liquid (skin and eyes) and secondarily through inhalation of the vapor. Three distinct symptoms associated with nerve agents are: pinpoint pupils, an extreme headache, and severe tightness in the chest. (Nerve agents are divided into two classes).
  ♦ G-series nerve agents are chemical agents of moderate to high toxicity developed in the 1930s. Examples are tabun (GA), sarin (GB), soman (GD), and GF.
  ♦ V-series nerve agents are chemical agents of moderate to high toxicity developed in the 1950s. They are generally persistent. Examples are VE, VG, VM, VS, and VX.

• Blister Agents are substances that cause blistering of the skin. Exposure is through liquid or vapor contact with any exposed tissue (eyes, skin, lungs).
• Blood Agents are substances that injure a person by interfering with cell respiration (the exchange of oxygen and carbon dioxide between blood and tissues).

• Choking Agents are substances that cause physical injury to the lungs. Exposure is through inhalation. In extreme cases, membranes swell and lungs become filled with liquid. Death results from lack of oxygen; hence, the victim is choked.

• Incapacitating agents produce temporary physiological and/or mental effects via action on the central nervous system. Effects may persist for hours or days, but victims usually do not require medical treatment. However, such treatment speeds recovery. (Incapacitating agents are divided into four classes).
  ♦ Vomiting agents produce nausea and vomiting effects, can also cause coughing, sneezing, pain in the nose and throat, nasal discharge, and tears.
  ♦ Tear (riot control) agents produce irritating or disabling effects that rapidly disappear within minutes after exposure ceases.
  ♦ Central nervous system depressants are compounds that have the predominant effect of depressing or blocking the activity of the central nervous system. The primary mental effects include the disruption of the ability to think, sedation, and lack of motivation.
  ♦ Central nervous system stimulants are compounds that have the predominant effect of flooding the brain with too much information.
The primary mental effect is loss of concentration, causing indecisiveness and the inability to act in a sustained, purposeful manner.

In summary, the emergency responders in the U.S. must be prepared to deal with an extensive range of chemical agents, including those that have been developed and stockpiled for military use. The CDC recommendation report: *Biological and Chemical Terrorism: Strategic Plan for Preparedness and Response* (2000) states "Chemical terrorism acts are likely to be overt because the effects of chemical agents absorbed through inhalation or by absorption through the skin or mucous membranes are usually immediate and obvious. Such attacks elicit immediate response from police, fire, and EMS personnel" (p.3).

The 3/30 Rule and how will it result in fewer fatalities in the event of a CA terrorism incident

Maglione, (2000) stated, "Any terrorist incident involving chemical, biological, radiological or conventional explosives will by design seek to injure or kill. Immediate and decisive action must be taken by authorities to mitigate injury and prevent death. Fire departments will respond to a terrorist incident immediately, usually in less than five minutes. How well we are prepared will correlate with the degree to which we can protect life, property and the environment" (n.p).

Moore wrote in 2000, that local first responders would be the first link in the response chain to any terrorism incident in the United States, followed by state and federal assistance. This is why local capability is crucial to reducing preventable injuries and deaths caused by terrorist attacks. Moore further believes that the issues of
preparedness, rapidity of response, and government response integration will determine either the success level of our nation’s ability to respond to a major terrorist attack.

Sprinzak, et al, (1999) wrote that the existing local capabilities should be utilized because federal response units usually take about 8-12 hours before they arrive at the scene leaving a wide time frame in which local first responders will be operating on their own.

Jarboe, in 1996, wrote, "If faced with an incident involving a chemical weapon agent, first responders must decide whether to mount an offensive or defensive operation. That is, will the mission be one of rescuing savable victims or to establish a safe perimeter from which to aid victims" (p.32)

Eversole & Hunt (2001), state that the "Guidelines for Incident Commander's Use of Firefighter Protective Ensemble with Self Contained Breathing Apparatus For Rescue Operations During A Terrorist Chemical Agent Incident, commonly known as the 3/30 Rule, provide guidance to the incident commander on how to direct rapid rescue of viable victims in a contaminated environment. While the full report runs over 60 pages, the two primary findings it presents are very simple" (p.28):

- Standard turnout gear with SCBA provides a first responder with sufficient protection from nerve agent vapor hazards inside interior or downwind areas of the hot zone to allow 30 minutes of rescue time for known live victims.
- Self-taped turnout gear with SCBA provides sufficient protection in an unknown nerve agent environment for a three-minute reconnaissance to search for living victims (or a two-minute reconnaissance if HD - distilled sulfur mustard agent - is suspected.)
The test findings of the U.S. Army SBCCOM *Guidelines for Incident Commander's Use of Firefighter Protective Ensemble with Self Contained Breathing Apparatus For Rescue Operations During A Terrorist Chemical Agent Incident* (1999) state "minimizing rescuer exposure duration will minimize their potential hazard. However, rescue in standard turnout gear with SCBA is protected adequately for 30 minutes, even without taking time to apply quick fixes, such as duct tape. Time delays before rescuing known live victims may increase the cumulative dosage a victim receives. Quick entry, rescue, and exit, while diligently avoiding any contact with liquid contamination, will minimize the hazards to victims and rescuers" (p.6).

In 2001, Eversole & Hunt wrote about the implementing the 3/30 Rule at the scene of a chemical terrorist incident:

"While no single guideline can address every situation incident commanders may face, the logic behind these guidelines is straightforward. If first responders operating with full running gear and SCBA find viable patients approximately 15 minutes after the chemical release, the atmosphere isn't likely to be an immediate danger to life and health. Responders should be sufficiently protected to remove viable victims and perform initial gross decontamination. If they enter the site and find no viable victims, the level of exposure is clearly above the IDLH level, and the rescuers should limit their entry to a rapid recon, minimizing their on-scene time and exposure. Gross decontamination of responders prior to doffing their PPE is required" (p.28).
FEMA Fact Sheet: *Emergency Response to Terrorism* (2001) states "it is critical that emergency responders understand the implications of these modern threats and know proper response procedures and the limits of safe and prudent response. This knowledge will help prevent further fatalities" (p.16).

In summary, a chemical terrorist attack would require LFD responders to deal with a set of circumstances that are far different from regular fire department emergencies. Waiting up to 60 minutes to get a HAZMAT team on the scene, suited up, and into the hot zone to rescue victims, virtually assures that many viable-rescue victims will become fatalities. However, according to Eversole & Hunt (2001), "The 3/30 Rule is simple and easy for responders to remember six months or six years from now. By training, exercising and incorporating this as a response option, responders will develop a level of confidence that they can handle the initial response to a WMD incident" (p. 29).

**PROCEDURES**

Evaluative research was the method used in developing a 3/30 Rule Standard Operating Procedure (SOP) for the LFD. The research procedures used in preparing this paper began with a literature review at the Learning Resource Center (LRC) at the NFA in June of 2001. Additional literature reviews were conducted through the use of the Internet and from various library materials.

The literature targeted magazines, journals, newsletters, fact sheets and prior Executive Fire Officer (EFO) applied research projects for the rationale on determining the capabilities of using the 3/30 Rule to guide LFD responders in chemical agent
terrorism response. Applicable national standards, such as OSHA regulations, were also researched to ensure uniformity between parochial and national concerns.

Multiple parameters were studied in conducting this research project. The research objectives were to identify: (1) if the United States is vulnerable to chemical agent terrorism; (2) what is chemical agent terrorism; (3) what is the 3/30 Rule and how will it result in fewer fatalities in the event of a CA terrorism incident. A key parameter to the success of this research project was to provide information to develop a SOP for LFD personnel responding to a mass-casualty chemical terrorism incident (Appendix A).

The first step in this project was to conduct interviews with individuals with recognized expertise in the subject matter. The first interview was with Captain Alan Breazeale of the Lubbock Fire Department. Captain Breazeale is responsible for the initial creation of the LFD HAZMAT team in 1989, and is currently responsible for researching and developing response procedures to WMD events for the LFD. Captain Breazeale is one of the few people in the U.S. that was certified by the National Fire Academy as a Hazardous Materials Specialist. In addition, Captain Breazeale holds the designations of Certified Emergency Manager (CEM) and Certified Hazardous Materials Manager (CHMM). The purpose of this interview was to review life safety concerns and research the feasibility of developing and implementing an SOP utilizing the 3/30 Rule in response to CA terrorism incidents. The next interview was with Ray Vaughn, PE, who is a Certified Industrial Hygienist (CIH) and a Certified Safety Professional (CSP). Mr. Vaughn is a private consultant who performs professional regulatory and industrial hygiene consulting services throughout the United States. The purpose of this interview was to determine what are the occupational hazards and concerns for personnel
performing 3/30 Rule operations in contaminated environments. The results of these informal interviews are included in the "Results" section of this report.

The next step in this project was to evaluate the needs and duties (Appendix D) of LFD responders at a CA terrorism incident, so that the project focus chosen would satisfy those needs. One need identified was to develop a SOP, based on the 3/30 Rule, for responding to CA terrorism incidents and promote the benefits of this procedure to the LFD. Additional needs included identifying local resource cost (Appendix C) and researching the terrorism funding status of federal agencies in order to identify possible avenues of capital assistance.

This research had the following limitations. The first limitation was the fact that although the 3/30 Rule was released in 1999, it has not been widely publicized, until recently. As yet, most fire departments have not reviewed or adopted the premise of utilizing first responders to perform rapid recon/rescue operations in a contaminated CA environment. Therefore, standardized operating procedures for this type of project were not readily available from other departments for review or comparison. The second limitation was that the Occupational Safety and Health Agency (OSHA) has not formally approved the 3/30 Rule. Although discussions have indicated that, based on the results of the scientific testing, OSHA would rule in favor of immediate rescue operations. However, this ambiguity by OSHA places an increased level of liability on Incident Commanders and increases the difficulty of gaining acceptance from front line personnel.

Reference material was extremely limited in relation to the use of the 3/30 Rule in a contaminated CA environment. Research related to this subject was restricted to
reports available in magazines, journals, newsletters, fact sheets and prior EFO applied research projects. Recommendations were made on the basis of reference material available to the researcher operating within the above-mentioned constraints.

**Definition of Terms**

Most of the following definitions were taken from the National Fire Academy, Applied Research Project of Deputy Chief Theodore Lee Jarboe (1996), entitled *Fire Service Planning in Montgomery County to Manage the Consequences of Terrorism Involving Chemical Warfare Agents*. Other definitions were taken from various resources including Jessica Stern’s book entitled *The Ultimate Terrorist*.

**Assessment** - The evaluation and interpretation of measurements and other information to provide a basis for decision-making.

**Blister Agent** - A chemical agent which produces local irritation and damage to the skin and mucous membranes, pain and injury to the eyes, reddening and blistering of the skin, and when inhaled, damage to the respiratory tract.

**Blood Agent** - A chemical agent, which is inhaled and absorbed into the blood. The blood carries the agent to all body tissues where it interferes with the tissue.

**Chemical Agent** - Any chemical substance which is intended for use in military operations to kill, seriously injure, or incapacitate humans because of its physiological effects.

**Chemical Agent Symbol** - A code usually consisting of two letters that are used as a designation to identify chemical agents, e.g., GB for the chemical agent sarin.

**Chemical Warfare Agent** - A chemical substance which, because of its physiological, psychological, or pharmacological effects, is intended for use in military operations to
kill, seriously injure, or incapacitate humans (or animals through its toxicological effects. Excluded are riot control agents, chemical herbicides, and smoke and flame agents.

**Choking Agents** - These agents cause the alveoli in the lungs to constantly secrete watery fluid into the air sacs, which is called pulmonary edema. When a lethal amount of a choking agent is received, the air sacs become so flooded that the air cannot enter and the victim dies of anoxia (oxygen deficiency); also known as a dry land drowning.

**Combating Terrorism** - The full range of Federal programs and activities applied against terrorism, domestically and abroad, regardless of the source or motive.

**Decontamination** - The process of neutralizing or removing contaminants that have accumulated on personnel, clothing, and equipment.

**Emergency Response Team** - A team composed of Federal program and support personnel, which FEMA activates and deploys into an area affected by a major disaster or emergency.

**Evacuation** - Organized, phased, and supervised dispersal of civilians from dangerous or potentially dangerous areas, and their reception and care in safe areas.

**First Responder** - Local police, fire, and emergency medical personnel who first arrive on the scene of an incident and take action to save lives, protect property, and meet basic human needs.

**Incapacitating Agent** - An agent that produces physiological or mental effects, or both, that may persist for hours or days after exposure, rendering an individual incapable of performing his or her assigned duties.
**M8 Chemical Agent Detector Paper** - A paper used to detect and identify liquid V- and G-type nerve agents and H-type blister agents. It does not detect chemical agent vapors.

**M256 Kit** - A kit that detects and identifies vapor concentrations of nerve, blister, and blood agents.

**Macroterrorism** - Terrorist acts that result in mass casualties.

**NBC** - Nuclear, Biological, Chemical.

**Nerve Agents** - Agents which effect the transmission of nerve impulses by reacting with the enzyme cholinesterase, permitting an accumulation of acetylcholine and continuous muscle stimulation. The muscles tire due to over stimulation and begin to contract.

**Non-Persistent Agent** - An agent that remains in the target area(s) for a relatively short period of time. The hazard, predominantly vapor, will exist for minutes or, in exceptional cases, hours after dissemination of the agent. As a general rule, a non-persistent agent duration will be less than 12 hours.

**Persistent Agent** - An agent that remains in the target area for longer periods of time. Hazards from both vapor and liquid may exist for hours, days, or in exceptional cases, weeks or months after dissemination of the agent. As a general rule, persistent agents duration will be greater than 12 hours.

**Response** - Those activities and programs designed to address the immediate and short-term effects of the onset of an emergency or disaster.

**Terrorism** - Terrorism includes the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.
**Vesicant Agent** - An agent that acts on the eyes and lungs and blisters the skin.

Vomiting Agent - Compounds, which cause irritation of the upper respiratory tract and involuntary vomiting.

**Weapon of Mass Destruction (WMD)** - A WMD is any device, material, or substance used in a manner, in a quantity or type, or under circumstances evidencing intent to cause death or serious injury to persons or significant damage to property.

**RESULTS**

Using a literature review, the research questions were answered and conclusions were drawn about the need for developing a SOP, based on the 3/30 Rule, for responding to CA terrorism incidents. For the researcher, it was clearly indicated that a SOP providing guidelines for rapid recon/rescue would enable LFD personnel to be better prepared to conduct operations at a mass casualty CA terrorism incident.

**Is the U.S. Vulnerable to Chemical Agent Terrorism?**

In her book *The Ultimate Terrorists*, Jessica Stern coins the term "macro-terrorism" to describe terrorist acts that result in mass casualties. On September 11th 2001, macro-terrorism became a reality in the United States. This dubious fact would have come to pass sooner if the tremendous thermal blast had not destroyed the cyanide, which was packed in with the explosive that rocked the World Trade Center in 1993, thus preventing cyanide gas from spreading throughout the area. It is no longer a matter of if and when, but rather how deadly will the next weapon of mass destruction be, that is used against the people and institutions of the United States.

The FBI presently is tracking several groups around the world that have the capability and inclination to use CA weapons in terror attacks. This inevitable attempt...
by domestic or foreign terrorists to use such weapons against the United States requires that emergency first responders be prepared to manage the consequences of such an incident.

Due to open borders of the U.S. and the liberty enjoyed by our citizens and the apparent willingness of some terrorist to die in order to kill, there is a high probability that an incident will happen. A WMD will be used against Americans in our own country.

The time to manage the consequences of such an attack is now. The emergence of macro-terrorist means that we must become macro-responders, seeking out and developing new solutions in consequence management for a rapidly changing environment.

**What is Chemical Agent Terrorism?**

Chemical agent terrorism is the unlawful use of chemical agents to intimidate or coerce people or governments. Chemical agents such as nerve, blister or choking agents are used to produce illness or death in large numbers of people (Appendix E). The potential for catastrophic casualties in chemical terrorist incidents is high due to their accessibility and ability to be rapidly disseminated. A chemical terrorist attack is intentionally designed to harm or kill and could affect up to thousands of people.

**What is the 3/30 Rule and how will it result in fewer fatalities in the event of a CA terrorism incident?**

During the research process of this project an informal interview was conducted with Ray Vaughn, PE, who is a Certified Industrial Hygienist (CIH) and a Certified Safety Professional (CSP). Mr. Vaughn is a private consultant who performs professional regulatory and industrial hygiene consulting services throughout the United States. The
purpose of this interview was to determine what are the occupational hazards and concerns for personnel performing 3/30 Rule operations in contaminated environments.

Mr. Vaughn believes that detection, diagnosis, and mitigation of illness and injury caused by CA terrorism is a complex process that involves numerous details and activities including the provision of prophylactic protective equipment, chemical antidotes, and long term medical supervision. Early chemical detection and identification is essential for ensuring a safe response to a CA attack. Mr. Vaughn recommends a comprehensive response to CA terrorism incidents involving chemical identification, medical treatment and prophylaxis for affected persons, and the initiation of environmental decontamination measures.

Mr. Vaughn cautions that emergency responders could suffer a lifetime of debilitating effects as a result of exposure to minute amounts of chemical agents. Much in the same manner as soldiers who were exposed to chemical agents during Desert Storm have been affected.

Mr. Vaughn’s statements carry a sobering warning of just how dangerous these chemicals are that may be encountered in the field. The level of danger involved provides a mandate that 3/30 Rule tactics only be used when lives are at risk.

The next interview conducted during the research process was with Captain Alan Breazeale, who is responsible for providing operational oversight of the WMD response program for the LFD. The purpose of this interview was to determine the feasibility of utilizing the 3/30 Rule in response to a chemical terrorism incident and what would be the expected results.
Captain Breazeale explained that the feasibility of utilizing the 3/30 Rule is backed up by sound scientific testing as reported in the *Guidelines for Incident Commander's Use of Firefighter Protective Ensemble with Self Contained Breathing Apparatus For Rescue Operations During A Terrorist Chemical Agent Incident*. However, he advises that any response to a CA incident will be impacted by the preparedness of first responders to implement 3/30 Rule tactics.

Captain Breazeale explained that for LFD responders to address chemical terrorism operationally and rapidly, their collective efforts will need coordinating, and they will have to react instinctively and collaboratively as they do in emergency situations for which they have been adequately trained. However, as unlikely a chemical terrorist act is in any given locale, its potential impact makes it vital to LFD responders, especially the principal decision makers, that preplans and procedures be developed and training conducted well in advance of a CA incident.

Captain Breazeale notes that to achieve the objective of acquiring support for the development and use of a SOP utilizing the 3/30 Rule requires an in-depth analysis of governmental regulatory standards. The framework of these regulatory standards is the framework in which one is required to function in developing response procedures for a chemical terrorism incident. While he believes that OSHA would probably rule in favor of immediate rescue, based on the results of the scientific testing, he cautions that OSHA has not provided a written opinion on the 3/30 Rule, and any department or incident commander that implements rapid recon/rescue operations based on the 3/30 Rule could be incurring increased liability.
Captain Breazeale further explained that after an attack with chemical agents (Appendix F), there is a "golden hour" within which to make a difference. After that hour, those who are going to survive do so, and those who are not going to survive, do not. This golden hour is when first responders utilizing the 3/30 Rule as a guide can conduct rapid recon/rescue operations to remove non-ambulatory victims to a gross decontamination site. Once decontaminated and removed from the incident site, or "hot zone," victims can be dispersed to hospitals. These actions if conducted within the golden hour could save the lives of many victims that would not otherwise survive.

In summary, the 3/30 Rule is not for handling routine HAZMAT incidents with lower levels of protection. Normal procedures should be followed when lives are not at stake. However, when lives are at risk and the number of victims injured by a CA exceeds the capability of personnel in protective level A chemical suits to rescue in the golden hour, then the incident commander must consider the use of rapid recon/rescue in lower levels of personal protective equipment as outlined in the 3/30 Rule. It is the expected result of saving lives that proves the need and feasibility of using 3/30 Rule rapid recon/rescue tactics, when faced with evidence of a clear and present danger from chemical agents to injured victims. A primary objective of this research is to develop a standard operation procedure (Appendix A) that utilizes existing resources to the best advantage of the emergency responders and the community until resources and aid arrive from state and federal response agencies.

DISCUSSION

The literature review confirmed the authors opinion that CA terrorism is a growing threat and that the LFD must be prepared to respond to and deal with this type of
emergency event. The effects of macro terrorism are so horrendous and tragic that The
United Nations Security Council (1999), unanimously adopted resolution 1269,
unequivocally condemning all acts, methods, and practices of terrorism, and calling on
states to strengthen international cooperation in fighting terrorism and bringing terrorists
to justice.

**Financial Management Concerns**

Tremendous improvements have been made in our local and national
preparedness to respond to mass casualty terrorism incidents. However, more
progress is needed and training of the next generation of local responders and officials
at all levels of government will remain an ongoing task. Local emergency response
agencies have received extra tasking with the increased concern about the dangers of
new terrorist trends, yet they have not benefited from a sustained increase in funding
support to fundamentally change their impact on the problem.

The United States OMB Annual Report notes that from 1998 to 2001 spending
for preparing for and responding to terrorist acts increased from $126 million to $627
million, an increase of 398%. This shift is particularly relevant for funding relating to
WMD terrorism and incident response. The increase in funding for preparing for and
responding to WMD terrorist acts increased from $89 million in 1998 to $566 million
three years later, an increase of 536% (Appendix G). In contrast, emergency response
agencies have received only a small portion of sustained funding to local departments
over the same period. A shift in funding emphasis seems warranted at this stage of
American terrorism policy. Increasing emphasis should be place on funding for the front
line response agencies. Local first responders perform critical missions in combating
terrorism and Congress will have to decide who will pay for the infrastructure and capabilities necessary to meet the threat.

The LFD has made great strides in recent years to enhance its capabilities to respond to terrorism, particularly terrorist use of weapons of mass destruction (WMD). However in our anxiousness to address the threat of terrorism, the department must be careful that it does not confuse the act of spending big with spending smart.

Funding, as in so many instances, is the determining factor of success and local first responder agencies are no different in this aspect. In addition, local departments have not yet developed a culture of expertise in terrorism preparedness. Therefore, it is necessary that the LFD devote funds to the following activities:

- Invest in chemical and biological agent detection. Detection is the first line of defense; it is where tactical response begins.
- Mandate WMD awareness and training. New awareness, education, and training concepts will be the keys to success.
- Encourage seminars and conferences, the more the better. This type of training offers a significant return for a relatively small investment.
- Identify, train, and mentor individuals within organizations. A new culture must be created to deal with the consequences of terrorist use of WMD.
- Prepare for a tiered response. National assets are generally not going to be able to respond to an incident within 6 to 12 hours. In that case, local responders will have to carry the burden of the immediate response.

**Implications**
The implications of this research for the LFD is that the most effective action will depend on all personnel communicating, and coordinating their actions, as well as working closely with federal, state, and local authorities. For the LFD to achieve these goals at a CA terrorism incident, they must prepare by:

- Performing advanced training of emergency first responders on response tactics to CA terrorism incidents.
- Developing the capacity to detect and monitor chemical agents.
- Procuring adequate supply of chemical protective equipment.
- Developing guidelines for the detection and decontamination CA victims.
- Developing standard operating procedures for rapid recon/rescue operations to a mass casualty CA terrorism incident.

The author of this research project has reached the conclusion that LFD personnel responding to a chemical agent terrorist attack on a civilian population will face extraordinary crisis control and consequence management problems. According to Jarboe et al., *A Systematic Approach to Rescue Operations* (1998), "If the number of live victims exposed to and impaired by a chemical agent(s) exceeds the availability of personnel in level A suits to rescue in a timely manner, then the Incident Commander must consider the use of other acceptable personal protective ensembles" (p.1).

The literature review confirms and supports the fact that the best way for the LFD to prepare and train for a CA terrorism incident is by incorporating the 3/30 Rule into its response procedures. The United States Domestic Preparedness Program conducted extensive testing on firefighters' protective gear to determine suitability for use in a CA environment. This testing provided the data needed to develop guidelines for response
to CA terrorism incidents. These test findings; known as the 3/30 Rule, provide incident commanders with guidance on how to direct rapid recon/rescue operations in a contaminated environment. According to Eversole and Hunt (2001), the two primary findings are:

- Standard turnout gear with SCBA provides a first responder with sufficient protection from nerve agent vapor hazards inside interior or downwind areas of the hot zone to allow 30 minutes of rescue time for known live victims.

- Self-taped turnout gear with SCBA provides sufficient protection in an unknown nerve agent environment for a three-minute reconnaissance to search for living victims (or a two-minute reconnaissance if HD — distilled sulfur mustard agent — is suspected.

Funded under the Domestic Preparedness Program, the Chemical Weapons Improved Response Program developed the 3/30 Rule after evaluating methods of enhancing response to CA terrorism incidents. The tests showed a significant level of protection from nerve agent vapor with either the PBI or Nomex types of structural firefighting gear. By further limiting the routes of exposure by taping seams and openings closed with duct tape, higher levels of protection were obtained.

While the 3/30 Rule cannot address every situation first responders may face, the guidelines developed from this scientific testing are simple. If first responders enter a CA contaminated site and do not find any viable victims, the level of exposure is obviously immediately dangerous to life and health, and the rescuers should limit their entry to no more than a 3-minute rapid reconnaissance followed by gross decontamination. However, if first responders operating with full turnout gear and
SCBA find viable victims approximately 10 to 15 minutes after a CA release, the atmosphere isn't likely to be immediately dangerous to life and health. Responders should be sufficiently protected for a 30-minute period to remove viable victims to a decontamination area.

Due to the literature review the author has reached the conclusion that the LFD needs a preconceived written SOP for use by LFD personnel to react rapidly, competently, and instinctively during and after a CA terrorism incident. Furthermore, the implications of the literature review are clear. The 3/30 Rule provides the most realistic and productive response guidance to CA terrorism incidents that exists today and using the 3/30 Rule, as a basis for rapid recon/rescue operations will result in fewer fatalities.

RECOMMENDATIONS

The main emphasis of any procedure that will cause a strategic change in operational policy must be on strengthening the department and making the best use of material resources and personnel. The 3/30 Rule fulfills those requirements and those departments that best utilize the knowledge gained from this advanced scientific testing will undoubtedly suffer fewer fatalities in the event of a CA terrorism incident. Therefore, it is recommended that the LFD should incorporate the attached written procedure (Appendix A) Rapid Recon/Rescue in Chemical Agent Environments (The 3/30 Rule) into its standard operational procedures manual.

As is the case in many sustained emergency operations, equipment management and supply can determine the difference between success or failure. The use of turnout gear in rapid recon/rescue operations would be only the first step of many in a response
to a CA terrorism incident. Therefore it is recommended that the LFD obtain the identified material resources (Appendix C) in order to provide its professionals with adequate CA response capabilities for a sustained response to a CA terrorism incident.

Training of all personnel should be conducted to explain the purpose of the *Rapid Recon/Rescue in Chemical Agent Environments (The 3/30 Rule)* procedure. Training should be focused towards educating the firefighter on the supporting research of the protective capabilities of their turnout out gear and to demonstrate the effectiveness of using the 3/30 Rule at a mass casualty CA terrorism incident. The steps for obtaining support and acceptance from first responders include: identifying CA hazards (Appendix F), assessing the attitudes and needs, implementing planning within the department, evaluating resources, and initiating a department wide training program.

In Summary, The recommendations resulting from this research include: (1) the LFD incorporating the attached written procedure (Appendix A) *Rapid Recon/Rescue in Chemical Agent Environments (The 3/30 Rule)* into its SOP manual; (2) the LFD obtaining the identified equipment and resources (Appendix C) needed for a sustained response to a CA terrorism incident; and (3) all LFD personnel being fully trained in the tactical and strategic implementation of this new procedure.
REFERENCE LIST


APPENDIX A
I. PURPOSES OF THE EMERGENCY RESPONSE PROCEDURES

1. The purpose of this SOP is to provide first responders with Guidelines for developing an on-scene action plan to safely and effectively rescue live victims during a chemical agent incident. Saving live victims is the rescue mission, while minimizing risk of harm to the rescuers.

2. The Level A suit represents the highest level of protection to emergency responders against both respiratory and skin hazard or exposure to chemical agents. However, if the number of live victims exposed to and impaired by a chemical agent(s) exceeds the availability of personnel in level A suits to rescue in a timely manner, then the Incident Commander must consider the use of other acceptable personal protective ensembles.

3. Turnout gear with Self-Contained Breathing Apparatus (SCBA) provides less protection than Level A suits, but will allow short exposures. Configurations of turnout gear with SCBA, listed in order of increased protection, include:
   - Standard (no use of duct tape)
   - Self-Taped
   - Buddy-Taped
   - Turnout gear over Tyvek undergarment

4. Note: Unless the chemical agent(s) is (are) identified by class or name, first responders must gather information about the incident based on:
   - Signs and symptoms of casualties
   - Comments from casualties and onlookers
   - Site specific information
   - Information from reconnaissance or detector readings,
   - Information available through intelligence provided by law enforcement officers

5. Note: First responders are cautioned not to "automatically" assume that the incident involves a super toxic chemical agent. The released material could be a substantially less toxic industrial chemical or a riot control agent such as pepper spray.
II. "Go" or a "No Go" Rescue Decision Factors

1. **Weather Conditions**: Consider the impact of wind direction and speed, temperature and humidity, and precipitation on the behavior and spread of the chemical agent(s) and on emergency operations. Use on-scene weather monitoring equipment if available.

2. **Scene Hazard Assessment**: Avoid "tunnel vision." Don't just assume chemical-related hazards. Also consider the possible presence of biological agents, radiological materials, and/or explosive devices.

3. **Preliminary Assessment**: If no living victims are visible from outside the building, the Incident Commander should assume a high concentration of chemical agent likely is present. However, the IC may consider a rapid reconnaissance by entering the building for no more than 3 minutes only to look for living victims.

4. **Recon (3 minutes)**: Conduct Recon to determine if live victims are still in the area of the chemical agent release. If possible, view the contaminated area through a closed window, an entrance doorway, or other reasonably safe location, to gather victim information.

5. **Note**: Before entering the building, the Recon team must increase their level of protection by at least self duct taping protective clothing openings and closures and continuing SCBA use. Duct-tape the following closure and openings as a minimum: the neck, around the face piece, the fly, wrists, ankles, waist, and the closure down the front of the jacket.

6. If no living victims are seen, the Recon team must leave the building immediately, seal and secure the building, and wait for the HAZMAT team in Level A suits to arrive at the scene.

7. **Rescue (30 minutes)**: The Incident Commander can assume nerve agent concentration is low and immediately start rescue operations (no longer than 30 minutes exposure for each responder) for live victims if **Recon personnel report**:
   - Living victims with nerve agent exposure symptoms.
   - Victims have been exposed for 15 minutes or more.
   - Mustard (HD) is not suspected.
8. **Note**: If mustard (HD) is suspected, rescue can continue at increased risk to rescuers. Testing shows that 50% of rescuers exposed for 2 minutes would experience latent skin reddening in more susceptible areas, such as the groin. Rescuers staying in HD environments of unknown concentration for 30 minutes would not receive the 5% lethal dosage.

9. **Warning**: Avoid entering rooms, chambers, or stairwells, where live victims are not visible, when evacuating victims. These areas may have increased chemical agent contamination that could further injure the victim or contribute to the rescuer's dosage.

### III. Victim Information

1. **Location**: Are casualties visible near an entrance? Are they in the line-of-sight? Can they be heard? Estimate how long it would take to reach and remove them.

2. **Number**: If there are enough HAZMAT team personnel in Level A suits available to rescue live victims in a timely manner, use them. Otherwise, consider using personnel who are wearing an acceptable protective clothing alternative (taped or untaped turnout gear with SCBA), as approved by the Incident Commander.


4. **Exposure**: Estimate how long they have been exposed to the chemical agent(s). 20 minutes? 30 minutes? Longer? Shorter?

### IV. Rescue and Standby Teams

1. Assemble two-in/two-out entry and standby teams. Assign at least two personnel per team with appropriate personal protection. Ensure personnel are hydrated. If outside temperatures are elevated, call for Rehab vehicle with cooling vests.

2. **Recon Team Exposure Time**: Limit the initial exposure time to 2-3 minutes. Self-taped turnout gear with SCBA provides sufficient protection in an unknown nerve agent environment for a three-minute reconnaissance to search for living victims or a two-minute reconnaissance if HD - distilled sulfur mustard agent - is suspected. (See Maximum Reconnaissance Exposure Time Table)
3. **Rescue Team Exposure Time:** Limit the initial exposure time to **30 minutes**. Standard turnout gear with SCBA provides a first responder with sufficient protection from nerve agent vapor hazards inside interior or downwind areas of the hot zone to allow 30 minutes of rescue time for known live victims. No entry team should re-enter the contaminated area unless authorized and extreme circumstances clearly warrant doing so. The IC may allow the rescue personnel to operate in the contaminated area for a longer period based on chemical agent(s) released, the quantity, its properties, the circumstances surrounding its release, and vapor suppression measures used.

4. **Chemical Agent Hazard Reduction:** Consider use of positive pressure ventilation (PPV) fans (electric preferred) or other fans to reduce or redirect vapor or aerosol concentration. **Be sure** that use of these fans will not spread chemical agent to endanger other people. If fans are acceptable, they should be placed in service while rescuers are donning their protective equipment.

5. **Review Information about Chemical Warfare Agents (CWA):** Remember, all chemical warfare agents are heavier than air, **except for HCN**. The higher the vapor pressure of a CWA, the higher its rate of evaporation (volatility). Temperature and humidity can affect CWA properties and exposure risk.

6. **Caution:** Because concentrations of the chemical agent released in a building could result in different concentrations in the rooms and corridors, victims should be removed through doors or windows that lead directly to the outside. If this is not possible, the rescuers should consider the use of escape masks or chemical masks by victims who must leave through other rooms and corridors to reach the outside.

7. **Caution:** When deciding which way to remove victims, remember that the chemical agent released is likely to be heavier than air. So, victims at ground level should be removed through a window or door that leads directly to the outside. When evacuating upper floors, consider removing victims through upper floor windows or by roof, using ground or aerial ladders.
V. **Personal Protective Ensemble (PPE)**

1. SCBA is mandatory for all rescue missions. SCBA’s provide an excellent inhalation Protection Factor (PF) of 10,000. Rescue personnel must wear at a minimum standard turnout gear with SCBA. If the situation permits, a Tyvek F (suit under personal protective clothing, with butyl gloves worn under NFPA-compliant gloves. PPE openings should be taped with duct tape by the responder or a buddy.

VI. **Emergency Decontamination**

1. Unless delay would compromise rescue, set up decontamination area before entry is made, locate setup as close as practicable, and monitor operations. Rescuers must remove their protective clothing before removing their regulator and face piece to avoid breathing any vapors possibly trapped in their clothing. Use chemical agent monitors.

2. **Caution:** Face Piece Removal. After exiting the rescue area, rescuers must continue using their SCBA to prevent respiratory harm from "off-gassing" of chemical agent until their decontamination is complete. The regulator and face piece must be the last items removed.

VII. **POST ENTRY**

1. **Medical Monitoring:** Check vital signs and ECG. Check again for chemical agent signs and symptoms.

2. **Rehabilitation (REHAB):** Provide rest and re-hydration. Re-check vital signs as necessary.

Remember this SOP is just a guide. Existing conditions, knowledge of the chemical agents, good judgment, combined with available personnel and personal protective equipment, will greatly influence what level of protection rescue personnel use. The safety of both the rescuers and victims is of paramount concern. When level A suits are not available, the mission of protected rescuers is to rescue live victims, nothing more.
APPENDIX B
MAXIMUM RECONNAISSANCE EXPOSURE TIME

Responders entering an unknown vapor environment for reconnaissance should assume worst case conditions and assume agent GB for nerve agent. However, if the chemical agent is known, or the firefighter performing reconnaissance is not self-taped, the 3-minute rule should be modified as specified in the table below according to the firefighter protective equipment (FFPE) worn.

This table shows maximum exposure time estimates for various FFPE configurations inside a room saturated with chemical agent vapor. If, during reconnaissance, living nerve agent exposure victims are discovered at least 15 minutes after the chemical agent release, the maximum exposure time should be revised to 30 minutes.

<table>
<thead>
<tr>
<th>Agent</th>
<th>First Responder Symptom Level</th>
<th>Maximum Reconnaissance Exposure Time(^1) (Unknown Environment(^2)) for Various “Quick Fix” turnout Gear Configurations(^3) (minutes)</th>
<th>Turnout</th>
<th>Self-Taped Turnout</th>
<th>Buddy-Taped Turnout</th>
<th>Tyvek suit Under Turnout</th>
</tr>
</thead>
<tbody>
<tr>
<td>GB</td>
<td>Threshold(^5)</td>
<td>1.5</td>
<td>3.0</td>
<td>4.0</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5% Lethal(^6)</td>
<td>4.0</td>
<td>6.0</td>
<td>7.0</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td>GD</td>
<td>Threshold(^5)</td>
<td>1.5</td>
<td>4.0</td>
<td>6.0</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5% Lethal(^6)</td>
<td>5.5</td>
<td>10</td>
<td>12</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>VX</td>
<td>Threshold(^5)</td>
<td>17</td>
<td>24</td>
<td>28</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5% Lethal(^6)</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>HD</td>
<td>Threshold(^7)</td>
<td>0.7</td>
<td>2.0</td>
<td>9.0</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5% Lethal(^8)</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Based on physiological thresholds established by the national Academy of Science*.  
\(^2\) Assumes a constant, saturated vapor environment.  
\(^3\) Chemical agent present at its room temperature vapor pressure.  
\(^4\) See the next section for descriptions and photographs.  
\(^5\) At this exposure time, 1 in 2 responders would have onset symptoms of increased sweating and muscle weakness.  
\(^6\) At this exposure time, 1 in 20 responders may die without medical treatment.  
\(^7\) At this exposure time, 1 in 2 responders would develop localized skin reddening and possible blisters 4-18 hours after exposure.  
\(^8\) Maximum exposure time is limited to 30-minutes because MIST trials did not exceed 30 minutes. Therefore, physiological protective dosage factors after 30 minutes were not defined. Assuming no significant change in physiological protective dosage factors during exposures after 30 minutes, the maximum exposure times to half the 5% lethal effects range from 31 minutes (standard turnout gear) to 98 minutes (buddy-taped).

* Review of Acute Human-toxicity Estimates for Selected Chemical-Warfare Agents, Committee on Toxicology, National Research Council, 1997
APPENDIX C
## CAPITAL BUDGET ITEMS

### CHEMICAL AGENT RESPONSE EQUIPMENT

<table>
<thead>
<tr>
<th>Category</th>
<th>Item Description</th>
<th>Amount</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPE</td>
<td>Butyl hoods &amp; gloves</td>
<td>50pr</td>
<td>$20.00</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>Chemical resistant boots</td>
<td>Butyl Gloves</td>
<td>10pr</td>
<td>$118.00</td>
<td>$1,180.00</td>
</tr>
<tr>
<td>Chemical resistant boots</td>
<td>Servus firefighter boots</td>
<td>20pr</td>
<td>$67.00</td>
<td>$1,340.00</td>
</tr>
<tr>
<td>Chemical resistant gloves</td>
<td>Extreme temp gloves</td>
<td>10pr</td>
<td>$50.00</td>
<td>$500.00</td>
</tr>
<tr>
<td>Chemical resistant gloves</td>
<td>Viton gloves</td>
<td>50pr</td>
<td>$80.00</td>
<td>$4,000.00</td>
</tr>
<tr>
<td>Chemical resistant gloves</td>
<td>Neoprene gloves</td>
<td>400pr</td>
<td>$4.00</td>
<td>$1,600.00</td>
</tr>
<tr>
<td>Chemical resistant gloves</td>
<td>Nitrile gloves</td>
<td>400pr</td>
<td>$3.00</td>
<td>$1,200.00</td>
</tr>
<tr>
<td>Chemical resistant gloves</td>
<td>PVA gloves</td>
<td>50pr</td>
<td>$30.00</td>
<td>$1,500.00</td>
</tr>
<tr>
<td>Chemical resistant gloves</td>
<td>Silver shield</td>
<td>200pr</td>
<td>$5.00</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>Closed circuit rebreather</td>
<td>Four Hr rebreathers</td>
<td>650</td>
<td>$2.00</td>
<td>$13,000.00</td>
</tr>
<tr>
<td>Air purifying respirators</td>
<td>Scott C-420 vari-flo</td>
<td>650</td>
<td>$4.00</td>
<td>$2,600.00</td>
</tr>
<tr>
<td>Air purifying respirators</td>
<td>Scott PAPR battery pack</td>
<td>68</td>
<td>$20.00</td>
<td>$1,360.00</td>
</tr>
<tr>
<td>Air purifying respirators</td>
<td>Scott PAPR CZA 1 cannisters</td>
<td>32</td>
<td>$50.00</td>
<td>$1,600.00</td>
</tr>
<tr>
<td>Air purifying respirators</td>
<td>Multipurpose w/p-100 filter</td>
<td>13</td>
<td>$60.00</td>
<td>$780.00</td>
</tr>
<tr>
<td>Air purifying respirators</td>
<td>Ammonia w/p-100 filter</td>
<td>13</td>
<td>$60.00</td>
<td>$780.00</td>
</tr>
<tr>
<td>Air purifying respirators</td>
<td>Acid gas w/p-100 filter</td>
<td>13</td>
<td>$60.00</td>
<td>$780.00</td>
</tr>
<tr>
<td>Hooded Chem Resist clothing</td>
<td>Saranex Tyvek - Kapler 70436</td>
<td>25</td>
<td>$500.00</td>
<td>$12,500.00</td>
</tr>
<tr>
<td>Hooded Chem Resist clothing</td>
<td>Tyvek</td>
<td>10</td>
<td>$1,000.00</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>Hooded Chem Resist clothing</td>
<td>Level B encapsulated-Kappler 4T 371</td>
<td>20</td>
<td>$150.00</td>
<td>$3,000.00</td>
</tr>
<tr>
<td>Hooded Chem Resist clothing</td>
<td>Level B Non-encapsulated-Kappler 4T 424</td>
<td>20</td>
<td>$75.00</td>
<td>$1,500.00</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
<td>Quantity</td>
<td>Total Price</td>
<td>Unit Price</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>Personal Cooling</strong></td>
<td>Cool vests Kappler 99600</td>
<td>10</td>
<td>$332.00</td>
<td>$3,320.00</td>
</tr>
<tr>
<td><strong>Reuseable chem resistant suits</strong></td>
<td>Level A CSM Suit Kappler 42583</td>
<td>10</td>
<td>$2,300.00</td>
<td>$23,000.00</td>
</tr>
<tr>
<td><strong>Reuseable chem resistant suits</strong></td>
<td>Reflector Level A Flash Suit Kappler 46560</td>
<td>10</td>
<td>$2,000.00</td>
<td>$20,000.00</td>
</tr>
<tr>
<td><strong>Testing Equipment For Level A suits</strong></td>
<td>Level A pressure tester Kappler 99971</td>
<td>2</td>
<td>$850.00</td>
<td>$1,700.00</td>
</tr>
</tbody>
</table>

**DETECTION**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Quantity</th>
<th>Total Price</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hazards Categorizing</strong></td>
<td>MPN 40 K Night Vision Binocular</td>
<td>2</td>
<td>$700.00</td>
<td>$1,400.00</td>
</tr>
<tr>
<td><strong>M-256 Detection Kit for Chemical Agent</strong></td>
<td>M256A1 Kit</td>
<td>20</td>
<td>$40.00</td>
<td>$800.00</td>
</tr>
<tr>
<td><strong>M-8 Detection Paper for Chemical Agent</strong></td>
<td>M-8 Detection Paper</td>
<td>10</td>
<td>$20.00</td>
<td>$200.00</td>
</tr>
<tr>
<td><strong>M-9 Detection Paper for Chemical</strong></td>
<td>Roll of M-9 Detection Paper</td>
<td>10</td>
<td>$60.00</td>
<td>$600.00</td>
</tr>
<tr>
<td><strong>Multi-Gas Meter</strong></td>
<td>Innova Type 1312 Multigas Monitor</td>
<td>1</td>
<td>$27,000.00</td>
<td>$27,000.00</td>
</tr>
<tr>
<td><strong>Multi-Gas Meter</strong></td>
<td>Innova Calibration Gas</td>
<td>2</td>
<td>$253.00</td>
<td>$506.00</td>
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<tr>
<td><strong>Point Chemical Agent Detector and Alarm</strong></td>
<td>M18A2 Chemical Agent Kit</td>
<td>10</td>
<td>$294.00</td>
<td>$2,940.00</td>
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<tr>
<td><strong>Point Chemical Agent Detector and Alarm</strong></td>
<td>CAM Unit</td>
<td>1</td>
<td>$8,500.00</td>
<td>$5,600.00</td>
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</tbody>
</table>

**DECONTAMINATION**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Quantity</th>
<th>Total Price</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atropine Autoinjectors</strong></td>
<td>Atropine Autoinjectors</td>
<td>10</td>
<td>$25.00</td>
<td>$250.00</td>
</tr>
<tr>
<td><strong>Atropine Autoinjectors</strong></td>
<td>Mark I Autoinjector Trainers</td>
<td>5</td>
<td>$25.00</td>
<td>$125.00</td>
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<tr>
<td><strong>Decontamination Systems</strong></td>
<td>6500 watt Commercial Generator</td>
<td>1</td>
<td>$2,500.00</td>
<td>$2,500.00</td>
</tr>
<tr>
<td><strong>Decontamination Systems</strong></td>
<td>HazMat Vacuum/Pressure Pump DC</td>
<td>1</td>
<td>$250.00</td>
<td>$250.00</td>
</tr>
<tr>
<td><strong>Decontamination Systems</strong></td>
<td>HazMat Vacuum/Pressure Pump AC</td>
<td>1</td>
<td>$200.00</td>
<td>$800.00</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
<td>Quantity</td>
<td>Price 1</td>
<td>Price 2</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>-----------------------------------------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>Chlorine Institute Emergency Kits- Kit &quot;A&quot;</td>
<td>1</td>
<td>$1,550.00</td>
<td>$1,550.00</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>Chlorine Institute Emergency Kits- Kit &quot;B&quot;</td>
<td>1</td>
<td>$1,800.00</td>
<td>$1,800.00</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>Chlorine Institute Emergency Kits- Kit &quot;C&quot;</td>
<td>1</td>
<td>$1,850.00</td>
<td>$1,850.00</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>Decon Backboard</td>
<td>2</td>
<td>$265.00</td>
<td>$530.00</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>65 Gal Poly Overpac</td>
<td>50</td>
<td>$125.00</td>
<td>$750.00</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>20 Gal Poly Lab-Pac</td>
<td>50</td>
<td>$40.00</td>
<td>$2,000.00</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>95 Gal Poly Overpac</td>
<td>50</td>
<td>$152.00</td>
<td>$7,600.00</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>Metal Hand Pump-Counter Assembly</td>
<td>2</td>
<td>$450.00</td>
<td>$900.00</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>Nylon Hand Pump</td>
<td>2</td>
<td>$35.00</td>
<td>$70.00</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>Plastic Sheeting 6mil-60x100</td>
<td>5</td>
<td>$20.00</td>
<td>$100.00</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>Victims Personal Items Kit</td>
<td>20</td>
<td>$20.00</td>
<td>$400.00</td>
</tr>
<tr>
<td>Decontamination System Supplies</td>
<td>300' 6&quot; Booms</td>
<td>2</td>
<td>$1,300.00</td>
<td>$2,600.00</td>
</tr>
<tr>
<td><strong>COMMUNICATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Systems</td>
<td>Computer: min 1000Mhz,</td>
<td>2</td>
<td>$3,500.00</td>
<td>$7,000.00</td>
</tr>
<tr>
<td>Computer Systems</td>
<td>Portable Printer</td>
<td>2</td>
<td>$200.00</td>
<td>$400.00</td>
</tr>
<tr>
<td>Insuit or Hand Held Communications</td>
<td>800 Mhz Hand Radio: Ericsson PK3ZGT</td>
<td>10</td>
<td>$2,500.00</td>
<td>$25,000.00</td>
</tr>
<tr>
<td>Insuit or Hand Held Communications</td>
<td>4 Bank Charger for Ericsson PK3ZGT</td>
<td>1</td>
<td>$720.00</td>
<td>$720.00</td>
</tr>
<tr>
<td>Insuit or Hand Held Communications</td>
<td>Batteries for Ericsson PK3ZGT</td>
<td>20</td>
<td>$57.00</td>
<td>$1,040.00</td>
</tr>
<tr>
<td>Two-Way in Suit Communications</td>
<td>Two-Way in Suit</td>
<td>1</td>
<td>$2,700.00</td>
<td>$2,700.00</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>$209,221.00</td>
</tr>
</tbody>
</table>
APPENDIX D
1. Incident "Size-up" and assessment
2. Scene control
3. Chemical agent hazard determination
4. Pre-entry determination of appropriate protective clothing & equipment
5. Establishment of gross decontamination area
6. Entry into contaminated area for rapid recon. (3 min.)
7. Conduct rescue of viable victims (30 min.)
8. Perform gross decontamination of victims and entry personnel
9. Move injured to triage area
10. BLS / ALS Care
11. Transport of patients to hospital
12. Post-rapid recon/rescue evaluation
13. Complete chemical agent determination
14. Conduct stabilization of the chemical agent release
15. Recordkeeping and after action reporting
16. Complete analysis of actions
APPENDIX E
GENERAL INFORMATION ABOUT CHEMICAL AGENTS

Information on chemical agents was taken in part from various sources and "Medical Management of Chemical Casualties Handbook," US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, Md.

THE CLASSIFICATION OF CHEMICAL AGENTS

Chemical agents can be classified into two main categories by their volatility, persistent and non-persistent agents.

- A persistent agent continues to present a hazard for a considerable period of time after its delivery. It does this by remaining as a contact hazard or by vaporizing over a period of time to produce a hazard by inhalation. Non-persistent agents may be made persistent through a thickening process. To thicken a chemical agent polymers are often dissolved in the agent to produce a highly viscous substance. As a result of thickening the agent's persistency time and adhesive ability increase.

- A non-persistent agent disperses rapidly after its release and presents an immediate but short-lived hazard. Non-persistent agents are released as airborne particles, liquids and gasses; intoxication usually results from the inhalation of the chemical agent. Chemical agents with low boiling points and a high vapor pressure tend to be non-persistent agents.

THE EFFECTIVENESS OF A CHEMICAL WEAPON

The effectiveness of a chemical weapon the "capacity of an agent to produce the maximum number of casualties or amount of disruption of operations with the least amount of agent." There are many factors that can influence the effectiveness of a chemical agent; such as the amount of the agent release, environmental factors, target population size, etc. the duration of effectiveness for a chemical agent depends on several meteorological factors which can be seen in the following table.

PHYSICAL, CHEMICAL, AND TOXICOLOGICAL CHARACTERISTICS OF CHEMICAL AGENTS

Physical: The physical properties of chemical agents cover a very wide range. The physical state of chemical agents, under normal conditions, can be gaseous, liquid, or solid. The chemical agents have a large range of vapor pressure that ranges from high to negligible. The vapor densities of the agents vary from slightly lighter too much more heavier than air. The odors of the chemical agents vary from no odor to a very pungent odor. The known chemical weapon agents can be soluble or insoluble in water.

Chemical: Every chemical agent has its own separate chemical properties but a generalization can be made. Overall the agents are sufficiently stable to survive dissemination and transport for their biological action. The reactivity and the stability of agents can vary greatly from agent to agent.
FACTORS THAT INFLUENCE THE EFFECTIVENESS OF A CHEMICAL AGENT

<table>
<thead>
<tr>
<th>Factor</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winds</td>
<td>Winds can allow chemical agents to disperse rapidly in certain topographical areas. Lack of winds can cause a build up in the concentration of certain chemical agents.</td>
</tr>
<tr>
<td>Temperature</td>
<td>High temperatures tend to decrease the persistency of some agents while cold temperatures tend to increase the persistency of other agents.</td>
</tr>
<tr>
<td>Rain</td>
<td>Rain effects chemical agents by disposing some, diluting others, or by promoting hydrolysis in some agents. Overall rain may dispose of some particular agents but others will most likely still be able to be used.</td>
</tr>
<tr>
<td>Atmospheric Stability</td>
<td>When the temperature of the air is higher than that of the ground, chemical agents in a vapor state tend to stay persistent for longer periods of time. However when the temperature of the air is lower than that of the ground, chemical agents in the vapor state tend not to persist as long as they usually do.</td>
</tr>
</tbody>
</table>

Chemical Agent Symbols usually consist of two letters that are used as a designation to identify chemical agents (e.g. GA = Tabun) and have nothing to do with the chemical formula of the agent. Biological agents can take days to display symptoms while chemical agents are measured in minutes to hours. Easily observed indicators such as colored residue, dead foliage and dead insect and animal life are usually present.

COMMON CHEMICAL AGENTS

<table>
<thead>
<tr>
<th>Types</th>
<th>Agents</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blister</td>
<td>Mustard Nitrogen</td>
<td>Causes large skin blisters; respiratory damage; long term debilitating injuries, including blindness</td>
</tr>
<tr>
<td></td>
<td>Mustard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lewisite</td>
<td></td>
</tr>
<tr>
<td>Chocking</td>
<td>Phosgene</td>
<td>Death from lack of oxygen</td>
</tr>
<tr>
<td>Blood</td>
<td>Hydrogen</td>
<td>Interferes with body’s oxygen supply, causing death</td>
</tr>
<tr>
<td></td>
<td>Cyanide</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cyanogen Chloride</td>
<td></td>
</tr>
<tr>
<td>Nerve</td>
<td>Tabun</td>
<td>Loss of muscular control, respiratory failure, and death</td>
</tr>
<tr>
<td></td>
<td>Saman</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cyclosarin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BX</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fourth Generation</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>TFNM</td>
<td>Penetrates air filter; Incapacitation</td>
</tr>
<tr>
<td></td>
<td>BZ</td>
<td></td>
</tr>
</tbody>
</table>
TYPES OF CHEMICAL AGENTS

CHOKING AGENTS

**Phosgene, Others** - irritate the alveoli in the lungs. This irritation causes the alveoli to constantly secrete fluid into the lungs. The lungs slowly fill with this fluid (which is called pulmonary edema), and the victim dies from lack of oxygen (also known as dry land drowning).

**Description:** Liquid dispersed in a liquid-filled shell that explodes, rapidly vaporizing as a low-lying, white cloud of gas. It has a characteristic odor of sweet, newly mown hay or freshly cut grass or corn.

**Symptoms:** After a latent period, the victim experiences worsening respiratory distress that at first is unaccompanied by signs of pulmonary damage but that may progress relentlessly to death. Irritation of the larynx by very large concentrations of the agent may lead to sudden laryngeal spasm and death. The most prominent symptom following the latent period is difficulty breathing, perceived as shortness of breath with or without chest tightness. Death results from respiratory failure or in combination with the effects of lack of oxygen to vital organs and tissues. Complications include infection of damaged lungs and delayed death following such respiratory infections.

**Treatment:** No antidote.

**Protection:** Protective mask, clothing.

BLISTER AGENTS

**Mustard (H, HD)** - affect the eyes, respiratory tract, and skin, first as a cell irritant, and then as a cell poison. Blister agents initially cause irritation of the eyes (and respiratory tract if inhaled), erythema (reddening of the skin), then blistering or ulcerations followed by systemic poisoning. There are three types of blister agents: mustards, arsenicals, and urticiants.

A major military threat agent since its introduction in World War I, mustard is an oily liquid with color ranging from a light yellow to brown and has an odor of garlic, onion, or mustard (hence its name). Mustard constitutes both a vapor and a liquid threat to exposed skin and mucous membranes. Effects are delayed, appearing hours after exposure. A vesicant, it causes vesicles (blisters) on the skin; however, these agents also damage the eyes and airways by direct contact and have other effects.

* Dusty Mustard is a dissemination means, not a different agent. This material is a chemical agent impregnated on a carrier material. The persistence of dusty mustard depends on the carrier's physical characteristics, while its toxicity is a result of the mustard agent on the dust. Dusty-Mustard: solid particulates impregnated with mustard agent. Forms dust cloud upon release. Minute particulates are easily inhaled and
corrupt lung tissue in 10-15 minutes. Can also get onto skin and become active via sweat, etc. Is not a true persistent agent, as a breeze/wind can reduce residual effect through dispersal. Also, it adheres to larger particles once settled, thus it is difficult to become airborne a second time for inhalation. Skin contact & activation, however, is still possible in areas of concentration.

**Symptoms:** Blisters on the skin, irritation, conjunctivitis, corneal opacity, and damage in the eyes; mild upper respiratory irritation and burning progresses to marked airway damage; also nausea and vomiting and bone marrow damage. Organs most commonly affected are skin, eyes (with mild conjunctivitis to severe eye damage), and airways (with mild irritation of the upper respiratory tract to severe bronchiolar damage leading to necrosis and hemorrhage of the airway). The GI tract may be damaged. Death stems from respiratory failure, bacterial pneumonia, or immune system failure.

**Treatment:** No specific antidote. Immediate decontamination is the only way to reduce damage.

**Protection:** Protective mask, clothing. Persistence is 32-36 hours.

**Lewisite (L)**

**Description:** An oily, colorless liquid, having the odor of geraniums. It is a vesicant that damages eyes, skin, and airways by direct contact. After absorption, it causes an increase in capillary permeability to produce shock and organ damage.

**Symptoms:** Lewisite causes immediate pain or irritation of skin and mucous membranes. Blisters on the skin, and eye and airway damage similar to those seen after mustard exposure, develop later. A person with a droplet of Lewisite on his skin will note the burning and will immediately take steps to try to remove it. The vapor is so irritating that a person will seek to leave a contaminated area. Because this warning causes the person exposed to take immediate steps to decontaminate, the Lewisite lesion will probably not be as severe as a mustard lesion.

**Treatment:** Immediate decontamination and treatment of lesions. A specific antidote, British anti-lewisite, decreases systemic effects but causes some toxicity itself.

**Protection:** Protective mask, clothing. Persistence is 24 hours to one week.

**Phosgene Oxime (CX)**

**Description:** Phosgene oxime is an itching stinging agent that causes a corrosive skin and tissue lesion. The vapor is extremely irritating, and both vapor and liquid cause
almost immediate tissue damage. The mechanism by which phosgene oxime causes biological effects is unknown.

**Symptoms:** On the skin and all mucous membranes, CX liquid or vapor causes immediate pain on contact. Extreme pain may persist for days. It is irritating and painful to the eyes and upper airways. Agent causes pulmonary edema after inhalation and after skin contact. Some data suggest that CX may cause hemorrhagic inflammatory changes in the GI tract.

**Treatment:** Immediate decontamination.

**Protection:** Protective mask, clothing.

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**BLOOD AGENTS**

**Hydrocyanic Acid (AC), Cyanogen Chloride (CK)** - act upon the enzyme cytochrome oxidase. This allows the red blood cells to acquire oxygen but prevents the transfer oxygen to other cells. Body tissue decays rapidly due to lack of oxygen and retention of carbon dioxide, first affecting the heart and then the brain.

**Description:** A rapidly acting lethal agent that is limited in its military usefulness by its high volatility. However, at high concentrations, cyanide kills quickly. Cyanides are sometimes called "blood agents." Cyanides are in liquid state in munitions but rapidly vaporize upon detonation of the munitions.

**HISTORY/MILITARY RELEVANCE**

The French used about 4000 tons of cyanide in WWI without notable military success, possibly because the small one- to two-pound munitions used could not deliver the large amounts needed to cause biological effects. Other factors included the high volatility of cyanide (which quickly evaporated and dispersed) and its "all or nothing" biological activity, i.e., it caused few effects below the lethal Ct (this is in contrast to mustard, which causes eye damage at 1% of the lethal amount). The U.S. maintained a small number of cyanide munitions during World War II (WWII). Japan allegedly used cyanide against China before and during WWII, and Iraq may have used cyanide against the Kurds in the 1980s.

Cyanides are also called "blood agents," an antiquated term still used by many in the military. At the time of the introduction of cyanide in World War I, the other chemical agents in use caused mainly local effects: riot control agents injured the skin and mucous membranes from direct contact, and phosgene damaged the lungs after inhalation. In contrast, cyanide when inhaled produced systemic effects and was thought to be carried in the blood; hence the term "blood agent." The widespread distribution of absorbed nerve agents and vesicants via the blood invalidates this term as a specific designator for cyanide. Also, the use of "blood agent" for cyanide connotes to some people that the site of action of cyanide is in the blood, an erroneous notion.
Materials of interest as chemical agents are the cyanide hydrogen cyanide (hydrocyanic acid; AC) and the simple cyanogen, cyanogen chloride (CK). Cyanogen bromide was used briefly in World War I, but is of no present interest.

**Symptoms:** After exposure to heavy dose, seizures, respiratory failure, and cardiac arrest appear. The organs most susceptible to cyanide are the central nervous system and the heart. Most clinical effects are of CNS origin and are nonspecific. About 15 seconds after inhalation of concentrated vapor, there is abnormally deep breathing followed in 15 to 30 seconds by convulsions. Respiratory activity stops two to three minutes later, and cardiac activity ceases several minutes later still or at about six to eight minutes after exposure.

**Treatment:** Sodium nitrite and sodium thiosulfate are effective antidotes. Amyl nitrite also is useful.

**Protection:** Protective mask, clothing.

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**INCAPACITATING AGENTS**

**CNS (Depressants and Stimulants)** - cause physiological or mental effects which lead to temporary disability lasting from hours to days after exposure to the agent has ceased.

Depressants produce their effects by interfering with transmission of information across central synapses. An example of this type of agent is 3-quinuclidinyl benzilate (BZ), which blocks the muscarinic action of acetylcholine both peripherally and centrally. In the central nervous system anticholinergic compounds disrupt the high integrative functions of memory, problem solving, attention and comprehension. Relatively high doses produce toxic delirium which destroys the ability to perform any military task.

**Depressants:** (BZ) and its analogues are glycollic acid esters. Some members of the group are liquid at ambient temperatures but BZ is a stable white crystalline powder that is only slightly soluble in water. After administration of an effective dose by inhalation by mouth or by injection mild peripheral effects of BZ occur within 1 hour and maximal central effects occur after about 4 hours lasting 24 to 48 hours, with a peak at 8 to 10 hours. Some other compounds in this group may take longer for their effects to develop and to disappear. Doubling the dose prolongs the duration of severe central effects by about 40 hours and shortens the onset time of severe effects to about 1 hour.

**Stimulants:** (LSD) cause excessive nervous activity by facilitating transmission of impulses. The effect is to flood the cortex and other higher regulatory centers with too much information, making concentration difficult and causing indecisiveness and inability to act in a sustained purposeful manner. A well-known drug which acts in this way is D-lysergic acid diethylamide; similar effects are sometimes produced by large doses of amphetamines.
Protection:
It is likely that such agents will be dispersed by smoke-producing munitions or aerosols, using the respiratory tract as a portal of entry. The use of the protective mask, therefore, is essential. With some agents the percutaneous route may be used and full individual protective equipment will be required.

IRRITANT OR TEAR AGENTS

CN, CS, CR - cause a large flow of tears and intense (although temporary) eye pain and irritation of the skin. The effects are immediate but transient. Riot control agents are irritants characterized by a very low toxicity (chronic or acute) and a short duration of action. Little or no latent period occurs after exposure. Orthohalorbenzylidene malononitrile (CS) is the most commonly used irritant for riot control purposes. Chloracetophenone (CN) is also used in some countries for this purpose in spite of its higher toxicity. A newer agent is dibenzoxazepine (CR) with which there is little experience. Arsenical smokes (sternutators) have in the past been used on the battlefield. Apart from their lachrymatory action they also provoke other effects, e.g., bronchoconstriction and emesis and are some times referred to as vomiting agents.

Symptoms: During exposure an individual is incapable of effective concerted action. Vomiting agents produce strong pepper-like irritation in the upper respiratory tract with irritation of the eyes and lachrymation. They cause violent uncontrollable sneezing, cough, nausea, vomiting and a general feeling of bodily discomfort. The principal agents in this group are diphenylchlorarsine (DA), diphenylaminearsine chloride (Adamsite (DM)) and diphenylcyanarsine (DC). DA, DM, and DC are also classed as sternutators. They are dispersed as aerosols and produce their effects by inhalation or by direct action on the eyes.

Protection: Full individual protective equipment will provide complete protection. The standard protective respirator and ordinary field clothing gives adequate protection against field concentrations of vomiting agents.

NERVE AGENTS

Tabun (GA), Sarin (GB), Soman (GD), GF, VX - The most toxic of the known chemical agents. Nerve agents are extreme hazards in their liquid and vapor states and can cause death minutes after exposure. They affect the transmission of nerve impulses by reacting with the enzyme cholinesterase, permitting an accumulation of acetylcholine and continuous muscle stimulation. The muscles tire due to over-stimulation and begin to contract. Nerve agents are colorless to light brown liquids, some of which are volatile. Toxic liquids are tasteless. Nerve agents may be absorbed through the skin, respiratory tract, gastrointestinal tract, and the eyes. Respiratory contamination is almost immediate. Significant absorption through the skin takes a period of minutes. Prompt medical treatment and decontamination is crucial in either case.
Nerve agents are considered major military threats. They can be dispersed from missiles, rockets, bombs, howitzer shells, spray tanks, land mines, and other large munitions.

**HISTORY/MILITARY RELEVANCE**

Nerve agents were developed in pre-World War II Germany. Germany had stockpiles of nerve agent munitions during World War II (WWII), but did not use them for reasons that are still unclear. In the closing days of the war, the U.S. and its allies discovered these stockpiles, developed the agents, and manufactured nerve agent munitions. The U.S. chemical agent stockpile contains the nerve agents GB and VX. Nerve agents are considered major military threat agents. The only known battlefield use of nerve agents was in the Iraq-Iran conflict. Intelligence analysts indicate that many countries have the technology to manufacture nerve agent munitions.

**Symptoms:** Small exposure to vapor brings constriction of the pupils, nasal inflammation, and mild difficulty breathing, while a large exposure to vapor causes sudden loss of consciousness, convulsions, and a halt in breathing, paralysis, and death. Small to moderate exposure of liquid on skin produces localized sweating, nausea, vomiting, and a feeling of weakness, while a large exposure to liquid on skin has same effect as vapor exposure. Lethal amounts of vapor or liquid cause a rapid cascade of events culminating, within a minute or two, with loss of consciousness and convulsive activity followed by a halt in breathing within several more minutes.

**Treatment:** Three drugs--atropine, pralidoxime chloride, and diazepam--are used to treat nerve agent exposure.

**Protection:** Pyridostigmine bromide as a pretreatment. Protective masks, clothing. Persistence is approx 30 minutes (Sarin) to 4-5 hours (Soman), 300-325 hours (VX).
APPENDIX F
# Table 1: Characteristics of Chemical Agents

**Blister Agents**

*Agents that cause blisters on skin and damage the respiratory tract, mucous membranes, and eyes.*

<table>
<thead>
<tr>
<th>Name</th>
<th>Physical Characteristics</th>
<th>Persistency</th>
<th>Commercial Uses of Chemicals or Precursor Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur Mustard (HD)</td>
<td>Colorless to amber, oily liquid with odor of garlic</td>
<td>Persistent</td>
<td>Paper and rubber manufacturing, pharmaceuticals, insecticides, plastics, detergents, cosmetics, lubricants</td>
</tr>
<tr>
<td>Lewisite</td>
<td>Light amber liquid with odor of geraniums</td>
<td>Semi-persistent</td>
<td>Ceramics, insecticides, pharmaceuticals</td>
</tr>
<tr>
<td>Nitrogen Mustard (HN-3)⁴</td>
<td>Amber, odorless liquid</td>
<td>Persistent</td>
<td>Toiletries, insecticides, waxes, polishes, lubricants, cosmetics</td>
</tr>
<tr>
<td>Mustard-Lewisite (HL)</td>
<td>Liquid with garlic odor</td>
<td>Semi-persistent</td>
<td>Paper and rubber manufacturing, pharmaceuticals, insecticides, plastics, detergents, cosmetics, ceramics, lubricants</td>
</tr>
<tr>
<td>Phosgene oxime (CX)</td>
<td>Colorless liquid or crystalline solid with a disagreeable odor</td>
<td>Relatively non-persistent</td>
<td></td>
</tr>
</tbody>
</table>

**Nerve Agents**

*Lethal substances that disable enzymes responsible for the transmission of nerve impulses.*

<table>
<thead>
<tr>
<th>Name (Symbol)</th>
<th>Physical Characteristics</th>
<th>Persistency</th>
<th>Commercial Uses of Chemicals or Precursor Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tabun (GA)</td>
<td>Brownish to colorless liquid with fruity odor</td>
<td>Persistent</td>
<td>Insecticides, gasoline additives, detergents, missile fuel, plastics, dyes, and pigments</td>
</tr>
<tr>
<td>Sarin (GB)</td>
<td>Colorless liquid with almost no odor</td>
<td>Non-persistent</td>
<td>Fire retardants, insecticides, disinfectants, paint solvents, ceramics, optical brighteners</td>
</tr>
</tbody>
</table>
### Choking Agents

Substances that damage respiratory tract, causing extensive fluid build-up in the lungs.

<table>
<thead>
<tr>
<th>Name (Symbol)</th>
<th>Physical Characteristics</th>
<th>Persistency</th>
<th>Commercial Uses of Chemicals or Precursor Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine</td>
<td>Colorless to slightly yellow with sharp odor</td>
<td>Non-persistent</td>
<td>Disinfectants, plastics, pesticides, solvents, chemical synthesis</td>
</tr>
<tr>
<td>Phosgene (CG)</td>
<td>Colorless gas with odor of freshly mown hay, or corn</td>
<td>Non-persistent</td>
<td>Plastics, pesticides, dyes, and herbicides</td>
</tr>
<tr>
<td>Diphosgene (DP)</td>
<td>Colorless liquid with odor of corn or mown hay</td>
<td>Non-persistent</td>
<td>Plastics, pesticides, dyes, and herbicides</td>
</tr>
<tr>
<td>Chloropicrin (PS)</td>
<td>Oily, colorless liquid with pungent odor</td>
<td>Non-persistent</td>
<td>Disinfectant, chemical synthesis</td>
</tr>
</tbody>
</table>

### Blood Agents

Agents that interfere with the absorption of oxygen into the bloodstream.

<table>
<thead>
<tr>
<th>Name (Symbol)</th>
<th>Physical Characteristics</th>
<th>Persistency</th>
<th>Commercial Uses of Chemicals or Precursor Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen Cyanide (AC)</td>
<td>Colorless gas with odor of bitter almonds</td>
<td>Non-persistent</td>
<td>Pesticides, fumigating, electroplating, gold and silver extraction</td>
</tr>
<tr>
<td>Cyanogen Chloride (CK)</td>
<td>Colorless liquid with sharp, pungent odor</td>
<td>Non-persistent</td>
<td>Dyes and pigments, nylon production</td>
</tr>
</tbody>
</table>
Riot Control (Incapacitating) Agents
Substances that rapidly produce temporary disabling effects.

<table>
<thead>
<tr>
<th>Name (Symbol)</th>
<th>Physical Characteristics</th>
<th>Persistency</th>
<th>Commercial Uses of Chemicals or Precursor Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tear Agent 2 (CN)</td>
<td>Colorless, gray solid with sharp, irritating, floral odor</td>
<td>Non-persistent</td>
<td>Commercially available as mace</td>
</tr>
<tr>
<td>Tear Agent 0 (CS)</td>
<td>White crystalline substance with pepper-like odor</td>
<td>Non-persistent</td>
<td></td>
</tr>
<tr>
<td>Psychedelic Agent 3 (BZ)</td>
<td>White crystalline solid with no odor</td>
<td>Non-persistent</td>
<td>Pharmaceuticals, tranquilizers</td>
</tr>
</tbody>
</table>
APPENDIX G
Federal Funding to Combat Terrorism, Including Defense Against Weapons of Mass Destruction
FY 1998-2001

Items in *italics* represent total funding for combating terrorism. All other items represent funding for defense specifically against terrorists using WMD terrorism and are part of the larger anti-terrorism funding totals. Unless otherwise noted, all figures are taken from: Executive Office of the President, Office of Management and Budget. *Annual Report to Congress on Combating Terrorism*. Pursuant to FY 1998 National Defense Authorization Act (Public Law 105-85) May 18, 2000, p. 47-51, 58-65.

All figures in millions of dollars.

<table>
<thead>
<tr>
<th>ALL GOVERNMENT BY CATEGORY</th>
<th>FY 1998</th>
<th>FY 1999</th>
<th>FY 2000</th>
<th>FY 2001 (requested)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FEDERAL GOVERNMENT (Total)</strong></td>
<td>$6,516.1</td>
<td>$8,757.3</td>
<td>$8,419.7</td>
<td>$9,311.3</td>
</tr>
<tr>
<td>Funding for Defense Against WMD from Above Total</td>
<td>$645.3</td>
<td>$1,238.4</td>
<td>$1,453.7</td>
<td>$1,555.0</td>
</tr>
<tr>
<td>Law enforcement &amp; investigative activities</td>
<td>$2,654.7</td>
<td>$2,686.8</td>
<td>$2,820.0</td>
<td>$3,025.5</td>
</tr>
<tr>
<td>WMD figure for the above category</td>
<td>$71.8</td>
<td>$102.3</td>
<td>$93.8</td>
<td>$142.5</td>
</tr>
<tr>
<td>Physical security of govt facilities/employees</td>
<td>$2,893.7</td>
<td>$4,356.4</td>
<td>$3,637.5</td>
<td>$4,259.2</td>
</tr>
<tr>
<td>WMD figure for the above category</td>
<td>$175.1</td>
<td>$199.4</td>
<td>$200.6</td>
<td>$185.4</td>
</tr>
<tr>
<td>Physical protection of national population/infrastructure</td>
<td>$146.7</td>
<td>$256.8</td>
<td>$249.9</td>
<td>$266.8</td>
</tr>
<tr>
<td>WMD figure for the above category</td>
<td>$3.4</td>
<td>$3.8</td>
<td>$3.6</td>
<td>$3.6</td>
</tr>
<tr>
<td>Preparing for &amp; responding to terrorist acts</td>
<td>$417.8</td>
<td>$930.2</td>
<td>$984.4</td>
<td>$947.0</td>
</tr>
<tr>
<td>WMD figure for the above category</td>
<td>$155.3</td>
<td>$564.2</td>
<td>$618.7</td>
<td>$633.5</td>
</tr>
<tr>
<td>- Equipment for First Responders</td>
<td>$15.1</td>
<td>$98.4</td>
<td>$95.2</td>
<td>$102.2</td>
</tr>
<tr>
<td>- Federal Planning / Exercises</td>
<td>$3.5</td>
<td>$6.1</td>
<td>$7.6</td>
<td>$8.6</td>
</tr>
<tr>
<td>Category</td>
<td>2012</td>
<td>2013</td>
<td>2014</td>
<td>2015</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>- First Responder Training and Exercises</td>
<td>$13.3</td>
<td>$86.1</td>
<td>$90.4</td>
<td>$104.0</td>
</tr>
<tr>
<td>- Medical Responder Training and Exercises</td>
<td>$0.0</td>
<td>$3.0</td>
<td>$1.0</td>
<td>$2.0</td>
</tr>
<tr>
<td>- Other Planning and Assistance to State/Local</td>
<td>$18.8</td>
<td>$60.0</td>
<td>$52.4</td>
<td>$66.7</td>
</tr>
<tr>
<td>- Public Health Infrastructure/Surveillance</td>
<td>$0.0</td>
<td>$62.0</td>
<td>$88.6</td>
<td>$91.4</td>
</tr>
<tr>
<td>- Special Response Units</td>
<td>$99.2</td>
<td>$191.5</td>
<td>$224.5</td>
<td>$191.4</td>
</tr>
<tr>
<td>- Stockpile of Vaccines and Therapeutics</td>
<td>$0.0</td>
<td>$51.0</td>
<td>$52.0</td>
<td>$52.0</td>
</tr>
<tr>
<td>- Other</td>
<td>$5.4</td>
<td>$5.9</td>
<td>$7.1</td>
<td>$15.2</td>
</tr>
<tr>
<td>Research and Development</td>
<td>$403.1</td>
<td>$527.0</td>
<td>$727.9</td>
<td>$812.8</td>
</tr>
<tr>
<td>WMD figure for the above category</td>
<td>$239.8</td>
<td>$368.8</td>
<td>$537.0</td>
<td>$589.9</td>
</tr>
<tr>
<td>- Basic Research, including Gene Sequencing</td>
<td>$70.5</td>
<td>$31.0</td>
<td>$48.0</td>
<td>$92.3</td>
</tr>
<tr>
<td>- Detection/Diagnostics</td>
<td>$17.8</td>
<td>$59.0</td>
<td>$78.3</td>
<td>$97.0</td>
</tr>
<tr>
<td>- Modeling, Simulation, Systems Analyses</td>
<td>$3.6</td>
<td>$10.6</td>
<td>$16.7</td>
<td>$16.7</td>
</tr>
<tr>
<td>- Personal/Collective Protection</td>
<td>$12.0</td>
<td>$10.0</td>
<td>$30.0</td>
<td>$28.2</td>
</tr>
<tr>
<td>- Personal/Environmental Decontamination</td>
<td>$1.8</td>
<td>$9.3</td>
<td>$20.3</td>
<td>$24.2</td>
</tr>
<tr>
<td>- Therapeutics/Treatments</td>
<td>$0.0</td>
<td>$16.0</td>
<td>$20.9</td>
<td>$26.6</td>
</tr>
<tr>
<td>- Vaccines</td>
<td>$2.9</td>
<td>$35.7</td>
<td>$82.6</td>
<td>$99.2</td>
</tr>
<tr>
<td>- Other</td>
<td>$131.2</td>
<td>$197.2</td>
<td>$240.3</td>
<td>$205.8</td>
</tr>
</tbody>
</table>