NEW JERSEY FIREFIGHTER SKILLS ADDENDUM

PUBLISHED BY
THE NEW JERSEY
DIVISION OF FIRE SAFETY
IN COOPERATION WITH KEAN UNIVERSITY

KEAN UNIVERSITY
www kean edu
WORLD CLASS EDUCATION

JULY 2011 EDITION

THE NEW JERSEY FIREFIGHTER SKILLS ADDENDUM

The Division of Fire Safety in partnership with Kean University has developed the New Jersey Firefighter Addendum to address the state specific regulations and standards responsible for firefighter safety and health. This booklet is the work of members of the fire service along with various agencies and public entities, such as the New Jersey State Office of Public Employees Occupational Safety and Health (PEOSH) the New Jersey Department of Health and Senior Services, the New Jersey Board of Public Utilities, Jersey Central Power and Light Company, Public Service Electric and Gas Company, New Jersey Natural Gas Company, Elizabethtown Gas Company, AEGIS Loss Control.

NEW JERSEY DIVISION OF FIRE SAFETY

Kent Neiswender, Supervisor, Office of Training and Certification

KEAN UNIVERSITY FIRE SAFETY TRAINING PROGRAM

Karen A. Grant, Program Director

Sandy Chou, Managing Administrative Assistant

Jolene Steele, Managing Administrative Assistant

Heloisa Tiberio, Academic Specialist

The New Jersey Division of Fire Safety wishes to acknowledge the Training and Education Council for assisting in the development of the material in this manual.

The written material developed for the NJ Incident Management System, Firefighter Safety Section was developed by Chief Robert G. Moran, Englewood (NJ) Fire Department and Lieutenant John J. Lewis Passaic (NJ) Fire Department utilizing the IMS Firefighter Safety Regulations as a foundation for the material.

NOTICE TO THE READER

The material presented in Section B "New Jersey Fire and Emergency Service Resources", and Section C "New Jersey Fire Service Standards and Regulations", is declared public domain material obtained from adopted Acts, Statues, Rules, Regulations and/or Standards from the U.S. Federal Government, State of New Jersey Government, and other safety/testing, engineering or fire service industry organizations. Information presented is obtained from public domain documents, or created through the New Jersey Division of Fire Safety for the specific purpose to convey pertinent fire safety information to the New Jersey Fire Service. The material presented in Section D "Public Utilities, Propane, and Carbon Monoxide Hazards" Chapter I and Chapter II are based on the work of the Associated Electric & Gas Insurance Services Limited and AEGIS Insurance Services, Inc. ("AEGIS") and used with their permission for the purpose of training the New Jersey Fire Service. Information presented in the Appendix Section represents official Guides, Models, Standards, Regulations, and Acts which have been either adopted and/or created for fire service emergency operations. The Appendix Section material has been deemed public domain.

Said materials are provided "AS IS" without warranties of any kind. While every effort is made to ensure that the information contained in this document is accurate and complete at the time of printing, the frequency of changes in the regulations makes it impossible to guarantee the complete accuracy of the information that follows. Use of the AEGIS materials is at your own risk. Therefore, neither Robert Moran, John Lewis, the State of New Jersey, Kean University, nor AEGIS shall be liable for any damages arising from the use of any of the aforementioned materials.

CONTENTS

CONTENTS

ACKNOWLEDGEMENTS

The New Jersey Division of Fire Safety wishes to acknowledge the Training and Education Council for assisting in the development of this manual.

Training & Education Advisory Council

C. KENNETH ANDERSON (CHAIRPERSON)
LAWRENCE WOOD (VICE-CHAIRPERSON)
GREGORY S. KIRKHAM (LIAISON)

RICHARD R. ANDERSON
CHARLES AUGHENBAUGH, JR
ALBERT S. BEERS
DR. BRIAN BENNETT, PH.D
HARRY R. CARTER
JACK CONATY
MICHAEL CORBO
MICHAEL DALEY
TIMOTHY FLANNERY
GLENN FRANZOI
ALFRED GERBER, III
DAVID L. GSELL
ROBERT V. HILL, SR
WILLIAM ITINGER
ANDREW G. JENSEN
CHRISTOPHER KOZUB
CHESTER KRAWCYKOWSKI, JR
JOHN KUBILEWICZ
KEVIN S. MALLEY
ANTHONY S. MANGERI
NICHOLAS J. PALUMBO
JOHN F. RINDT, JR
PAUL D. ROMAN
PAUL C. SANDROCK
JOSEPH VALLO
RAY VANMARTER
PHILIP WILK

The written material developed for the NJ Incident Management System, Firefighter Safety Section was developed by Chief Robert Moran, Englewood (NJ) Fire Department and Lieutenant John Lewis, Passaic (NJ) Fire Department, utilizing the IMS Firefighter Safety Regulations as a foundation for the material.

The following individuals developed the written material:

Chapter 1- Recognizing and Avoiding the Hazards of Electric Facilities

WILLIAM STEVENSON
Jersey Central Power and Light Company
VINCENT LOMBARDI
Public Service Electric and Gas Company
ROBERT GREEN
Public Service Electric and Gas Company

Chapter II - Recognizing and Avoiding the Hazards of Natural Gas & Carbon Monoxide

HOWIE BREY
New Jersey Natural Gas Company
STEVE MCGRATH
New Jersey Natural Gas Company
STEPHEN FREEDLEY
Elizabethtown Gas Company
WALTER SIEDLECKI
Elizabethtown Gas Company
CLARENCE WATKINS
South Jersey GasCompany
KEVIN CARR
Public Service Electric and Gas Company

Chapter III—Recognizing and Avoiding the Hazards of Propane

GERARD C. STOCKER
Thomas Associates

SCOT MACOMBER and **THOMAS DAVIS** of AEGIS Loss Control participated on the development team, provided technical expertise and supported the project.

LAWRENCE PETRILLO and **KENT NEISWENDER** of New Jersey Department of Community Affairs Division of Fire Safety and **DOUGLAS ZIEMBA** of the Board of Public Utilities provided the support needed to have this material included into the firefighter's handbook.

NEW JERSEY STATE FIRE MARSHAL

New Jersey Division of Fire Safety

Dear Firefighter Recruits:

Welcome and congratulations on taking the first step in your training to become a firefighter. We commend you for your desire, your commitment of time and effort, and lastly, your enthusiasm to join the brother/sisterhood of the fire service.

As you advance through your Firefighter I training, please embrace the subjects that are contained in this basic recruit curriculum. Keep in mind that your future success and safety will be forged by the course's 135 hours.

The New Jersey Division of Fire Safety has partnered with county and municipal fire training academies to ensure that training is standardized and that your textbook, New Jersey addendum materials, study guide, and instructional materials are identical. We believe this training curriculum provides the best instructional and student learning resources ever and will be instrumental in honing your firefighting knowledge and practical skills.

The fire service instructors who work to develop your knowledge and performance capabilities are dedicated, skilled professionals. They bring extensive know-how and many years of experience into the classroom to guide you through this nationally accredited Firefighter I training program. You may have heard that "no two fires are the same." We believe this is true, but there are common elements and lessons to be learned from each fire incident. Your instructors will bring these common threads together to provide you with fire ground survival information.

Firefighter I is just the beginning of your professional development, and we urge you to attend additional training programs and be recognized as a true fire service professional. Therefore, your fire department, county/municipal training academy, community county college, national fire service training institutions, and the New Jersey Division of Fire Safety are committed to serve your continuing educational needs.

New Jersey Division of Fire Safety
Office of Training and Certification

DEDICATION

This manual is dedicated to those brave men and women in the New Jersey Fire Service who have lost their lives in the battle to fight fire and save the lives of their fellow community members.

Additionally, the manual acknowledges the hard work, professionalism, and dedication exhibited by New Jersey's Fire Instructors to ensure our State's Firefighters perform to his or her best ability at every emergency incident.

WELCOME

SECTION
A

OUTLINE

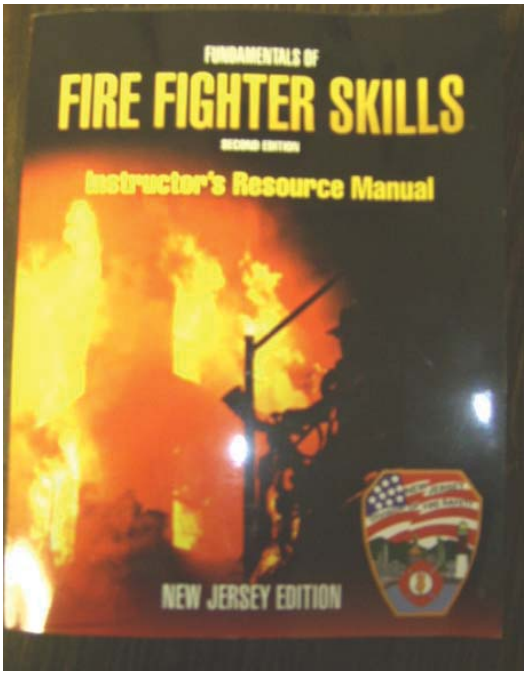
- Introduction and Welcome
- How to Use This Addendum

INTRODUCTION AND WELCOME

Welcome to the fire service in New Jersey! This special supplement was designed especially for you, the new firefighter, as you join the proud and dedicated men and women who make up New Jersey's fire and emergency service system.

As a firefighter, you play an important role in keeping communities, businesses, and private industries safe. You are the first line of community defense, and you have the potential to touch many lives as you respond to emergencies throughout your time in the fire service.

The New Jersey Division of Fire Safety, along with a variety of other state and local governmental agencies, stand behind you to provide the resources that will help you do your job. The goal of providing this special supplement is to ensure consistent training across the state and in the many academies and training centers that you will utilize throughout your career. If used properly, it will expand the quality and depth of knowledge necessary to get firefighters started on their career, and enhances the safety of personal operating at emergency incidents. The Division of Fire Safety has partnered with Jones and Bartlett to offer this unique addendum as a supplement to *The Firefighter's Handbook*, your basic tool for firefighter training, Figure A-1.



Firgure A-1 This addendum is a supplement to the Firefighter's Handbook.

The New Jersey Division of Fire Safety is striving to provide the best possible teaching, training, and testing materials to ensure that the local needs of the fire and emergency service agencies and providers are met. The Division of Fire Safety is your partner in safety and training, and we stand behind you on every call you will respond to throughout your career.

HOW TO USE THIS ADDENDUM

This manual is provided to firefighters entering the New Jersey fire and emergency services system to become familiar with the state government organizations and departments, and state standards and regulations that are important to firefighters. This addendum serves as a supplement to The Firefighter's Handbook in providing firefighters with a well-rounded and basic introduction to firefighting in the State of New Jersey.

The best use of this addendum is to ready and study the material, and then do some exploration on your own to expand your learning. The addendum provides other resources, including websites, where you can find further information about a variety of topics. Use these resources to answer the questions you have while reading through the material, and to examine more closely the subjects covered in the addendum, Figure A-2.

Figure A-2 The Fire Instructor is the first link in Firefighter Safety.

Firefighters know that continuous training and learning are what keeps them safe and most effective at emergency incidents.

For this reason, it is important that you make a commitment to lifelong learning as you enter the fire service. Keep this addendum with your notes and refer to them occasionally after your initial training. Add information about changing state regulations or state resources as these become available. Talk to others in your department about these changes, and make learning a team effort in the fire service. Remember, you and you alone have the ability to build your personal knowledge, skills, and abilities into a superior asset.

NEW JERSEY FIRE AND EMERGENCY SERVICE RESOURCES

SECTION B

Outline

- New Jersey Government
- New Jersey Division of Fire Safety
- Other State Resources

Objectives

- Other State Resources
- New Jersey Division of Fire Safety
- Describe the responsibilities of the Division of Fire Safety
- Explain the relationship between Departments and Agencies of the State of New Jersey
- Explain the responsibilities of the various bureaus and units within the Division of Fire Safety
- Describe who enforces the Uniform Fire Code in municipalities
- Describe the make-up of the membership of the Fire Safety Commission
- List and explain the three co-equal branches of the State of New Jersey government

NEW JERSEY GOVERNMENT

The government of the State of New Jersey, like that of the United States, is divided into three coequal branches: the legislative, the executive, and the judicial. The principal function of the Legislature is to enact laws. The Executive Branch (the Governor and State agencies) carries out the programs established by law. The Judiciary (the Supreme Court and lower courts) punishes violators, settles controversies and disputes, and is the final authority on the meaning and constitutionality of laws.

There are a variety of departments and agencies that comprise the State Government, Figure B-1.

More information about the State and Local governments of New Jersey and the departments and agencies that make up state government can be found at http://www.nj.gov

NEW JERSEY DIVISION OF FIRE SAFETY

Within the New Jersey Department of Community Affairs is the Division of Fire Safety. The Division of Fire Safety is the central fire service agency in the State, responsible for the development and enforcement of the State Uniform Fire Code, public education programs, Figure B-2. The Division of Fire Safety includes two bureaus: the Bureau of Fire Code Enforcement and the Bureau of Fire Department Services.

The following section outlines the various programs of the Division of Fire Safety and

New Jersey State Government Departments and Agencies

Departments	Agencies
Agriculture	Administrative Law, Office of
Banking & Insurance	Board of Public Utilities
Commerce	Building Authority
Community Affairs	Casino Control Commission
Corrections	Clean Air Council
Education	Cancer Research, Commission on
Environmental Protection	Commission on Higher Education
Health & Senior Services	Commission on Science and Technology
Human Services	Council on Local Mandates
Labor	Delaware River Basin Commission
Law & Public Safety	Economic Development Authority
Military & Veterans Affairs	Election Law Enforcement (Campaign and Lobbying Disclosure)
Personnel	Executive Commission on Ethical Standards
State	Garden State Preservation Trust
Transportation	Governor's Council on Alcoholism and Drug Abuse
Treasury	Health Care Facilities Financing Authority
	Higher Education Student Assistance Authority
	Homeland Security
	Housing and Mortgage Finance Agency
	Information Technology
	Interstate Environmental Commission
	Lottery
	Motor Vehicle Commission
	New Jersey Meadowlands Commission
	New Jersey Network (NJN)
	New Jersey Redevelopment Authority (NJRA)
	New Jersey School Construction Corporation
	New Jersey Transit

Figure B-1 New Jersey state government departments and agencies.

their purposes and functions. For further information regarding the Division of Fire Safety's programs, please visit the web site at http://www.nj.gov/dca/dfs and click on Bureaus and Offices.

The mailing address for the Division of Fire Safety is: New Jersey Department of Community Affairs, Division of Fire Safety, PO Box 809, Trenton, NJ 08625-0809.

Figure B-2 The Division of Fire Safety oversees a variety of programs, including training programs for firefighters.

Division of Fire Safety Programs

Fire Safety Commission

Type of Assistance: Advisory.

Description: Works closely with the Division of Fire Safety to promote fire safety in the State. The commission comprises 23 members, including state legislators and citizens with expertise or interest in fire safety. It was created by law to assist and advise the Commissioner of the Department of Community Affairs on all matters of fire safety.

Assistance Provided To: State government, the fire service and the general public.

Other Information: Meets five times each year to consider fire safety issues, amendments to the Uniform Fire Code, new fire safety programs and to hear comments from the public on matters of fire safety.

Legislative and Regulatory Services

Type of Assistance: Technical and Advisory.

Description: Provides guidance regarding local enforcement of the Uniform Fire Code Safety Act and State Fire Prevention Code; oversees local agency operations and conducts routine monitoring, develops and amends program rules, provides assistance to Peer Review Committee to assess sanctions against certified officials, undertakes appropriate corrective or enforcement action for violations of the Act and Code, maintains quarterly registry of agencies having jurisdiction within each municipality in the State.

Assistance Provided To: Municipalities, fire services or private individuals.

Volunteer Emergency Service Organization Loan Program

Type of Assistance: Financial–Loans. **Description:** Provides loans to fire departments and ambulance/rescue squads.

Funding Source: State Appropriation, Special Revenue.

Award Period: July 1 to June 30.

Assistance Provided To: Volunteer and partially-paid fire companies, first aid squads and rescue squads.

Other Information: Two percent interest, 10-year repayment, maximum loan: $50,000.

Procedure for Applying: Request for proposals mailed annually. Submission of an application.

Volunteer Recruitment and Retention Program

Type of Assistance: Advisory and Programmatic.

Description: Provides guidance, visual aids and assistance to local volunteer and combination fire departments and first aid, ambulance and rescue squads trying to recruit new members and retain current members.

Assistance Provided To: Volunteer and Combination fire departments, first aid, ambulance and rescue squads.

Bureau of Fire Code Enforcement Programs

Fire Code Services

Type of Assistance: Technical and Advisory.

Description: Provides technical assistance to fire officials/fire inspectors involved in the enforcement of the Uniform Fire Code and Regulations for Fire Code Enforcement.

Assistance Provided To: Local enforcing agencies and private individuals.

Inspections

Type of Assistance: Technical.
Description: Enforces the Uniform Fire Code in municipalities that do not elect to establish local enforcement agencies; responsible for the inspection of high-rise and life hazard use buildings/structures when the Department has retained direct enforcement authority, Figure B-3.

Assistance Provided To: Any municipality that has not established an enforcement agency for the Uniform Fire Code.

Figure B-3: Local Fire Prevention Bureaus can request assistance from the Division of Fire Safety Bureau of Code Enforcement.

Life Hazard Use Registration

Type of Assistance: Technical and Advisory.

Description: Life hazard use is defined as the use of a building or structure that may constitute a potential risk to human life, public welfare or firefighters. The program registers high-rise and life hazard use buildings/businesses to inspect and enforce the Uniform Fire Safety Act. Records of these structures are maintained and lists are distributed to local enforcement agencies. The program collects fees from life hazard use owners and establishes criteria to disburse funds to local agencies enforcing the Uniform Fire Code and Regulations.

Assistance Provided To: Any fire service, local enforcement agency or individual.

Local Assistance

Type of Assistance: Technical.

Description: Assists municipalities to establish local enforcing agencies in accordance with the Uniform Fire Safety Act; makes recommendations to the local enforcing agencies regarding daily operations; provides interpretations of the Uniform Fire Code. **Assistance Provided To**: Municipalities and local enforcing agencies.

State Building Fire Safety Inspections

Type of Assistance: Technical.

Description: Supervises fire prevention and protection programs in all state owned, state leased and state occupied structures.

Assistance Provided To: Mandatory for all state-owned or state-leased properties.

Bureau of Fire Department Services Programs

Fire Coordinator's Program

Type of Assistance: Technical.

Description: Administers the New Jersey Fire Coordinator System. This system is part of the State's emergency management system and manages the deployment of fire service resources requested beyond contiguous municipalities. There is a County Fire Coordinator assigned to each of the State's 21 counties.

The system is designed to deploy Division staff to the Emergency Operations Center at State Police Headquarters in West Trenton. From there, Division staff coordinates the deployment of fire service resources, particularly during a declared state of emergency.

County fire coordinators are responsible for maintaining resource lists, including apparatus, specialized equipment, and available staffing, and working with the Division staff to have them readily available.

Fire Department Programs

Type of Assistance: Technical and Advisory.

Description: Investigates serious injuries or deaths of firefighters in the line of duty and publishes the findings in a formal report. Additionally, this unit works with the Juvenile Firesetter Committee to research and develop a statewide policy for preventing juveniles from setting fires and for educating the public and the fire service about the problem.

Other Information: In cooperation with the Department of Treasury, the program develops specifications for firefighters' protective clothing and equipment for inclusion on the State Cooperative Purchasing Contract. This ensures that protective clothing meets the standards established in the Public Employees Occupational Safety and Health Act.

Assistance Provided To: Fire service organizations, emergency medical services, state, county or municipal governments and anyone dealing with the problems of a juvenile firesetter.

Fire Incident Reporting System

Type of Assistance: Technical.

Description: Administers a statewide fire incident reporting system that also serves as a central depository for the National Fire Incident Reporting System. Participating fire departments report emergency incidents in a standardized format that is passed on to the U.S. Fire Administration to be included in national statistics and analyses. The unit also analyzes statewide data to identify trends and publishes an annual report titled "Fire in New Jersey."

Assistance Provided To: Any fire service organization or interested individual.

Figure B-4 The Fire Instructor has various forms of media available along with support from the Division of Fire Safety, to provide training

Fire Protection Installers/ Maintenance Certification Program

Type of Assistance: Technical and Advisory.

Description: Establishes a comprehensive, mandatory licensing procedure for contractors who sell, install, repair, inspect and maintain fire protection equipment. Determines whether an application is complete and if all requirements have been met. The appropriate license is issued to the applicant in each field for which the qualifications are met.

Other Information: Currently, there are six license classifications established within this program: Fire Protection Equipment; Fire Sprinkler System; Special Hazard Fire Suppression System; Fire Alarm Equipment; Portable Fire Extinguisher; and Kitchen Fire Suppression System. Businesses that provide any type of service on fire safety equipment must obtain an annual business permit.

Office of Training and Certification

Type of Assistance: Technical, Advisory and Training.

Description: Provides statewide educational and training programs relating to fire protection, fire prevention, fire safety inspection, and to certify fire officials/fire inspectors who enforce the Uniform Fire Code. The office also develops training standards for various positions within the fire service and provides training programs leading to certification in those positions. Continuing education programs are also available to individuals holding certain certifications. This program also offers National Fire Academy Training courses covering all aspects of firefighting.

Assistance Provided To: Fire service training academies, any fire service organization or private individual.

People with Disabilities or Oxygen Use Emblem Program

Type of Assistance: Technical.

Description: Issues a person with a disability or who uses oxygen one of two identification emblems. The disability emblem is affixed to a window of a residential dwelling and alerts firefighters, medical, rescue or law enforcement personnel, when responding to an emergency situation, that a person with a

Figure B-5 The Bureau of Fire Department Services offers public education assistance and materials.

disability may be present therein and may require special assistance. The oxygen emblem is also affixed to a window of a residential dwelling to warn firefighters that oxygen is in use within that dwelling. A person with a disability or who uses oxygen may apply for an emblem by contacting the Division.

Public Education

Type of Assistance: Technical and Advisory.

Description: Increases public awareness of fire safety by developing educational fire safety materials such as brochures, flyers, posters and booklets for distribution to schools, fire departments and the general public; develops specific fire safety programs for schools, preschools and senior citizens, Figure B-5; publishes a newsletter for members of the fire service and other individuals and organizations interested in fire safety; and helps coordinate an annual fire safety poster contest for school children throughout the State.

Assistance Provided To: Municipalities, schools, fire departments and the general public.

Other State Resources

There are a variety of other state resources that may be beneficial to firefighters. Below is a partial listing of some of these resources.

New Jersey Department of Community Affairs, Division of Codes and Standards
http://www.state.nj.us/dca/codes/

New Jersey Department of Health and Senior Services, Office of Emergency Medical Services,http://www.state.nj.us/health/ems/index.html

New Jersey Department of Law and Public Safety, Division of Highway Traffic Safetyhttp://www.state.nj.us/lps/hts/index.html

New Jersey Department of Law and Public Safety, Office of Counter-Terrorism
http://www.state.nj.us/Ips/oct/index.html

New Jersey Department of Labor & Workforce Development,
http://www.nj.gov/labor/Isse/Ispeosh.html

New Jersey Homeland Security
http://njhomelandsecurity.gov/

REVIEW QUESTIONS

1. Describe the main responsibilities of the Division of Fire Safety.
2. Review the list of the departments and agencies within the State of New Jersey government.
3. What are the names of the two bureaus within the Division of Fire Safety?
4. Which bureau is responsible for the Fire Incident Reporting System and Office of Training and Certification?
5. What are the main responsibilities of the Department of Community Affairs Fire Safety Commission?
6. Name the co-equal branches of the New Jersey State government.
7. Enacting laws are the principal function of which branch of government?
8. Which branch of government has the principal function of carrying out the programs established by law?
9. The final authority on the meaning and constitutionality of law is the principal function of this branch of government.
10. What does the Bureau within the Division of Fire Safety investigate, serious firefighter injuries or fatalities? Why is this important component of firefighter safety and survival?

NEW JERSEY FIRE SERVICE STANDARDS AND REGULATIONS

SECTION C

OUTLINE

- Public Employees Occupational Safety and Health Act (PEOSHA) Standard
- Firefighter Safety
- Accountability
- Emergency Lights
- Public Employees Occupational Safety and Health Program Bloodborne Pathogens
- Hazard Communication Standard

OBJECTIVES

- Explain the difference between federal and state regulations concerning occupational safety and health of government employees.
- Describe the protective clothing that firefighters wear and its limitations.
- Explain what a pathogen is and how it can threaten the health of firefighters.
- Describe how a fire department's accountability system is used to track the whereabouts of all firefighters at an incident.
- Describe how a Personal Alert Safety System (PASS) works and the importance of using this type of equipment.
- Explain the significant differences between the new Hazard Communication Standard and the Worker and Community Right-to-Know Act.
- Explain why there are so many regulations concerning firefighting and the operation of fire departments.
- Explain the Firefighter Safety Regulations and the importance of properly utilizing these standards.

PUBLIC EMPLOYEES OCCUPATIONAL SAFETY AND HEALTH ACT

In 1970, the Williams-Steiger Occupational Health and Safety Act was passed by Congress. It required the adoption of occupational safety and health standards for employees. This act, known by its acronym OSHA, has been applied nationwide to all private employers and employees. State and local public employees were not covered by this Act.

In 1984, the New Jersey State Legislature enacted the Public Employees Occupational Safety and Health Act PEOSHA) to establish safety and health standards for state and local public employees. A copy of this Act is provided as Appendix I of this addendum. The PEOSHA Act requires that standards adopted in New Jersey must be at least as effective as the ones contained

Figure C-1. Fire officer conducts equipment check of a firefighter's personal protective equipment".

in the federal OSHA law and regulations to provide safe and healthful employment conditions and places of employment.

In order to implement PEOSHA, regulations establishing these standards (the standards in the Federal OSHA law and regulations) were adopted in 1984. In 1992, 1994, and 1998, the New Jersey Department of Labor adopted additional PEOSHA regulations that describe updated standards for protective clothing for the fire service, Figure C-1, New Jersey's regulations are different than the Federal OSHA regulations for fire protective clothing only. These state regulations include many new standards, including requirements for protective hoods, aerial ladder testing, and the adoption of the OSHA Respiratory Protection Standard 29 CFR 1910-134.

There are various compliance dates in these new regulations. Some call for eventual compliance with the new standards based on replacing existing equipment when it wears out rather than disposing of existing equipment. Others require compliance by a particular date. Each is discussed in detail, like earlier PEOSHA regulations, the 1992, 1994, and 1998 regulations apply to:

1. "The State, or any department, division, bureau, board, council, agency or authority of the State, except any bi-state agency"

Figure C-1.1. The New Jersey Department of Labor adopted additional PEOSHA regulations that describe up-dated standards for protective clothing for the fire service.

2. "Any county, municipality, or any department, division, bureau, board, council, agency or authority of any county or municipality, or of any school district or special purpose district created pursuant to law."

What Standards Apply to Firefighters?

Certain sections of the PEOSHA regulations apply only to firefighters. These are the regulations setting standards for fire protective clothing and equipment, and may be found in the regulations of the New Jersey Department of Labor. These regulations may be cited as N.J.A.C. 12:100-10 et seq. A copy of these regulations is included as Appendix II of this addendum.

All PEOSHA regulations relevant to the fire service apply to volunteer, paid, and combination firefighters. In some cases, implementation details are different for career and volunteer firefighters, although PEOSHA regulations do cover volunteers.

How Regulations Are Enforced

The New Jersey Department of Labor enforces these regulations, except for the provisions related to respiratory protective equipment. The state Labor Department enforces all matters related to protective clothing and equipment.

The New Jersey Department of Health enforces the parts of this regulation related to respiratory protective equipment. The state Health Department also enforces PEOSHA regulations related to hazardous materials.

The New Jersey Department of Community Affairs (DCA) is responsible for all matters related to building safety under the Uniform Construction Code or Fire Safety under the Uniform Fire Safety Code. DCA does not enforce regulations or standards related to protective clothing for firefighters. However, DCA maintains information on these standards and works with the New Jersey Department of Treasury to update the state contract for protective clothing.

Any employees or employee representatives who believe that a violation of these regulations or imminent danger exists should notify their employer immediately. They may also contact the State and request an inspection. Firefighters can use the previous explanation as a guideline to which agency should be contacted. When in doubt, contact the New Jersey Department of Labor.

Requests for inspections must be in writing and must describe the violation or danger that is believed to exist. While such letters must be signed by the employee or employee representative to be acted upon, the State must withhold the name of anyone who requests an inspection if that person asks that his or her name be withheld.

Once contacted, the relevant state agency must perform an inspection at the earliest date possible. At this inspection, the employee who requested the inspection, a representative of the employer, and a representative of the employee are allowed to accompany the inspector to aid the inspection. Employees who participate in such inspection must receive normal pay for the time on the inspection.

Notices of violation and recommendations for improvements will be provided to the employer by the relevant State agency (Labor, Health, or Community Affairs) after the inspection. In most cases, the agency that performed the inspection will communicate with the employer. In the case of hazardous material inspections, however, the Department of Health will perform the inspection, but notices of violation, if any, will come from the Department of Labor, on the report of the Department of Health. Inspection reports and notices calling for corrections are generally sent to the mayor of a municipality or the board of a fire district, with copies provided to the chief of the fire department.

Scope and Standards Information

These regulations apply to both career and volunteer members of the fire service. For purposes related to PEOSHA, use of the term "public employee" does not depend on whether or not the employee is paid. In some cases, different implementation details are set for career and volunteer members of the fire service, but the PEOSHA Act and regulations fully apply to career and volunteer firefighters.

These regulations are applicable to all firefighters. A "firefighter" is a public employee who engages in the physical activity of rescue, fire suppression, or both in buildings, enclosed structures, vehicles, vessels, or like properties that are involved in a fire or emergency situation. These regulations are not intended for those employed in the industries of construction, maritime, agriculture, airport crash rescue, or forest firefighting.

The protective clothing mandated by this regulation must be provided to all firefighters who participate in interior structural firefighting and overhaul. Interior structural firefighting is the physical activity of fire suppression, rescue, or both, which is conducted inside buildings or enclosed structures, after the incipient stage of the fire. Overhaul is the final control of a fire, with suppression of the main body of the fire and other pockets of fire, while searching for victims and performing salvage operations.

Organization Information

Employers must prepare a written description of:

1. The organizational structure of the fire department;
2. The expected number of members of the fire department;

3. The functions the fire department is expected to perform.

This document must be available for inspection by:

1. Employees
2. Their designated representatives (for example, labor unions); and
3. The New Jersey Department of Labor.

Physical Ability and Disability

The employer must assure that employees who are expected to fight interior structural fires are physically capable to do this work. The employer must make this determination in a way that is compatible with the Americans with Disabilities Act (ADA) of 1990, a federal law governing certain disability issues.

The details of ADA are beyond the scope of this document. For further information on ADA issues, and reviews of the Act. Discussions with legal advisors or both may be necessary.

Protective Clothing Requirements and Deadlines

Protective clothing must protect the:

1. Head, including face and eyes;
2. Body; and
3. Extremities (arms, legs, feet, and hands), see Figure C-2.

Employers must provide, at no cost to the employee, the protective clothing described in this regulation. The relationship between this mandate and any contracted clothing allowance must be agreed upon through collective bargaining between employers and employees. Employees who perform interior structural firefighting and overhaul must be provided with this equipment.

This law calls for cooperation from both employers and employees. Employers must assure that employees wear the protective clothing, use the safety equipment, and follow safety procedures. Employees must wear the required protective clothing, use the required equipment, and follow safety procedures at the time and in the ways specified by the law and their employer. The responsibility of wearing turnout gear and other PPE provided by the employer at emergency incidents rests squarely on the shoulders of the individual firefighter. An inherent culture existing in the fire service supports a casual attitude toward the proper and effective use of PPE at all emergency incidents. New firefighters coming into the New Jersey Fire Service must change this by adopting a “no exceptions” rule when it comes to properly wearing their assigned personal protective equipment to protect their health and safety and that of their team members.

For the most part, these regulations call for the eventual replacement of current equipment with new equipment that complies with more stringent standards. However, career firefighters must wear protective coats, pants, station uniforms, and boots that comply with these new standards.

Firefighters must remember that meeting standards for protection or resistance to certain substances or forces does not mean that a product will protect a firefighter from every possible condition experienced in the line of duty or that exceeds the tests performed.

Exposure to conditions that exceed the product's tested performance can lead to serious injury or death.

Foot and Leg Protection

New boots must comply with NFPA 1974-1987, "Protective Footwear for Structural Fire Fighting."

Figure C-2. A firefighter's structural firefighting ensemble.

Structural Firefighting PPE Ensemble Components

- Helmet
- Goggles
- SCBA
- Coat
- Pants
- Boots
- Hood
- Radio
- Flashlight
- PASS Device
- Pocket tools
- Gloves

This standard is the 1987 edition of NFPA standard number 1974.

Footwear that meets the NFPA standard will bear a label or stamp specifically stating that it complies with NFPA 1974-1987. Only boots with such a label will be considered to comply with the law.

The standard requires that boots will be at least 8 inches high, water resistant with a puncture-resistant sole, a ladder shank, and an impact and compression-resistant toe cap. There are several options for footwear available to firefighters, see figure C-3, C-4, C-5.

Boots must also meet standards for resistance to heat, corrosion, punctures, electricity, impact and compression, flame, abrasion, wear, and water. The details of these technical standards can be found in the NFPA text, along with information on testing methods.

Compliance Deadlines: Career firefighters must wear boots and bunker pants that comply with the standard at this time.

Volunteer firefighters must wear boots and bunker pants that comply with the standard when their current boots are next replaced or when they are worn out, whichever comes first.

Figure C-3. Common Rubber Boot

- Easy to don
- Excellent Water Repellency
- Easy Decontamination
- Inexpensive
- Sloppy Fit

Figure C-4. Leather Pull-Up Boot

- Lightweight
- Curable
- Comfortable
- Minimal Ankle Support
- Difficult to Decon
- Expensive

Figure C-5. Leather Lace-Up Boot

- Tight Fit
- Ankle Support
- Durable
- Expensive
- Height Decreases Water Resistance
- Difficult to Decon

Body Protection

This section covers both turnout (or bunker) gear and station uniforms.

Turnout Gear: Turnout gear must comply with NFPA 1971-1986, "Protective Clothing for Structural Fire Fighting." This is the 1986 edition of NFPA standard number 1971. Turnout gear includes both a protective coat and protective pants.

Turnout gear that meets the NFPA standard will bear a label specifically stating that it fully complies with NFPA 1971-1986, Figure C-6. Only coats and pants with such a label will be considered to comply with the law.

The NFPA standard for turnout gear includes tests for thermal protection; thermal shrinkage; heat, char, and ignition resistance; tear resistance; and retro-reflectivity.

The protective coat is designed to protect the upper torso, neck, arms, and wrists. It must be composed of three layers: outer shell, moisture barrier, and thermal barrier.

Because it will be worn with protective trousers, the new standard protective coat may be shorter than coats used in the past. To protect the neck, a collar at least 4 inches wide and containing at least the same three layers as the body of the coat must be part of the coat. Coats must also contain wristlets that meet the same performance standards as the body of the coat.

High visibility safety trim must be included on the protective coat. This trim must be at least 2 inches wide and have both retro-reflective and fluorescent surfaces. Each coat must have a continuous band of fluorescent and retro-reflective material, at least 2 inches wide, around the coat, as well as a similar band at least 2 inches wide around each wrist. Each coat must have at least 325 square inches of fluorescent trim. Retro-reflective surfaces must be at least 0.625 inches wide.

Protective pants, also known as bunker pants are required. These are designed to protect the lower torso and legs (excluding the ankles and feet. Like the protective coat, protective pants must he composed of three layers: outer shell, moisture barrier, and thermal barrier.

Bands of the same high visibility trim used on the protective coat must be placed between

Figure C-6. Interior label indicating turnout gear complies with NFPA 1971-1986

the bottom hem and the knee of each leg of the pants. Protective trouser trim must include at least 80 square inches of fluorescent surface area.

For career firefighters, these protective garments must be worn in conjunction with a station uniform that complies with the regulations.

Career firefighters must wear protective coats and pants that meet the standard at this time.

Volunteer firefighters must be provided and wear protective coats and pants that comply with the new standard when their current coats are no longer serviceable.

Volunteer firefighters must wear protective pants when they wear the shorter boots.

Station Uniforms: Station uniforms may comply with NFPA 1975-1985, "Station/Work Uniforms for Fire Fighters." or be made of a nonmeltable material, such as cotton. Station uniforms include a shirt and pants. Station gear that meets the NFPA standard will bear a label or stamp specifically stating that it fully complies with NFPA 1975-1985. State PEOSHA regulations do not require station uniforms that comply with this NFPA standard. Station uniforms are not meant to take the place of turnout gear. Career firefighters must wear station uniforms that comply with this regulation at this time. Station uniforms are not required for volunteers.

In 2007, the National Fire Protection Association (NFPA) adopted a revised standard on station wear and work uniforms titled “Station/Work Uniforms for Emergency Services.” Unfortunately, as of February 2010 the New Jersey Department of Labor has not yet

adopted this revised standard. According to PEOSHA representatives the new standard may be cited during an inspection and/or investigation. However, they will continue to utilize the prior standard covering station uniforms and personal protective equipment documented in this section to determine violations of their regulations.

Hand Protection

Gloves must comply with NFPA 1973-1988, Gloves for Structural Fire Fighting. This standard is the 1988 edition of NFPA standard number 1973.

Gloves that meet the NFPA standard will bear a label inside each glove specifically stating that it fully complies with NFPA 1973-1988. Only gloves with such a label will be considered to comply with the law.

Compliant gloves are designed to minimize the effects of flame, heat, sharp objects, and other hazards associated with structural firefighting. Gloves must provide complete and secure thermal and moisture protection, and are designed to interfere as little as possible with movement and dexterity.

Gloves must extend at least 1 inch above the wrist, and must also contain a secure wristlet to prevent the entry of embers and other matter.

There are specific sizing criteria in the NFPA standard to ensure uniformity of hand measurement and sizing. These criteria are included in the standard.

Gloves must comply with the standard at this time.

Head, Eye, and Face Protection (Helmets and Protective Hoods)

Helmets must comply either with the existing OSHA standard for helmets, found in Federal regulations at 29 CFR Part 1910.156(00), or NFPA 1972-1987, "Helmets for Structural Fire Fighting," The 1994 State PEOSHA regulation continues to approve of the current OSHA standard helmet and adds the NFPA-standard helmet as an alternative. Protective hoods must comply with NFPA 1971-1991. “Protective Clothing for Structural Fire Fighting.”

Helmets must protect the head, eyes, and face, and must include earflaps and a chinstrap, Figure C-7.

Helmets that meet the NEPA standard will bear a label specifically stating that it fully complies with NFPA 1972-1987. Helmets that comply with the OSHA standard will also bear a label specifically stating that it complies with the appropriate OSHA standard. Only helmets bearing one of these labels will be considered to comply with the law.

The NFPA performance requirements for helmets cover protection from impact, penetration, heat, flame, and electricity. Ancillary features such as the chinstrap, ear covers, face shield, and retroreflective markings are also designed to meet NFPA criteria, although the criteria and testing are not necessarily identical to those for the body of the helmet.

Face shields, Figure C-8, that comply with the standards will bear a label stating compliance with the requirements of 29 CFR 1910.134. The label will also point out that users may still require additional eye protection.

Protective hoods must protect areas of the head and neck excluding the face, which is normally protected by the SCBA facepiece. Protective hoods meeting the NFPA standard will bear a label specifically stating that it fully complies with NFPA 1971-1991.

This regulation allows the use of helmets that comply with the existing OSHA standard, and allows the use of the NFPA helmet standard as an alternative. Helmets must comply with this regulation at this time.

Protective hoods must be provided and worn at this time unless the hood interferes with the proper fit of the firefighter's helmet. If this is the case, a hood shall be provided at such time as the helmet becomes unserviceable and is replaced.

In 2007, the National Fire Protection Association (NFPA) adopted a new protective clothing standard titled “Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting” (NFPA 1971-2007). This revised standard regulates the identical components of the prior standard such as, structural firefighting PPE, foot and leg protection, head protection, along with hand and head protection. However, some major safety related additions/revisions to this standard were adopted by the NFPA. These new sections include standards on the testing of the materials used to construct PPE, the inclusion of safety features such as a drag rescue device (DRD) within each individual set of PPE, and an

optional CBERN (Chemical Biological, Explosive, Radiological and Nuclear) section that allows departments who may respond to terrorist incidents the opportunity to purchase PPE that will afford their members enhanced protection against certain CBERN agents.

Figure C-7. Helmets must include a chinstrap.

Unfortunately, as of February 2010, the New Jersey Department of Labor has not yet adopted these revised standard. According to PEOSHA representatives, the new standard may be cited during inspection and/or investigation. However, they will continue to utilize the prior standard covering PPE documented in this section when conducting inspections and/or investigations.

Figure C-8. A face shield and earflaps are required on a helmet.

Respiratory Protection Devices

Respiratory protection equipment must comply with 29 CFR 1910.134 and NFPA 1981-1987, "Open-Circuit Self-Contained Breathing Apparatus for Firefighters." This is the 1987 edition of NFPA standard number 1981.

Employers must establish and maintain a respiratory protection program complying with 29 CFR 1910.134. This OSHA standard has been adopted by PEOSHA in its entirety.

Respiratory protection equipment that complies with the NFPA standard will bear a label specifically stating that it complies with NFPA 1981. Only equipment that bears such a label will he considered to comply with the law.

To bear the NFPA label, the National Institute of Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration must certify this equipment. These organizations require that the equipment weigh no more than 35 pounds and carry at least a 30-minute supply of air.

Respiratory protection equipment must be of the open circulation type, which means that exhaled air is expelled from the equipment and not reused in any way.

There are two types of open circulation systems, positive pressure and negative pressure. Only positive pressure open circulation systems comply with the NFPA standard. Devices that operate in positive pressure mode but can be switched to negative pressure mode do not meet the standard.

No respiratory protection equipment that has been approved by the Bureau of Mines complies with the NFPA standard, regardless of any grandfather provision or statement to the contrary by any government or private group.

Respiratory protection equipment must meet standards for airflow as well as resistance to heat, vibration and shock, flame, corrosion, dust, facepiece lens abrasion, and voice communication.

Respiratory protection equipment ordered or purchased after January 1 1993, must comply with the NFPA standard. Existing respirators that comply with the previous

OSHA standards may be worn until they are unserviceable under certain conditions. Specifically, these respirators may be used with approved air cylinders from other approved systems as long as they are of the same capacity and pressure rating. Existing respirators that are switchable from demand to positive pressure mode must be used in positive pressure mode during all firefighting and overhaul work.

Career and volunteer firefighters must be provided with compliant respiratory protection equipment upon the next replacement of current equipment.

Life-Safety Rope, Harness, and Hardware

Life-safety rope, harnesses, and hardware must comply with NFPA 1983-1985. This standard is the 1985 edition of NFPA standards number 1983.

This equipment need only be provided in those departments that train and perform rope rescue services.

Life-safety rope that meets the NFPA standard will bear a label specifically stating that it complies with NFPA 1983, it will also contain an identification tape wound into the full length of the rope bearing the same statement.

Only life-safety ropes with both the label and the tape will be considered to comply with the law. Rope with a tape but without a label should, not be used for rescue purposes, because removal of the label is one way of marking rope that is no longer suitable for rescue work.

Life-safety rope must be of block creel construction, which means that lengths are made without knots or splices.

Life-safety rope that has been previously used for rescue or non-rescue purposes should be destroyed or removed from use for rescue purposes. Failure to observe this recommendation could lead to serious injury or death because no acceptable means of testing used rope exists.

Life-safety rope is available in two classes—one person rope and two person rope. Ropes that comply with the law will bear a label identifying whether it is one or two person rope. One-person rope is designed with a maximum working load of at least 300 pounds and a tensile strength of at least 4,500 pounds.

In contrast, two-person rope is designed with a maximum working load of at least 600 pounds and a tensile strength of at least 9,000 pounds.

Life-safety rope, harness, and hardware must comply with this standard at this time.

Life-Safety Harnesses: Life-safety harnesses meeting the NFPA standard will bear a cloth label or a riveted metal tag stating that it complies with NFPA 1983. Only harnesses with such a label or tag will be considered to comply with the law.

Webbing for these harnesses must be constructed of virgin, continuous fibers and be at

Figure C-9. A Class I harness is secured only around the waist.

least 1-3/4 inches wide. Webbing, structural stitching, and rivets are designed and tested to meet and exceed their intended use situations.

Harnesses are designated as being from one of three classes. Class I harnesses fasten around the waist, Figure C-9. They are designed to secure one person to a ladder or to bear the weight of one person in an emergency rescue. Class I harnesses, should not be worn by firefighters during efforts to rescue another person.

Class II harnesses, are worn around the waist and around the thighs or under the buttocks, Figure C-10. They are designed for use in rescue situations where two-person loads (e.g., one firefighter and one victim) may he encountered.

Class III harnesses, are fastened around the waist, around the thighs or under the buttocks, and over the shoulders, Figure C-11. They are designed for rescue situations where a two-person load and inverting may be encountered.

Life-Safety Hardware: There is no NFPA label applied to life-safety hardware, but load-bearing hardware will carry the name of the manufacturer and the MIL-SPEC number, if applicable.

Figure C-10. A Class II Harness is secured around the waist and thighs.

All hardware must be able to withstand corrosion in a laboratory salt spray test. In addition, all load-bearing hardware, buckles, rings, snap-links, ascent devices, and descent devices are tested to withstand forces that match and exceed expected use conditions. Snap-link gates, which are load-bearing, gated fasteners, must lock automatically. Recently, many fire departments have begun to purchase personal safety harnesses and personal escape devices for individual firefighters.

Figure C-11. A Class III harness.

These life saving units are designed to allow firefighters the capability to safely and rapidly remove themselves from an IDLH atmosphere should an emergency event occur. While these devices are not mandatory, the proactive manner by which individual departments are assuming the responsibility of enhancing firefighter safety through these purchases should be commended.

Personal Alert Safety System (PASS)

Personal Alert Safety System (PASS) devices must comply with NFPA 1982-1988. This is the 1988 edition of NFPA standard number 1982. However, devices that comply with the 1983 edition of this standard, NFPA 1982-1983, may continue in use until they become unserviceable.

PASS devices are motion-detector-based devices, worn by individual firefighters, that emit an alarm when a firefighter has not moved in approximately 30 seconds. The purpose of a PASS is to alert other firefighters that the wearer may be unable to move and may be in need of assistance. They must be worn by firefighters in the following situations:

- While engaging in interior structural firefighting
- While working in confined spaces; and
- During all phases of overhaul.

The PASS device shall be attached to the exterior of the firefighter's turnout gear.

PASS devices that meet the NFPA standard will bear a label specifically stating that it fully complies with NFPA Standard 1982. There are 1988 and 1983 editions of this standard, and an explanation of which edition of the standard must be met is provided under "Compliance Deadlines."

Figure C-12. Various types of PASS Devices are available. Including those that are integrated with SCBA

Only devices with labels specifically mentioning the appropriate standard will be considered to comply with the law.

PASS devices emit an alarm sound when the firefighter has not moved for approximately 30 seconds, or when the firefighter manually operates the alarm switch, Figure C-12. They are battery-powered devices, weighing no more than 16 ounces, which can be attached to a firefighter's SCBA gear or elsewhere.

PASS devices are designed to be operated in three modes—automatic, manual, and off. In automatic mode, the motion detector will activate a pre-alarm warning after approximately 30 seconds of no motion by the wearer. This warning sound will be distinct from the alarm sound. Motion sensed after the pre-alarm warning sound will return the device to automatic mode. Under normal operating conditions, the device will be able to sound its alarm for at least one hour.

- When the wearer or operator switches the device to manual mode, the alarm will sound within one second.
- In the off mode, the device does not function and there is no drain on battery power.
- The switch used to change modes must be operable by a hand wearing a heavy glove.

Turning the switch to the off position requires two distinct motions to limit the possibility of accidental shutoff.

The device must also emit a low battery warning sound when the battery is drained to the point it would be unable to sustain a full alarm sound for one hour. The low battery warning is distinct from other sounds emitted by the device.

A career or volunteer firefighter who does not currently have any PASS device must wear a PASS device that complies with NFPA 1982-1988. A career or volunteer firefighter who has a PASS that does not comply with any edition of NFPA Standard Number 1982 must have a device that complies with NFPA 1982-1988 by January 4, 1994.

A career or volunteer firefighter whose current PASS complies with the 1983 edition of the NFPA standard (NFPA 1982-1983) must be issued a device that complies with the 1988 edition of the standard (NFPA 1982-1988) upon replacement of the current device.

Many fire departments have begun to use Integrated PASS units which provide PASS devices and SCBA in the same appliance. This application meets the previous intent of regulation so long as the Integrated PASS unit meets all the previously stated requirements and is worn, not only while engaged in interior structural firefighting, but while working in a

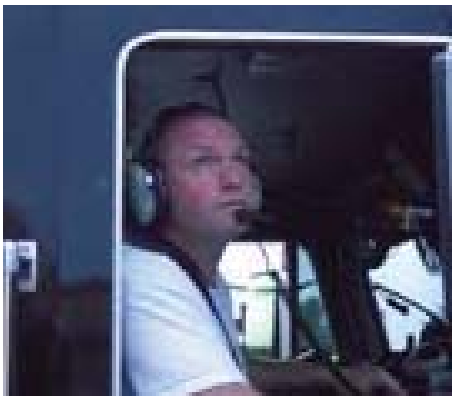


Figure C-13 Apparatus headsets provide hearing protection for firefighters.

confined space, during all phases of overhaul, and whenever there is a possibility that the previously mentioned actions could occur.

Hearing Protection

PEOSHA hearing protection standards do not apply to working in emergency situations. They apply only to the use of power tools or any other noise-emitting devices during testing or other non-emergency situations, Figure C-13.

In general, noise above 90 decibels, when encountered in a non-emergency situation, requires hearing protection provided by the employer. However, hearing protection is not required (even in a non-emergency situation) if its use would create an additional hazard to the user.

Employers must engage in a noise reduction program to identify potentially harmful noise sources and reduce or eliminate these sources. The program should be described in writing by the employer and may be incorporated into the employer's Standard Operating Procedures.

Federal and state regulations on general workplace noise (N.J.A.C. 12:100-4.2(a)6 and US CFR 1910.95) also apply to firefighters.

Career and volunteer firefighters are covered by PEOSHA hearing protection rules at this time.

Filling Air Cylinders

Filling of air cylinders must be performed only by firefighters specifically trained to do this work. Filling gas cylinders must be done only in areas equipped to protect the operator and nearby personnel. These regulations on filling air cylinders are effective at this time.

Apparatus Operational and Passenger Safety

All firefighters (except the driver) must don protective gear before boarding apparatus leaving the station for a fire or other emergency. No firefighter is allowed to put on protective gear while riding on moving apparatus.

Employers must provide seat belts or harnesses for all firefighters riding apparatus, figure C-14.

All the fire apparatus purchased or remanufactured after January 4, 1993, must have enclosed seating with seatbelts for all personnel riding on the apparatus.

Standards for this seating can be found in the following NFPA standards:

Pumpers – NFPA 1901-1991
Initial Attack – NFPA 1902-1991
Mobile Water Supply – NFPA 1903-1991
Aerial Ladder and Elevating Platform – NFPA 1904-1991

These standards call for fully enclosed seats with seatbelts for whatever number of personnel is specified by the purchasing employer. A seat must be provided for each firefighter the apparatus is designed to carry.

Each seat must be at least 18 inches wide by 15 inches deep. Headroom must be at least 36 inches from the top of the cushion to any overhead obstruction. Each seat must have at least 22 inches of shoulder room. Driver seats must be adjustable from front to back, and driver compartments must have seating capacity for at least two firefighters.

Figure C-14. Employers must provide seatbelts or harnesses for all firefighters riding apparatus.

Maintenance of Firefighter Equipment

Any equipment required by PEOSHA rules must be removed from service if it is damaged or unserviceable.

Fire department aerial apparatus is required under these revised standards to be tested in a accordance with NFPA 1914-1991, Testing Fire Department Aerial Devices. This standard calls for annual visual, operational, and load testing. Additionally, every five years, or if the ladder is damaged or fails the annual testing, ladders shall be subjected to complete inspections and nondestructive testing as described in NFPA 1914-1991.

This standard is in effect at this time.

FIREFIGHTER SAFETY

NJ Fire Service Incident Management System

In 2007, the NJ Fire Safety Commission directed the Division of Fire Safety in conjunction with the Firefighter Safety and Health Advisory Council to initiate the development of a statewide firefighter safety standard that would significantly increase the level of firefighter safety at emergency incidents and seamlessly integrate into the existing NJ Fire Service Incident Management System. It was felt that a common standard of this type was necessary in order to ensure the state's firefighters were properly protected to the highest levels of safety during emergency incident operations. Additionally, it was imperative that the standard be easily implemented, contain common terminology, meet other current nationally recognized standards, and encompass several critical components of incident safety not previously addressed in NJ Regulations.

After conducting a substantial amount of research and challenging work, the parties involved agreed on a standard that would meet the original goal of improving the safety of firefighters operating at emergency incidents. The proposal was presented to the Fire Safety Commission who, with their endorsement, presented it to the Department of Community Affairs, Commissioner Doria, for adoption into regulation. The Commissioner adopted the regulations on April 14, 2008 and the regulations became effective June 2, 2008.

While the standard emergency incident priorities of life safety, incident stabilization, and property conservation stand true to this day, it is the life safety of firefighters that has become the foundation of effective emergency incident operations and the number one priority for incident commanders at emergency incidents. Safety standards create a solid basis from which the incident commander and emergency responders can operate from in the dynamic and fluctuating environment of an emergency incident. The stable foundation created by these standards coupled with strict adherence to applicable local standard operating guidelines (SOG's) will form an acceptable level of firefighter safety at emergency incidents.

It is critically important for firefighters to understand that firefighting is one of the most dangerous occupations to be engaged in. Regardless of the pre-determined levels of safety provided to personnel operating at emergency scenes the extreme hazards presented by the dangerous environments and IDLH atmospheres firefighters are forced to operate in cultivate events and circumstances that can lead to severe injuries and fatalities. This is the profession's reality. However, in an effort to counter this recognized fact firefighters must develop and practice an individual and team oriented attitude of "safety first" while operating at emergency incidents. This attitude shall include actively supporting and practicing the following NJ Firefighter Safety Regulations.

Figure C-15. Command Staff needs to constantly monitor and update critical information.

SAFETY OFFICER

NFPA 1500 and 1561 mandate the assignment of an Incident Safety Officer (ISO) at emergency incidents. Since the inception of these standards and the adoption of New Jersey's Incident Management regulations in 1995, fire departments have been required to operate within the parameters of a uniform incident management system (IMS) that includes the assignment of a Safety Officer at every response. The NJ Firefighter Safety regulations adopted in June of 2008 mandates the assignment of a safety officer at every significant emergency event (N.J.A.C. 5:75-2.5 Safety Officer). In this method the new regulations integrate seamlessly with the current IMS regulations and should not pose any additional burden on fire department emergency

operations. As written, the new regulation allows the incident commander to serve as both the IC and the safety officer at an emergency incident. However, the staffing of the safety officer position in this manner is not conducive to ensuring an appropriate level of firefighter safety. It is a documented fact that the IC has a significant amount of responsibility at an incident. This responsibility makes it extremely difficult, if not impossible, to effectively complete his duties and those of the safety officer. To offer assurances that an IC will assign an operational staff member to this position the new regulation specifically defines a significant emergency event as "any occasion or instance for which, in the determination of an incident commander, he or she cannot effectively monitor conditions to insure the safety of assigned personnel or he or she deems an operations section is needed or where firefighters are exposed to conditions immediately dangerous to life or health (IDLH) a safety officer shall be appointed." Based on this definition, the clearly recognizable fact that countless fire department responses can be categorized as a significant event, and the acknowledged dynamic nature of emergency incidents, many fire departments have taken a proactive approach to ensuring this position is properly staffed prior to an emergency response with a member other than the incident commander. This practical method of assigning personnel to this position prior to an incident has rapidly become the standard by which most fire departments in New Jersey operate. The full text of the safety officer regulation is indicated below.

Figure C-16. A Safety Officer monitors all activities on the fireground

N.J.C.A. 5:75-2.5 Safety Officer

(a) An incident commander shall appoint a safety officer at every significant emergency event.

1. "Significant emergency event" means any occasion or instance for which, in the determination of an incident commander, he or she cannot effectively monitor conditions to insure the safety of assigned personnel or he or she deems an operations section is needed or where firefighters are exposed to conditions immediately dangerous to life or health (IDLH).

2. Complex incidents or those that cover a large geographic area may require the appointment of assistant safety officers, who shall be assigned to branches, divisions, or groups.

(b) The following items shall govern the appointment of a safety officer:

1. The safety officer shall be assigned as early in the incident as possible and shall be knowledgeable in the actions being implemented;

2. The safety officer shall report directly to the incident commander;

3. The safety officer shall identify existing or potential hazards and inform command of those findings;

4. The safety officer shall recommend to the incident commander any changes to the incident action plan as a result of on-going surveys;

5. The safety officer shall have the authority to alter, suspend, or terminate any activity that is an unacceptable safety risk. The safety officer shall inform the incident commander and other affected operational personnel immediately if he or she changes any operational activities for safety reasons; and

6. When operating in hazardous positions, the safety officer shall be attired in appropriate personal protective equipment (PPE), including self contained breathing apparatus (SCBA); have radio communication equipment; and be accompanied by another firefighter.

(c) If a safety officer has not been appointed, the incident commander shall be the safety officer.

EMERGENCY RADIO TRAFFIC

Proper and effective emergency incident radio communications is one of the most influential and direct contributing factors enhancing firefighter's safety at emergency incidents. Common terminology, a clear and concise voice,

calm demeanor, and professional radio conduct are the key ingredients to effective radio communications at emergency incidents. It is therefore a learned skill not commonly associated with the standard classroom environment. This fact alone forms a basis as to how important it is for firefighters to practice effective communications and understand how the dynamics of communication can effect the overall operation of an emergency incident.

Incident commanders, company officers, and firefighters who employ substandard radio communications at emergency incidents create stressful situations that can generate an emergency incident environment filled with confusion, disorder, and incompetent incident management under normal conditions. A much more serious communication problem can develop during incidents at which firefighters become trapped or disoriented within a structure or area ultimately requiring rescue from a rapid intervention crew or other emergency responders. If incident commanders and firefighters cannot effectively manage radio communications and deliver accurate information at a common everyday incident how can they be expected to perform during an intense, dynamic, and duress filled operation requiring the rescue of trapped firefighters? In order to provide the New Jersey fire service with direction and a common standard operating guideline to place into effect during these type of life-threatening incidents the State regulations adopted in 2008 includes a section on Emergency Radio Traffic. Essentially, this section details the common terminology radio protocol, and step by step standard operating guidelines that are mandated to be written and utilized by fire departments throughout the state in the event a firefighter becomes lost, disoriented, or injured at an emergency response thus ensuring the use of common terminology at emergency incidents.

Experience has shown that strict adherence to a standard set of emergency communication procedures by disciplined firefighters is a critical component of controlling the turmoil created during the issuance of a “mayday” message and subsequent rescue operation. To further reduce the opportunity for disorder during these events the emergency radio traffic section of these guidelines include specific details on the prioritization of emergency radio traffic or “mayday messages” over routine communication, identifying who can call a “mayday”, distinguishing conditions requiring a “mayday”, confirming the procedure used to call a mayday, accurate use of the LUNAR acronym, and management of the PASS alarm during a “mayday” situation. Firgure C-17

Fire Chiefs are ultimately responsible for the overall safety of their firefighters. One of the most positive ways to ensure this obligation is fulfilled is to support and follow the mandates included in these new regulations. A proactive fire department committed to the safety of their members will write effective standard operating guidelines that meet the emergency radio traffic regulations indicated below and train their firefighters to use them as necessary during emergent situations. The full text of the emergency radio traffic regulation is indicated below.

N.J.A.C. 5:75-2.6 Emergency radio traffic

(a) A fire department communication system shall provide a standard method for giving priority, over that of routine radio communication, to the transmission of emergency messages and notification of imminent hazards to all levels of the incident command structure.

(b) When firefighters encounter conditions that pose a non-routine threat to their life or safety or that of others, they shall convey that situation via two-way radio to incident commanders and/or rescue crews utilizing clear text (see (f) below).

(c) Fire departments shall have a written standard operating guideline or procedure that uses the radio terms "emergency traffic" or "mayday" as a designation to clear radio traffic. An incident commander, safety officer, division or group supervisor, or any member who is in trouble or sees an emergency condition can declare emergency traffic.

1. Various radio tones may also be used to draw attention to an "emergency traffic" or "mayday" message.

(d) Examples of emergency conditions that warrant emergency radio traffic include:

1. A firefighter down or has fallen;
2. A firefighter missing;
3. A firefighter trapped;
4. A firefighter lost;
5. A firefighter "stuck";
6. The need to immediately evacuate the building or area;

7. A building or structure collapse or imminent collapse;

8. A wind direction shift, such as from north to south;

9. Changing from offensive to defensive operations;

10. Equipment failure posing an imminent danger;

11. Fire discovered entering an exposure to a degree that any delay may considerably enlarge the fire problem;

12. Necessity to change from an interior to an exterior attack mode; or

13. Loss of water or other extinguishing agent that would endanger members.

(e) Whenever "emergency traffic" or "mayday" is transmitted via two-way radio, all communications on that frequency shall cease except those between the firefighter initiating the emergency radio transmission and the incident commander and/or the fire department dispatch center. Normal two-way radio use may be resumed upon completion of the emergency message, unless the incident commander orders otherwise.

(f) When a member has declared an emergency traffic or "mayday" message, he or she shall use clear text terms identified in their fire department standard operating guidelines or procedures, such as "firefighter down," "firefighter missing," etc.

1. The term "mayday" shall not be used when operating with aviation or marine personnel.

(g) The procedure for the use of "emergency traffic" or "mayday is as follows:

1. Firefighters in life-threatening situations shall immediately contact the incident commander via two-way radio stating "emergency traffic" or "mayday and then identify themselves;

2. The incident commander, upon hearing the "emergency traffic" or "mayday radio transmission, shall acknowledge the person issuing the " emergency traffic" or "mayday" via two-way radio by stating "emergency traffic, clear the channel";

3. The person making the "emergency traffic" or "mayday" call shall respond to the incident commander by repeating "emergency traffic"

Figure C-17. Emergency radio procedures should be trained for on a consistent basis.

or "mayday," shall identify themselves, their unit and assignment, shall report the nature of the situation including resources needed and shall give their location (LUNAR-location, unit, name or number, assignment and resources needed). Repeating the "emergency traffic" or "mayday" radio transmission shall give any emergency personnel monitoring the radio frequency that may have missed the first transmission an opportunity to hear and react to the "emergency traffic" or "mayday" call accordingly;

4. A person in distress who initiates an "emergency traffic" or "mayday" call shall first activate their personal alert safety system (PASS) device and, if applicable, their radio's emergency button. A person in distress who initiates an "emergency traffic" or "mayday" call shall coordinate his or her radio transmissions with the activation of his or her PASS device;

5. "Emergency traffic" or "mayday" transmissions that are not acknowledged shall be repeated until they are acknowledged.

6. Any fire officer or firefighter hearing an "emergency traffic" or "mayday" signal and realizing that it is not being acknowledged shall acknowledge the radio transmission, ascertain its nature and promptly relay all information to the incident commander;

7. Upon receipt of an "emergency traffic" or "mayday" radio transmission, the incident commander shall be responsible for determining appropriate actions to mitigate the

situation at hand; and

8. At the conclusion of the emergency condition, an "all clear for emergency traffic" shall be transmitted to allow a return to normal operations.

(h) Fire departments should use communication systems that are appropriate for emergency radio communications.

(i) Fire departments shall develop and utilize written standard operating procedures/guidelines that comply with the requirements of this section for the use of emergency radio transmissions.

(j) Fire departments shall assure that all emergency response personnel receive training adequate to ensure proficiency in the procedures as set forth in this section.

EVACUATION SIGNAL

Emergency incident operations are extremely fluid events that place firefighters in exceptionally hazardous environments. Added to this fact is the constant threat of a significant major occurrence during the operation such as a collapse, flashover, or back draft. These rapid and unpredictable changes have been known to transform a common everyday response into a chaotic and life threatening situation.

When an incident such as this occurs during a response the incident commander is required to make swift and confident decisions regarding the continuation or termination of the operation. These difficult decisions are typically measured by the level of risk imposed on the firefighters by that catastrophic event. If the decision to terminate the operation and evacuate an area or structure is made by the IC, he is responsible to account for and assure the safety of all firefighters at the scene. This can be an intimidating and complicated task marked by extreme danger and disorder.

It is conclusively acknowledged that the incident commander is responsible to ensure the evacuation process is managed properly. However, firefighters operating at a scene must also understand the critical role they play in the overall effectiveness of the evacuation procedure. In reality, the responsibility of evacuating an area is a team oriented procedure ordered by the IC, but carried out by the personnel operating in the IDLH environment. Its effectiveness is therefore based on excellent communication of the evacuation order and well disciplined firefighters who acknowledge and comply with the message. In an effort to provide the incident commander and firefighters with the resources necessary to conduct an effective evacuation a common statewide procedure has been adopted. By adopting and mandating the use of this standard the state has provided fire departments with a universal evacuation system capable of being effortlessly integrated into an individual department's standard operating guidelines, IMS system, and state mandated accountability procedures. The full text of the evacuation signal regulation is indicated below.

N.J.A.C. 5:75-2.7 Evacuation signal

(a) When the risk posed to firefighters is so great that an incident commander or his or her designee must order an evacuation from a hazardous area, a uniform procedure and accompanying audible signal recognizable by all personnel operating on an incident scene shall be established, adopted and utilized by all fire departments.

(b) The evacuation signal shall consist of repeated short blasts of an air horn for a period no longer than 10 seconds, followed by 10 seconds of silence. This sequence of repeated short air horn blasts for 10 seconds followed by a 10- second period of silence shall be done three times; the total evacuation signal, including periods of silence, shall last 50 seconds.

1. To reduce the possibility of missing radio messages while the evacuation signal is sounding, incident commanders shall designate apparatus away from the command post as the signal sounder.

2. For fire departments operating at multi-discipline scenes, the evacuation signal shall be as designated in the incident action plan.

(c) Whenever an emergency evacuation signal is being sounded, there shall also be a radio message transmitted either from the incident scene or from the designated fire department dispatch center announcing the evacuation order. To the extent possible, the radio message should be coordinated with the sounding of the evacuation signal to insure the radio messages are heard.

(d) The emergency evacuation signal shall be activated whenever it becomes necessary for firefighters and related agency personnel to immediately evacuate a building or an area in which emergency operations are taking place due to conditions posing an immediate and probable

hazard to life. The evacuation order shall only be conducted upon the order of the incident commander or his or her designee.

(e) Upon being alerted to an emergency evacuation signal, all personnel shall evacuate the hazardous area to an area of obvious safety. As all personnel evacuate, they shall warn others in the event they have not been alerted by the signal. During an emergency evacuation, it may be necessary to abandon equipment in order to evacuate the hazardous area quickly and safely. Firefighters should retain any equipment needed to insure personal firefighter safety during the evacuation, that is, self-contained breathing apparatus (SCBA), personal protective equipment (PPE), etc.

(f) Once personnel have exited the hazardous area, they shall report to their company officer or assemble in a predetermined area where officers shall take roll of those present. Personnel accountability tags (PATs) shall be retrieved by firefighters at the time of roll call. A personnel accountability report (PAR) shall be communicated to the incident commander when the roll call is complete. If it is determined that personnel are missing, resources shall be immediately focused on the goal of rescuing or locating those persons missing.

(g) Re-entry to an evacuated hazardous area for normal firefighting-rescue operations shall be permitted only upon the order of the incident commander or his or her designee.

(h) Fire departments shall develop and utilize written standard operating procedures/guidelines for using emergency evacuation signals that comply with the requirements of this section.

(i) Fire departments shall assure that all emergency response personnel receive training adequate to ensure proficiency in the procedures as set forth in this section.

RAPID INTERVENTION CREWS (RICs)

A rapid intervention crew can be defined as a team of firefighters specifically designated by the incident commander to standby in a state of readiness should the need arise to initiate a rescue effort of a distressed or missing member at an emergency incident. Due to the many hazards faced at emergency incidents it is imperative that a highly skilled and well trained team such as the one described above be readily available to rescue one of their own should the need arise. The use of these "firefighter rescue" crews (RIC's) has been inherently built into fire department emergency incident operations for over ten years and in that time have evolved into the most formidable, effective and accessible resource an incident commander possesses to enhance the safety of firefighters operating at emergency incidents. One of the more important revisions to current model RIC programs adopted within the new state regulations is a modification of the name and associated acronym given to a firefighter rescue team. Historically these teams have been called either firefighter assistance teams (FAST) or rapid intervention teams (RIT). However, the State has adopted a revised term of rapid intervention crew (RIC) as a common statewide designation. This follows current NFPA and IMS standards.

Figure C-18. Rapid Intervention Crew standing by in a state of readiness at an emergency incident

Within the RIC safety regulations incident commanders are granted the discretion to request the response of a RIC when he/she deems the "circumstances dictate" the need. One could assume that allowing this generous level of discretion may create a significant gap in the standard level of safety provided to firefighters across the state. In essence, "What one incident commander may deem as mandatory, another may not." In order to ensure this unpredictable disparity is removed from an operation and a standard level of RIC usage is maintained throughout the state, incident commanders and those acting in that position must adopt a "no exceptions" attitude regarding the use of RICs at emergency incidents. If taken, this stance will not only solidify the intent

of the new regulations, it will also significantly increase firefighter safety at emergency scenes.

The State regulations follow current NFPA standards that state that a minimum of two (2) firefighters who are trained, equipped, and attired to perform the necessary action(s) of rescuing a downed member shall be assigned as the RIC from the initiation of an incident. While it is common for some fire departments to have staffing shortages during the incipient stage of an incident that will not allow the assignment of more than two (2) firefighters to this team, studies, fire ground experience, and real life rapid intervention crew deployments have provided explicit, documented evidence, that the minimum number of two (2) members indicated above will not be capable of rescuing a downed firefighter. Although the state adopted this minimum number to comply with PEOSHA regulations and NFPA Standards, incident commanders should be prepared to assign a minimum of four (4) and a maximum of six (6) firefighters to each individual RIC. This will ensure an adequate number of personnel are available to complete the multitude of tasks required to be completed by the rapid intervention crew during a rescue deployment. Additionally, the IC may also have to assign multiple RICs for incidents involving specialized rescue operations, large scale incidents, sizeable buildings, and/or other complex responses. Firefighters assigned to rapid intervention crews must be extremely skilled, well trained, and experienced in operating within dangerous and complex environments.

In order to obtain the expertise required to complete the successful removal of a distressed firefighter from an IDLH atmosphere, firefighters must consistently train on the hands-on and classroom based complex skills and abilities required to successfully complete an operation of this type. In an effort to provide New Jersey firefighters with these skills and knowledge a common RIC Awareness training curriculum that coincides and supports the adoption of these regulations has been developed and will be offered to all firefighters across the state beginning in the fall of 2009. In addition, future programs that will establish RIC operations, RIC officer, and RIC team training competencies are being formulated and developed at this time. The full text of the Rapid Intervention Crew regulations is indicated in the following topic.

N.J.A.C. 5:75-2.8 Rapid intervention crews (RICs)

(a) If the circumstances dictate it, a rapid intervention crew/company (RIC) shall be designated to standby in a state of readiness should the need arise to initiate a rescue effort for downed or missing firefighters.

(b) An RIC shall be comprised of a minimum of two firefighters who are trained, attired and equipped to perform the actions necessary to facilitate the immediate rescue of other emergency workers.

(c) The RIC shall have awareness of where resources are committed on the incident.

(d) To the extent possible, the RIC shall not be assigned to other duties that would in any way delay or impede their rescue effort.

(e) More than one RIC may be required for large scale or complex operations.

1. A rapid intervention group supervisor shall be assigned to manage multiple RICs.

(f) Fire departments shall develop and utilize written standard operating procedures/guidelines for using RICs including specialized training for members who will serve on the RIC.

Figure C-19. Rapid Intervention Crews shall be well trained, properly staffed, and provided adequate resources

MEDICAL UNIT/RESPONDER REHABILIATION

Emergency incident rehabilitation is an integral component of ensuring the health and safety of firefighters operating at an emergency scene. Incident commanders are ultimately

responsible for ensuring that the physical and mental condition of emergency responders operating at an event does not deteriorate to a point where it affects the safety of an individual member, his/her crew, or the overall integrity of the operation. Over the past several years fire departments have favorably accepted the need to implement an effective rehabilitation program and provide properly trained and equipped medical evaluation unit(s) at emergency incidents as required. This has been accomplished through the development and definitive use of standard written operational policies reflecting current NFPA standards and PEOSHA regulations related to this fundamental component of firefighter health and safety. Recognizing the need for and requesting rehabilitation services must be accomplished early in an incident. It is essential that incident commanders identify with and adopt this position in order to improve the level of safety of emergency responders.

Extreme temperatures (extreme heat or cold) should not be the lone motive for establishing a rehab sector at an incident. Any activity or event that requires a large number of firefighters, is long in duration, large in size, or involves labor intensive tasks will quickly exhaust the physical capabilities of personnel resulting in the required establishment of a dedicated rehabilitation/ medical sector under the logistics section of the IMS. Although the incident commander maintains full responsibility for the formation of the rehab section, to be effective, rehabilitation should be viewed in a team oriented approach beginning with the individual firefighter and moving upward to the IC. Additionally, it is acutely important for all supervisors to maintain an awareness of the condition of each member operating within their company or area. Competent supervisors should maintain an intimate knowledge of the physical and mental limitations of their company or department personnel and be proactively prepared to request relief for these members based on this knowledge. The full text of the rehabilitation regulations is indicated below.

N.J.A.C 5:75-2.9 Medical unit/responder rehabilitation (rehab)

(a) Incident commanders shall ensure that the physical and mental condition of emergency responders operating at the scene of an emergency does not deteriorate to a point where it affects the safety of each member or it jeopardizes the safety and integrity of the operation.

Figure C-20. A Rehab area should be established for long term incidents

(b) Responder rehabilitation (rehab) shall be used to evaluate and assist personnel who may be suffering from the effects or sustained physical exertion during emergency operations.

(c) Command officers should consider the need for rehab during the initial planning stages of an emergency response. Climatic or environmental conditions (for example, high or low temperatures) shall not be the sole justification for establishing rehab. Any activity or incident that is large in size, long in duration, and/or labor intensive will rapidly deplete the energy and strength of personnel and therefore merits the establishment of rehab.

(d) All supervisors shall maintain an awareness of the condition of each member operating within their immediate span of control and ensure that adequate steps are taken to provide for each member's safety and health. The command structure shall be used to request relief and the reassignment of fatigued crews.

(e) When the circumstances dictate it, responder rehabilitation shall be the responsibility of a medical unit under the logistics section.

(f) A medical unit shall provide a specific area where personnel will assemble to receive:

1. A medical assessment;
2. Nourishment and re-hydration;
3. Treatment for injuries;
4. Monitoring of physical condition;
5. Transportation for those requiring treatment at medical facilities; and

6. Initial critical incident stress debriefing.

(g) Critical components of a rehab operation shall include:

1. Nourishment and re-hydration;

2. Rest;

3. Recovery;

4. Medical evaluation and treatment; and

5. Accountability.

(h) Fire departments shall develop and utilize written standard operating procedures/guidelines for rehab. Each of the elements in (g) above shall be included when developing standard operating guidelines or procedures for carrying out rehab operations.

(i) Rehab shall be responsible to identify resources that have been cleared from rehab and ready for re-assignment through staging or released from the incident.

Figure C-20a. Members operating should be rotated through rehab

INCIDENT TIME KEEPING

It is a very well known fact that incident commanders have a multitude of critical tasks they are responsible for at an emergency incident. The dynamic and changing environment of an emergency incident is rarely conducive to allowing the implementation of a methodical well thought out decision making process. As a result, the process used by the IC in developing an effective incident action plan includes many variables that can have a major impact on the overall operation. One of the more influential but less thought of factors included in this process involves the capability to accurately confirm the elapsed on scene time of emergency response personnel. Simply stated, all emergency responses can be viewed as time sensitive events. However, the more complex multi-agency structure fire will provide a greater challenge to the incident commander than a simple single engine response regarding his/her ability to accurately record the on scene time of all emergency responders. In order to reduce this uncertainty and enhance the safety of personnel operating at the scene the IC must develop a system of benchmarks to use as a guide in determining the exact duration of time on scene and whether or not the adopted incident action plan is successfully mitigating the emergency.

The standardized incident time-keeping regulations adopt a procedure utilizing elapsed time on scene announcements from the local communications center to the IC in 10-15 minute intervals as the model benchmark system to be utilized throughout the state. Departments are mandated to develop and employ written standard operating guidelines conforming to these regulations. In writing these guidelines departments must be cognizant of the dangers associated with today's modern fire environment and the detrimental effect it has on incident operations and the duration of time firefighters are allowed to operate on the interior of structures. Simply stated, increased on scene operational time translates into increased hazards. Therefore it is critically important for the IC to be provided with time-keeping announcements that begin at time of dispatch and not time of arrival. This will offer the incident commander a more solid foundation as to an accurate time count from which he/she can develop adequate standards to determine if revisions to strategic and tactical operations are necessary. An additional benefit of the time-keeping mandate is that it also provides the incident commander with a prompt from which accountability roll calls can be implemented. The regulation states the IC shall use the 30 minute time interval (or other standard time) to conduct incident roll calls. The full text of the Incident time-keeping regulations is indicated below. Figure C-21.

N.J.A.C 5:75-2.10 Incident Time Keeping

(a) For time sensitive incidents, fire departments shall develop a system that provides the incident commander with elapsed time on-scene, in 10- or 15-minute intervals, from their communications center.

(b) The elapsed time on-scene shall be used to provide the incident commander with time frames that could signal the need for a change in tactical operations.

(c) The elapsed time on-scene shall be used every 30 minutes or some other standard time as established with dispatch for required roll calls.

(d) Fire departments shall develop and utilize written standard operating procedures/guidelines for incident time-keeping.

Figure C-21. Incident timekeeping and updates from the dispatch center are vital to strategic and tactical decision making

ACCOUNTABILITY

NJ PERSONNEL ACCOUNTABILITY SYSTEM (NJPAS)

In 2001, the NJ Fire Safety Commission directed the Division of Fire Safety in conjunction with the Firefighter Safety and Health Advisory Council to develop a statewide standard for fire department personnel accountability systems. It was felt that in order to provide uniform accounting of firefighters at emergency incidents throughout the state, especially where two or more departments worked together, one system utilizing the same operational components was necessary, Figure C-22.

Such a system had to be easy to use yet effective, as inexpensive as possible, and be as compatible with existing systems in use by fire departments as possible.

After weighing many options, the parties involved with the system's development agreed on a two-tag system that would allow incident commanders to know where firefighters were operating at any given time.

The proposal was presented to the Fire Safety Commission who, with their endorsement, presented it to Department of Community Affairs Commissioner Levin for adoption into regulation. The Commissioner adopted the regulations on May 3, 2002 and the regulations became operative on January 3, 2003.

Personnel accountability is one of the most critical elements on an incident scene with regard to firefighter safety. Essentially, personnel accontability is an effort to improve the safety of emergency responders by keeping track of their locations and assignments when operating at the scene of an incident.

Figure C-22 A personnel accountability system is designed to track the status of crews working on the scene of an incident.

A properly implemented PAS will help to ensure that the incident command staff knows the exact number and identity of personnel working at an incident, their approximate locations, and whether they are in distress, Figure C-22a. In some form or another, regardless of size or nature, personnel accountability is a part of every incident to which fire and rescue personnel may respond. Failure to maintain personnel accountability can, and does, have tragic results. In order for a personnel accountability system to perform efficiently at an emergency incident, individual firefighters must “buy into” the process and set the foundation for compliance by properly affixing their tags at the designated collection point while responding and prior to entering the IDLH atmosphere. It is at this critical point of initiation that the effectiveness of the entire system for that particular incident is established and confirmed. However, at no time should a personnel accountability system be considered the only solution to securing firefighter accountability at emergency incidents. Several other critical operational factors will have a major impact on the safety and accountability of firefighters operating in IDLH atmospheres and can actually enhance the efficiency of the system. These factors include a commitment to complete specific task assignments in a systematic and organized method, maintaining company integrity, eliminating freelancing, assigning competent company officers, and the ability to communicate effectively with all personnel operating at the incident. In the event that an emergency responder is injured or otherwise incapacitated on the scene of an emergency, a properly functioning PAS should assist rescuers in locating the personnel in trouble and get them to safety quickly.

It is important to note that NFPA 1561, adopted as an integral part of the regulations of New Jersey's Incident Management System requires that the accountability system "shall include a means to specifically identify and keep track of members entering and leaving hazardous areas."

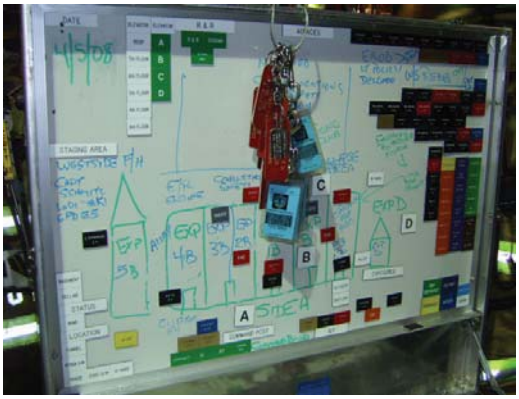


Figure C-22a The PASS ensures the incident command staff knows the exact number and identity of personnel working at an incident.

THE NJ PERSONNEL ACCOUNTABILITY SYSTEM

The New Jersey Personnel Accountability System (NJPAS) is basically a system that tracks three key elements on the incident scene: location, function and time. The regulations set forth the minimum requirements of the system including the hardware required to operate the system.

Very basically, each firefighter is to be issued two accountability tags. These tags may be simply laminated ID cards produced in-house, or some other type of tag constructed of plastic, metal or other durable material. Each tag is to have at minimum the firefighter's name and fire department affiliation. Tags are to be equipped with a fastening latch that can be affixed to the firefighter's turnout gear and can be clipped and un-clipped with a gloved hand.

Once on the incident scene, the firefighter should place one tag at a central collection point as determined by SOP or the incident commander (IC). Such a point might be the incident command post or the apparatus that the firefighter responded with. Career firefighters might place this tag on their apparatus at the beginning of each shift if that is the department's policy. A central collection point is necessary so that the IC and command staff have a reliable way to know who is operating on the incident scene as a whole, Figure C-23.

The second tag is to be given to the Personnel Accountability Officer (PAO) upon entering any hazardous area. Usually, this will be when the firefighter enters a structure or space where they will be performing firefighting or rescue operations in an Immediately Dangerous to Life and Health (IDLH) atmosphere. However, this requirement also applies where firefighters may be involved in wildland operations or confined space operations where there is a risk of becoming lost or disoriented either in wide expanses or maze-like areas. Upon leaving the hazardous area, the tag is to be retrieved by the firefighter.

The secondary tag should also be used when a firefighter checks into a rehabilitation station or a decontamination station or other specialized operational area at an incident scene. In this way, there is always someone other than the firefighters themselves that knows where they are and what they are doing.

Figure C-23 Accountability tags are placed at a central collection point.

It is usually advisable to limit the number of points of entry into a hazardous area. In this way, it is easier to monitor entry and egress of firefighters and can reduce the potential for freelancing. However, where there are different points of entry into a hazardous area, firefighters entering will need to be accounted for. Many times more than one entry point is observable by one PAO such as at a corner of a structure. Other times it may be advantageous to designate more than one PAO if it is necessary to operate multiple points of entry. Some volunteer departments have found it feasible to utilize Fire Police who are not assigned to their normal duties to act as PAOs. In some career departments, an Incident Management Specialist position has been instituted. These individuals may be utilized as PAOs. Departments may need to develop innovative solutions in order to comply with the regulations and provide appropriate accountability for personnel.

Fire departments may, at the very beginning of operations at an incident, find it difficult to provide staffing for the accountability function. While the lack of staffing does not relieve the department from maintaining proper accountability of its members, some innovation may be necessary. One

method may involve the placing of a large traffic cone with a metal ring attached near the entry point. In this way, members entering a hazardous area can "tag in" on the cone. It must be remembered that until a PAO is assigned, the incident commander retains the responsibility for the function in accordance with the requirements of the NJ Incident Management System. It is recognized that the incident management system at any incident grows with the incident and as additional staffing arrives.

Another way of providing accountability until a PAO is assigned is for the "two-out" personnel to maintain accountability. These are the two individuals that are required to be outside the hazardous area in a ready state in case it becomes necessary to rescue the initial team of firefighters in the hazardous area.

These previously referred to "interim actions" must only be utilized prior to the assignment of a PAO and should not be relied upon as a means of providing accountability throughout an incident. A PAO should be assigned as soon as it is possible. If departmental staffing is so short that it is often difficult to staff the accountability function, then additional staffing in the form of mutual aid may be an option.

It must be noted that the scope of the PAS does not simply involve the transfer of tags between personnel on the incident scene. The tags are only the tools for the PAO to use to monitor personnel with regard to location, function and time.

Taken individually beginning with location, the PAO by monitoring entry into a hazardous area knows the approximate location of firefighters. By using some type of accountability board divided by location i.e. basement; division 1; roof etc., tags can be grouped into the area where the firefighting team is assigned.

In the same way, function can be monitored in conjunction with location i.e. division 1 search; roof ventilation etc. depending upon assignment.

Time can be monitored by the PAO by utilizing a dry erase marker on a suitable accountability board for example. By marking the time of entry of each crew and knowing the average duration of the department's SCBA, the PAO can gauge as to when to expect the crew to exit or if they might be in trouble if they are overdue. The key to all of this working effectively is communication between the interior crews and the PAO regarding where the crew is assigned and what their function is. Additionally, communication between the interior crews and the IC or designated officer with regard to regular situation/status reports should inform those outside what they are experiencing and accomplishing. The incident commander should also be asking for information on a regular basis. All players have an equal responsibility to ensure that every firefighter is accounted for at all times.

Another important part of the PAS is the Personnel Accountability Report (PAR) and roll call. If there is any question regarding the whereabouts or safety of firefighters, or if there is a change in firefighting mode, or if an evacuation is ordered, the IC will call for a PAR. A PAR is actually the result of a roll call conducted by the PAO and

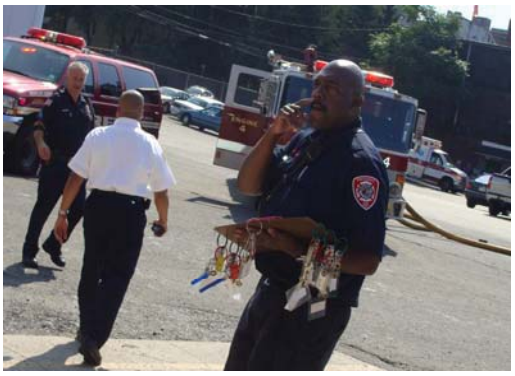


Figure C-24. An Accountability Officer tracks members operating at an incident.

Company officers via portable radio, to ensure all firefighters are accounted for and in a safe location. The primary reasons for the IC to call for a PAR are the following:

- If there is a report of a firefighter missing.
- When an emergency evacuation is ordered.
- When the incident is declared under control.
- When changing attack modes (i.e. offensive to defensive). See figure C-24.
- Anytime the IC feels it necessary to conduct a PAR.

Once the roll call is completed the PAR is then conveyed to the IC and if there are any firefighters unaccounted for, search and/or rescue operations are then undertaken. Usually if the PAO is holding firefighter's tags when a PAR is ordered, the PAO must try to ascertain where the firefighters that he/she is holding tags for are located.

It cannot be more strongly stressed that all those operating on the incident scene play an important role in the PAS. It is for this reason that all members be trained in the use of the system. Additionally, the system needs to be instituted on every incident except those that are so minor all firefighters are in plain sight at all times.

INTEGRATION WITH NJ INCIDENT MANAGEMENT SYSTEM

Since the inception of New Jersey's Incident Management regulations, fire departments have been required to operate within the parameters of a uniform incident management system (IMS). Part of the requirements of the IMS has always been that a fire department must utilize a PAS. The NJPAS regulations have expanded upon that requirement by providing a specific uniform method of complying with the original regulations. In this way the new regulations integrate seamlessly with the IMS and should pose little if any additional obligations on a fire department than what was originally required.

ACCOUNTABILITY OPTIONS

As stated earlier in this booklet, the regulations for PAS are the minimum requirements that must be adhered to by fire departments. There are many enhancements that a department may want to implement to make the PAS more effective or easier to use. Tools such as dry erase accountability boards provide an easy way to organize firefighters' tags by location and function in the hazardous area, they can provide the PAO a quick reference to rapidly assess the location all the firefighters he/she is responsible for.

Additionally, some departments find that medical information on a personnel accountability tag (PAT) relating to the firefighter is useful in the event a firefighter is injured and transported to a hospital. Normally the most suitable type of PAT for this would be the laminated type where the inner part of the tag is folded in half with the confidential medical information inside. The tag is then laminated and if it is necessary to access the information, the tag is cut open.

If medical information is to be collected and included on the PAT, it must be remembered that all information is confidential and should not be shared beyond those responsible for the collection of the information without the permission of the information's owner. Information collection should also never be mandatory. A firefighter may not want to share all or any of their personal information and they should be informed that it is their right to provide only what they wish to. Any information provided should not be used for any other purpose.

Another consideration is whether the information collected will be utilized by EMS or a hospital. Some health care providers may not want to rely on what could be outdated or incorrect information. It would probably be best for the fire department to meet with their normal EMS and healthcare providers to find out whether the information provided will be used in an emergency, and if so, what information in particular would be useful to collect.

Some departments may wish to issue additional PATs above the two that are required by the regulations. Departments are free to do this if for instance it is desired for a firefighter to have a PAT on his/her person at all times in the unfortunate circumstance where identification of a severely injured or deceased firefighter must be made. Other reasons for extra PATs may be secondary access to smaller areas inside a larger hazardous area such as high rise buildings or large complexes; or where firefighters may travel on vehicles to remote locations before being assigned to tasks, such as a large wildland fire scenario.

One key element of the new PAS regulations is the ability for newer technology that provides at least the same level of firefighter safety to be utilized. There are some advanced systems that are basically like simple tag systems with features that integrate computerization. An example is a system that utilizes bar coding, where instead of a tag with readable printing, the bar code contains the firefighter's information. This code is scanned into a computer and a task and location are input to show where the firefighter is and what his/her assignment is. With a standard tag system, an accountability board and dry erase marker perform the same function manually.

There are newer systems on the horizon that utilize Global Positioning System (GPS) technology where firefighters have "sending units" attached to their gear or integrated into their SCBA that send signals to satellites and then to a central computer on the incident scene. The location and movements of each firefighter are tracked accurately within a few feet of their position and displayed on the computer screen. Some of these systems provide for telemetry between the computer location and the individual firefighters and are capable of monitoring breathing rate, air supply and interior temperature. Additionally, they can provide for the activation of integrated PASS devices and the transmission of distress signals to the outside.

FURTHER INFORMATION

Appendix IV contains Regulations for the NJ Personnel Accountability System. Appendix V has Regulations for the NJ Incident Management System, and includes Appendix V is a Model SOP for the NJ Personnel Accountability System.

REGULATIONS FOR THE NJ PERSONNEL ACCOUNTABILITY SYSTEM

N.J.A.C. 5:75-1.5 Definitions

The following terms shall have the meanings indicated except where the content clearly indicates otherwise:

"Branch" means an organizational level having functional or geographical responsibility for major aspects of incident operations.

"Commissioner" means the Commissioner of Community Affairs.

"Division" means the organization level having responsibility for operations within a defined geographic area.

"Emergency incident" means any situation to which the fire department responds to deliver emergency services including, but not limited to, rescue, fire suppression, emergency medical care, special operations, and other forms of hazard control and mitigation.

"Fire department" means a fire service organization providing rescue, fire suppression and related activities. The term "fire department" shall include any public, governmental fire service organization engaging in this activity.

"Group" means an organizational level having responsibility for operations within a defined functional area.

"Hazardous area" means any location(s) that may pose a safety and/or health risk to firefighters due to, but not limited to, the presence of products of combustion, the existence of hazardous or otherwise oxygen deficient or oxygen enriched atmosphere, the potential for any immediately dangerous to life and health atmosphere, the use of hazardous equipment or operations, or the potential for any of these situations to exist. Additionally, any area or location that predisposes a firefighter to become lost, disoriented, or trapped, including any structure, confined space and wild land areas, shall be considered a hazardous area.

"Incident action plan" means an oral or written plan containing general objectives reflecting the overall strategy for managing an incident.

"Incident commander" means the individual responsible for all incident activities, including the development of strategies and tactics and the ordering and release of resources.

"Incident management system" means a nationally recognized and organized system of rules, responsibilities and standard operating procedures used to manage emergency operations.

"Logistics section" means the section responsible for providing facilities, services, and material support for an incident.

"Member" means a person, at least 18 years of age, who is involved in performing the duties and responsibilities of a fire department, under the auspices of the organization. For the purpose of this chapter, a fire department member may be a full-time or part-time employee, a paid or unpaid volunteer, may occupy any position or rank within the department and may or may not engage in emergency operations.

"Personnel accountability officer" means the person designated by the Incident Commander to monitor entry into and exit out of hazardous areas for the purpose of ensuring accountability of all personnel in the hazardous area or structure.

"Personnel accountability report" means the results of an accounting of all personnel on the emergency incident scene to the Incident Commander.

"Personnel accountability roll call" means the process of accounting of all personnel on the emergency incident scene.

"Safety officer" means a member of an incident command staff responsible for monitoring and assessing safety hazards and unsafe conditions, and for developing measures for ensuring personnel safety.

Amended by R.2002 d.179, effective June 3, 2002 (operative January 2, 2003); R.2008 d.142, effective June 2, 2008.

N.J.A.C 5:75-2.4 Personnel accountability

(a) As an integral part of the incident management system used by the fire service, personnel accountability shall be maintained through the use of a personnel accountability system meeting the requirements of this section as a means to track and locate all fire department personnel operating at all emergency incidents.

(b) Every member of a fire department shall be issued a minimum of two personnel accountability tags.

1. Such tags shall be constructed of (but not limited to) metal, plastic, plastic laminated paper, plastic laminated cardboard, or similar durable material.

2. Each tag shall be equipped with a latch hook that will allow attachment of the tag to the firefighter's protective clothing. The clip or latch hook shall be designed to be attached and removed by a firefighter with a gloved hand.

3. At a minimum, the tag shall be engraved, imprinted, or otherwise marked or electronically coded with the firefighter's name and fire department affiliation.

(c) At each incident, the Incident Commander shall designate a personnel accountability officer. The personnel accountability officer shall be responsible for ensuring that all personnel are accounted for. The personnel accountability officer may serve other functions at an incident scene if he or she is able to safely perform the accountability function. At minor incidents, the Incident Commander may retain this function as he or she sees fit.

(d) To ensure personnel accountability, each firefighter shall take the following steps:

1. Upon arrival at an incident scene, each firefighter shall surrender the primary personnel accountability tag at a central collection point as designated by the Incident Commander or departmental policy. Such point may be a command post or the apparatus to which the firefighter is assigned;

2. Upon leaving the incident scene, each firefighter shall immediately retrieve his or her personnel accountability tag from the designated collection point and reattach it to the designated area of his or her protective gear as determined by the fire department;

3. Firefighters assigned to a specific piece of apparatus for the duration of a tour of duty shall leave their primary personnel accountability tag on that apparatus for the duration of their tour.

(e) Upon entry in a hazardous area, each firefighter shall surrender the secondary personnel accountability tag to the personnel accountability officer who shall be in close proximity to the entry point into the hazardous area. Upon leaving the hazardous area, the member shall immediately retrieve his or her personnel accountability tag from the personnel accountability officer and re-attach it to the designated area of his or her protective clothing.

(f) If the need arises to evacuate a hazardous area and an evacuation is ordered, the personnel accountability officer shall:

1. Order an immediate personnel accountability roll call of all members operating at the incident to be conducted as soon as they exit the hazardous area;

2. Assure that every member who has surrendered his or her accountability tag retrieves it and reattaches it to their protective gear;

3. Report immediately to the Incident Commander when crews have not retrieved their personnel accountability tags after a reasonable time, members are unaccounted for, and the need for search and rescue exists or if conditions indicate that the area is immediately unsafe for crews and/or the personnel accountability officer to operate in safely; and

4. Report to the Incident Commander that all members are accounted for if the personnel accountability officer is not holding any personnel accountability tags after an evacuation is ordered.

(g) The Incident Commander shall call for a personnel accountability report:

1. If there is a report of a firefighter missing;

2. When an emergency evacuation is ordered;

3. When the incident is declared under control;

4. When changing attack modes (that is, offensive to defensive); or

5. Anytime the Incident Commander feels it necessary to conduct a personnel accountability report.

(h) When it is announced that a personnel accountability report is to be provided to the Incident Commander, all companies will:

1. Conduct a personnel accountability roll call of the members in that company to ensure all members are accounted for;

2. Cease all but emergency radio

communications; and

3. Report all members accounted for or report members missing.

(i) Nothing in this section shall restrict the use of more sophisticated accountability systems utilizing bar coding, geographic positioning systems or similar methods providing the intent of this section is met.

New Rule, R.2002 d.179, effective June 3, 2002 (operative January 2, 2003).

Personal Motor Vehicle Emergency Response Lighting

This section is intended to provide guidance to members of New Jersey's fire service on the use of emergency lights based on existing laws governing use and operation.

The first section will provide an overview of the use of blue lights.

The second section provides information on the use of red lights for emergency purposes.

BLUE LIGHTS

N.J.S.A. 39:3-54.7. Members of certain organizations; display of emergency warning lights

a. An active member in good standing of any of the following organizations may mount and operate, on a motor vehicle operated by that member, an emergency warning light or lights as provided in P.L.1977, c. 223 (C.39:3-54.7 et seq.):

(1) a volunteer fire company or a volunteer first aid or rescue squad recognized by and rendering service in any municipality; or

(2) any county or municipal volunteer Office of Emergency Management recognized by and rendering service in any county or municipality, provided the member's official duties include responding to a fire or emergency call.

b. The Chief Administrator of the New Jersey Motor Vehicle Commission shall not require the member to specify on which motor vehicles the emergency warning light or lights may be mounted.

N.J.S.A. 39:3-54.8. Time of operation

Emergency warning lights may be operated only while the vehicle is being used in answering a fire or emergency call.

N.J.S.A. 39:3-54.9. Specifications

Emergency warning lights shall be removable or permanently attached, of the flashing or revolving type, equipped with a blue lens and controlled by a switch installed inside the vehicle or shall be blue of the light bar type, in accordance with the specifications prescribed by the chief administrator .

N.J.S.A. 39:3-54.10. Placement on motor vehicle

No more than two emergency warning lights shall be installed on a vehicle. If one light is used it shall be installed in the center of the roof of the car, or on the front of the vehicle so that the top of

the emergency warning light is no higher than the top of the vehicle's headlights, or in the center of the dashboard. It may be a low profile light bar of the strobe, halogen or incandescent type, or a combination thereof. If two lights are used they may be placed on the windshield columns on each side of the vehicle where spotlights are normally mounted, or on either side of the roof at the front of the vehicle directly back of the top of the windshield. Under no circumstances may one light be placed on the roof and one on the windshield column in the spotlight position. Light elements shall be shielded from direct sight or view of the driver.

N.J.S.A. 39:3-54.11. Display of emergency warning lights; identification cards

a. The Chief Administrator of the New Jersey Motor Vehicle Commission shall prepare suitable identification cards bearing the signature of the chief administrator which, upon the request of the mayor or chief executive officer of any municipality recognizing and being served by a volunteer fire company or a volunteer first aid or rescue squad on a form and in a manner prescribed by the chief administrator, shall be forwarded to the mayor or chief executive officer, to be countersigned and issued by the mayor or chief executive officer to the members in good standing of the volunteer fire company or first aid or rescue squad.

b. Identification cards issued pursuant to this section and sections 5 and 6 of P.L.2005, c. 34 (C.39:3-54.22 and C.39:3-54.23) shall be considered permits to mount and operate emergency warning lights as provided for in P.L.1977, c. 223 (C.39:3-54.7 et seq.) and shall apply to any motor vehicle driven by the member of a volunteer fire company , a volunteer first aid or rescue squad or a volunteer Office of Emergency Management. Emergency warning lights shall not be mounted prior to the issuance of the identification cards. Each member of a volunteer fire company, a volunteer first aid or rescue squad or a volunteer Office of Emergency Management must carry the identification card while an emergency warning light or lights are operated on the vehicle.

N.J.S.A. 39:3-54.12. Rights of motor vehicle with emergency warning lights in operation

Nothing contained herein is intended to grant to any member of a volunteer fire company , a volunteer first aid or rescue squad or a volunteer Office of Emergency Management any privileges or exemptions denied to the drivers of other vehicles, and such members operating emergency warning lights shall drive with due regard for the safety of all persons and shall obey all the traffic laws of this State including R.S.39:4-81, provided, however, that the drivers of non-emergency vehicles upon any highway shall yield the right of way to the vehicle of any member of a volunteer fire company , a volunteer first aid or rescue squad or a volunteer Office of Emergency Management operating emergency warning lights in the same manner as is provided for authorized emergency vehicles pursuant to R.S. 39:4-92.

N.J.S.A. 39:4-81. Observing traffic signals

a. The driver of every vehicle, the motorman of every street car and every pedestrian shall obey the instructions of any official traffic control device applicable thereto, placed in accordance with the provisions of this chapter, unless otherwise directed by a traffic or police officer.

b. When, by reason of a power failure or other malfunction, a traffic control signal at an intersection is not illuminated, the driver of a vehicle or street car shall, with respect to that intersection, observe the requirement for a stop intersection, as provided in R.S.39:4-144.

N.J.S.A. 39:3-54.13. Violations; penalty

Any person authorized to operate emergency warning lights pursuant to P.L.1977, c. 223 (C.39:3-54.7 et seq.) who willfully operates such emergency warning lights in violation of the provisions of P.L.1977, c. 223 (C.39:3-54. 7 et seq.) shall be liable to a penalty of not more than $ 100 and the person's privilege to operate such emergency warning lights may be suspended or revoked by the Chief Administrator of the New Jersey Motor Vehicle Commission. A person who is not authorized to operate emergency warning lights who willfully operates such emergency warning lights shall be liable to a penalty of not more than $ 200.

N.J.S.A. 39:3-54.15. Red emergency warning lights and/or siren on motor vehicles owned by current volunteer fire chief or first assistant chief or chief officer of first aid or rescue squad

A current chief or first assistant chief of a volunteer fire company, or chief officer of a first aid or rescue squad, recognized by and rendering service in any municipality may mount and operate on a motor vehicle owned by him and registered in his name a red emergency warning light or lights, a siren, or both, as prescribed in P.L.1985, c. 171 (C.39:3-54.15 et seq.). The size and type of lights and siren, and the location of their controls, shall be determined by the Chief Administrator of the New Jersey Motor Vehicle Commission.

N.J.S.A. 39:3-54.16. Placement of red emergency warning lights

All red emergency lights shall be mounted on the exterior of the motor vehicle. No more than two red emergency warning lights shall be installed on a vehicle. If one light is used it shall be installed in the center of the roof of the vehicle, or on the left windshield column in a position where a spotlight is normally located. If two lights are used they may be placed on the windshield columns on each side of the vehicle where spotlights are normally mounted, or on either side of the roof at the front of the vehicle directly back of the top of the windshield. Under no circumstances may one light be placed on the roof and one on a windshield column in the spotlight position. They shall be operated only while the vehicle is being used by the registered owner chief or first assistant chief in answering a fire or emergency call.

N.J.S.A. 39:3-54.17. Placement of sirens

All sirens shall be mounted under the hood of the motor vehicle and shall be operated only while the vehicle is being used by the registered owner chief or first assistant chief in answering a fire or emergency call.

N.J.S.A. 39:3-54.18. Identification cards for chief or first assistant chief; issuance; purpose

The Director of the Division of Motor Vehicles shall prepare suitable identification cards bearing the signature of the director, which, upon the request of the mayor or chief executive officer of any municipality recognizing and being served by a volunteer fire company, on a form and in a manner prescribed by the director, shall be forwarded to the mayor or chief executive officer, to be countersigned and issued by the mayor or chief executive officer to the chief or first assistant chief of the volunteer fire company. Identification cards issued pursuant to this section shall be considered permits to display and operate red emergency warning lights, sirens, or both, as provided for in this act, and no lights or sirens shall be mounted prior to the issuance of the identification cards. Each chief or first assistant chief of a volunteer fire company shall carry the identification card while red emergency warning lights, sirens, or both, are displayed on his vehicle.

N.J.S.A. 39:3-54.19. Operation of motor vehicles with red emergency warning lights or sirens; yielding right of way

This act shall not grant to any chief or first assistant chief of a volunteer fire company any privileges or exemptions denied to the drivers of other vehicles, and persons displaying red emergency warning lights, sirens, or both, shall drive with due regard for the safety of all persons and shall obey the traffic laws of this State; but drivers of nonemergency vehicles upon any highway shall yield the right of way to the vehicle of any chief or first assistant chief of a volunteer fire company displaying red emergency warning lights, sirens, or both, in the same manner as is provided for authorized emergency vehicles pursuant to R.S. 39:4-92.

N.J.S.A. 39:3-54.20. Unlawful use of red emergency warning lights or sirens; penalty

Any person authorized to display red emergency warning lights, sirens, or both, pursuant to this act, who willfully displays or uses the lights or sirens in violation of the provisions of this act, shall be liable to a penalty of not more than $50.00 and his privilege to display the lights or sirens may be suspended or revoked by the Director of the Division of Motor Vehicles.

PUBLIC EMPLOYEES OCCUPATIONAL SAFETY AND HEALTH BLOODBORNE PATHOGENS STANDARD

Many workers risk on-the-job contact with blood and other body fluids. These materials may contain pathogens (organisms that can cause serious disease). Of major concern are the hepatitis B virus (HBV), the hepatitis C virus (HCV), and the human immunodeficiency virus (HIV), the cause of Acquired Immunodeficiency Syndrome (AIDS).

On December 6, 1991, federal OSHA adopted 29 CFR 1910.1030. "Bloodborne Pathogens." This standard protects workers in the private sector who come in contact with blood or other potentially infectious materials. On July 6, 1993, the federal OSHA Standard was adopted under the New Jersey Public Employees Occupational Safety and Health (PEOSH) Act to protect public employees in New Jersey.

Note: This information bulletin provides a general overview of the New Jersey PEOSH Bloodborne Pathogens Standard, Consult the standard itself for complete information. This information was prepared for the New Jersey Department of Health and Senior Services, Public Employees Occupational Safety and Health Program by the University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School, Department of Environmental and Community Medicine, and the Division of Consumer Health Education.

The standard covers all public employees who may have contact with blood or other potentially infectious materials because of their work. Employees most likely to be covered include but are not limited to:

- Health care workers (e.g., medical and dental personnel, school nurses);
- Emergency medical services employees;
- Firefighters (including volunteers);
- Police officers;
- Correctional officers;
- Some laundry and housekeeping staff;
- Lifeguards;
- Workers in institutions for the developmentally disabled.

Potentially Infectious Materials

The standard defines other potentially infectious materials, such as semen and vaginal secretions; fluid from the brain, spine, lungs, and amniotic sac; fluid around joints, the heart, and the abdominal lining; saliva in dental procedures; all body fluids that are visibly contaminated with blood; and all body fluids when you cannot tell which type they are.

Also considered as potentially infectious materials are any unfixed human tissue or organs other than skin, and animals or cells infected with HIV for medical research. (Research laboratories for other bloodborne pathogens, such as hepatitis C, could also be included.)

How Are Employees Exposed?

Occupational exposures occur when employees do tasks that can cause blood or other potentially infectious materials to enter their bodies. These exposures happen through cuts, cracks, or abrasions in the skin; splashing, or spraying into the eyes, mouth, or nose; and puncture wounds from contaminated sharps (needles, broken glass).

Major Requirements of the Standard

The major requirements of the standard are as follows:

- Employee exposure control plan
- Methods to prevent exposure
- Hepatitis B vaccinations
- Medical evaluation and follow-up
- Employee training
- Recordkeeping

- Special precautions for HIV and HBV research laboratories. (Research laboratories for other bloodborne pathogens, such as hepatitis C, could also be included.)

The Exposure Control Plan. Employers must prepare a written plan that includes the job classification tasks and procedures in which employees have occupational exposure, the schedule and methods for implementing the requirements of the standard, and procedures for documenting the circumstances surrounding an employee's exposure. The plan must be accessible to employees. It also must be updated at least annually or more often if work tasks or control methods change.

Methods to Prevent Exposure. The standard describes the following methods to prevent occupational exposure to bloodborne pathogens:

- Universal Precautions—Handle all human blood or other potentially infectious materials as if they were contaminated. This approach is known as universal precautions.
- Engineering Controls—Use engineering controls whenever possible. These are methods that contain or remove the hazard, such as puncture resistant containers for sharps, splash guards, or self-sheathing needles, figure C-18.
- Work Practice Procedures—Use work practice procedures that reduce the chances of exposure. Employers must provide the necessary equipment to implement them. These procedures include:
  - Immediately wash hands (and other parts of the body as needed) following any contact with blood or other potentially infectious materials. This may not he possible for certain jobs, such as police work or emergency medical services. In these cases, employers must provide anti-septic hand cleansers, as well as paper or cloth towels. Employees must wash with running water and soap as soon as they can after the exposure.
  - Wash hands as soon as possible after removing gloves or other protective equipment.
  - Do not recap, break, or bend by hand any contaminated needles. Put used needles and other sharps into special containers until they can be processed or disposed of, Figure C-25. These containers must be closeable, puncture-resistant, and leakproof. They should he labeled and put close to the area where sharps are used. Containers should never be overfilled.
  - Do not eat, drink, smoke, apply makeup or lip balm, or handle contact lenses in areas where exposure might occur. Don't store food or drinks in potentially contaminated areas like refrigerators used to store lab specimens.
  - Use methods to prevent splashing, spraying, or spattering when doing any procedures involving blood or other potentially infectious materials. Don't use your mouth for suctioning or pipetting.
  - Use leakproof containers for collecting, handling, processing, storing, carrying, or shipping blood specimens or other potentially infectious materials.
  - Label or use color codes on containers and refrigerators used for storage, carrying, or shipping. (See the standard for information on using the biohazard symbol.)
  - Decontaminate any equipment before it is sent out for repair.
- Personal Protective Equipment – Wear personal protective equipment when exposure cannot be avoided by other means. This equipment includes gloves, face shields, goggles, gowns, lab coats, mouthpieces, pocket masks, and resuscitation bags, Figure C- l9. Employers must provide the equipment free of charge. (They must also provide alternatives to employees who are allergic to the gloves normally used.) Personal protective equipment must be accessible and available in sizes to fit each employee. It should be taken off and put in designated containers for cleaning, repair, or disposal if it becomes contaminated or damaged.

Employers are required to clean and repair equipment that can be reused. This includes lab coats that are used as personal protective equipment.
• Housekeeping Requirements - These requirements include the following:
  • Establish written procedures and schedules for regular cleaning of the worksite and for disinfecting contaminated surfaces and materials.
  • Do not pick up potentially contaminated broken glassware. Use tongs, forceps, or a brush and dust pan. Only use containers made for storing, carrying, and shipping sharps.
  • Handle contaminated laundry as little as possible and wear gloves (and other protective equipment, if necessary). It must be stored and transported in labeled, leak proof containers.
  • Follow state laws for handling and disposing of regulated waste. Contact the New Jersey Department of Environmental Protection
  Bureau of Technical Assistance
  PO Box 414, 120 South Street
  Trenton, NJ 08625-0414
  (609) 984-6985.

Figure C-25 Contaminated needles and sharps must be disposed of in special containers.

  • Hepatitis B Vaccinations—Employers must offer free Hepatitis B vaccinations to all employees who have anticipated exposure to blood or other poten¬tially infectious materials. The vaccinations must be given within 10 working days after employees begin jobs that have the potential for exposure. Employees may decline the vaccination, but must sign a "declination" statement if they do so.

  • Medical Evaluation for Exposed Employees: Employers are required to offer free, confidential material evaluation and follow-up to all employees who receive an occupational exposure to blood or other potentially infectious materials. These services must include: a written report of how the exposure occurred, testing the source person if possible, testing the exposed employee's blood if she or he consents, and post exposure treatment and counseling.

  • Employee Training About Potential Hazards: Employers are required to provide initial training for employees who have anticipated occupational exposure. This training must cover all of the major parts of the standard and be repeated annually.

  • Employees must also have access to a copy of the standard and the exposure control plan.

  • Recordkeeping – confidential records about employee exposures, medical evaluation, and follow-up must be kept for the length of employment plus 30 years. Records showing that employee training has occurred must he kept for three years.

  • Special Precautions for HIV and HBV Research Laboratories: Additional procedures, employee training, and equipment are required for HIV and HBV research laboratories. Consult the standard for details. See Table C- 1

Training Resources

Agencies and organizations with free or low-cost training materials about bloodborne pathogens are listed in Table C-2.

Figure C-26

Standard Precautions for Infection Control

WASH HANDS (PLAIN SOAP)
Wash after touching blood, body fluids, secretions, excretions, and contaminated items. Wash immediately after gloves are removed and between patient contacts. Avoid transfer of microorganisms to other patients or environments.

WEAR GLOVES
Wear when touching blood, body fluids, secretions, excretions, and contaminated items. Put on clean gloves just before touching mucous membranes and nonimpact skin. Change gloves between tasks and procedures on the same patient after contact with material that may contain high concentrations of microorganisms. Remove gloves promptly after use, before touching non contaminated items and environmental surfaces, and before going to another patient, and wash hands immediately to avoid transfer of microorganisms to other patients or environments

WEAR MASK AND EYE PROTECTION OR FACE SHIELD
Protect mucous membranes of the eyes, nose, and mouth during procedures and patient care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions.

WEAR GOWN
Protect skin and prevent soiling of clothing during procedures that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions. Remove a soiled gown as promptly as possible and wash hands to avoid transfer of microorganisms to other patients or environments.

PATIENT CARE EQUIPMENT
Handle used patient care equipment soiled with blood, body fluids, secretions, or excretions in a manner that prevents skin and mucous membrane exposures, contamination of clothing, and transfer of microorganisms to other patients or environments. Ensure that reusable equipment is not used for the care of another patient until it has been appropriately cleaned and reprocessed and that single-use items are properly discarded

LINEN
Handle, transport, and process used linen soiled with blood, body fluids, secretions, or excretions in a manner that prevents exposures and contamination of clothing and avoids transfer of microorganisms to other patients or environments.

USE RESUSCITATION DEVICES AS AN ALTERNATIVE TO MOUTH-TO-MOUTH RESUSCITATION.

Table C-1

New Jersey Department of Health and Senior Services

Public Employees Occupational Safety and Health (PEOSH) Program
CN 360, 7th Floor

Trenton, NJ 08625-0360

(609) 984-1863

The PEOSH Program has developed a model Exposure Control Plan which is intended to serve as an employer compliance guide to the Bloodborne Pathogens Standard. The model plan is available from the PEOSH Program at the above address or from our Internet site at http://www.state.nj.us/health/eoh/peoshweb/.

American Hospital Association Services, Inc.
PO Box 92683

Chicago, IL 60675-2683

(800)AHA-2626, Fax: (312) 422-4505

AHA has several publications of interest, including OSHA's Final Bloodborne Pathogens Standard: A Special Briefing.

Center for Disease Control
AIDS Clearing House

(800) 458-5231

Federal Emergency Management Agency (FEMA)

National Fire Academy
Publications Department
16825 S. Seton Avenue
Emmitsburg, MD 21727
(301) 447-6771

FEMA has a free curriculum for firefighters and emergency responders.

International Association of Fire Fighters
1750 New York Avenue

Washington, DC 20006

(202) 737-8484

IAFF has free materials for firefighters.

National Institute for Occupational Safety and Health
Attention: Publications

4676 Columbia Parkway

Cincinnati, OH 45226

(800) 356-4674

NIOSH has two publications that are especially useful: Guidelines for Protecting the Safety and Health of Health Care Workers, 1988. DHHS (NIOSH) Publication #88-1I9.

A Curriculum Guide for Public Safety and Emergency-Response Workers, 1989. DHHS (NIOSH) Publication #89-108.

Some unions and professional organizations have developed materials for their members. In addition, a few of the manufacturers of hepatitis B vaccine have prepared information.

Table C2

RIGHT-TO-KNOW

NEW JERSEY WORKER AND COMMUNITY RIGHT-TO-KNOW ACT

This fire service reference is designed to assist fire departments in complying with the regulations of the Worker and Community Right-to-Know Act and for personnel to understand their rights with regard to working with or around hazardous substances.

This information was developed with the invaluable assistance of the New Jersey Department of Health and Senior Services, Right to Know Program.

PURPOSE

The Worker and Community Right to Know (RTK) Act was signed into law on August 29, 1983 with the majority of the act taking effect on August 29, 1984.

The purpose of this law is to establish a program for the disclosure of information about hazardous substances in the workplace and in the community as well as provide public access to this information, Figure C-25.

Figure C27. Firefighters should remain aware of the types of facilities and their associated hazards that may be located in their districts.

Additionally, the legislature took note of the fact that local health, fire, police, emergency medical services, safety and other governmental officials required detailed information about the identity, characteristics, and quantities of hazardous substances used and stored in their communities in order to adequately plan for and respond to emergencies involving those materials.

There are two ways that a fire department will become involved with the Worker and Community RTK ACT, They are:

- As an employer (See Section 2)
- As a planner and responder to local emergencies (See Section 3)

WHEN DID THIS LAW TAKE EFFECT?

The Worker and Community RTK Act became effective in stages between 1984 and 1986. The Department of Health and Senior Services (DHSS) regulations were adopted on October 1, 1984 and have been amended several times since. In 1989, the education and training program regulations were amended to include volunteer fire departments, rescue squads and emergency medical services units. The date which all volunteers who work for these groups were to receive training was October 1, 1990. Subsequent to this date, volunteers were required to receive training within six months of joining the department or squad. Municipalities were made responsible for providing the training to these volunteers.

In 1993, the regulations were amended to explain the relationship of the training requirements of the Public Employees Occupational Safety and Health Standard for Hazardous Waste Operations and Emergency Responses to the training requirements of the Right to Know Act.

SECTION 1

The Law:

Worker and Community Right to Know Act L. 1983, c. 315, N.J.S.A. 34:5A-1, et seq.

Effective Date: August 29, 1984

Enforcing Agencies:
New Jersey Department of Health and Senior Services
Right to Know Program
P.O. Box 368
Trenton, New Jersey 08625-0368
(609) 984-2022

Right to Know regulations: N.J.A.C. 8:59
New Jersey Department of Environmental Protection
Bureau of Chemical Release Information and Prevention
P.O. Box 405
Trenton, New Jersey 08625-0405
(609) 292-6714

Right to Know regulations: N.J.A.C. 7:1G
New Jersey Department of Labor Division of Workplace Standards
PO. Box 386 Trenton, New Jersey 08625-0386
(609) 292-7036

SECTION 2

The Fire Department as an Employer

Depending on how it is organized, a fire department may be responsible to ensure compliance with the Right-to-Know law if the fire department is part of the municipality, a fire district or private employer:

- Completing and submitting a RTK Survey
- Maintaining Hazardous Substance Fact Sheets (HSFS) and Material Safety Data Sheets (MSDS) for all hazardous substances at the workplace in the RTK central file
- Labeling all containers in the workplace
- Providing RTK training for all employees
- Providing RTK training for
- Posting the RTK poster.

If the fire department is an independent private employer, it is the municipality's responsibility to ensure that all employees receive RTK training. The requirements of a RTK survey, RTK central file, RTK labeling and RTK poster do not have to be met at the facility of a private fire department.

Completing and Submitting the Right to Know Survey

If the fire department is considered part of the municipality or fire district, then the municipality or fire district is responsible for completing the RTK survey. If the fire department is considered a private employer, it is not responsible for completing the RTK survey.

How Do I Determine Who Is Responsible?

If you are not sure if the fire department, the municipality or the fire district is the employer, check with the municipal clerk or the fire district administrator, the municipal or fire district attorney, or the local ordinance that created the fire department.

Right to Know Survey

All employers in the public sector are required to complete a RTK Survey developed by the DHSS every year. A complete inventory of products containing hazardous chemicals present at the fire house must be reported every five years. In the intervening years, only new products have to be reported.

Do I Have to Ask for a Right to Know Survey?

No. The New Jersey DHSS will automatically send all public employers a RTK Survey. A volunteer private company that owns its own building will not receive a survey and does not have to fill one out. However, if you do not receive a survey and need one, you may request a survey from the DHSS at the address listed on this page.

What Should a Fire Department do if it Receives a Right to Know Survey?

A fire department that is covered under the law will receive a RTK survey with its name and address preprinted on the survey. The list of hazardous substances required to be reported should already be present in the RTK central file.

The municipality or fire district has each hazardous substance listed on the RTK Hazardous Substance List (RTKHSL) which is present at its facilities. The information to be included on the survey includes the product name and a list of hazardous substance ingredients by:

- RTK Substance Number (see RTKHSL)
- Hazardous Chemical Name
- Chemical Abstracts Service (CAS) Number (see RTKHSL)
- DOT Identification Number (see RTKHSL)
- Type of container (using code), Figure C-2
- Mixture percentage (using a code)
- Inventory quantity (using a code)
- Whether it is a solid, liquid or gas
- The number of employees exposed or potentially exposed to the chemical
- Special health hazard codes, if any
- Location (required only for large quantities at a single location)

How Do I Figure Out What Must Be Reported?

Consult the RTK instruction booklet that came with the RTK survey and the RTKHSL. This booklet and the list will provide the information needed for completing the Survey.

Who Do I Send the Survey To?

Send the original survey to NJDHSS, and copies to the local police department, health department, RTK county lead agency and the Local Emergency Planning Committee. Keep a copy in your RTK central file.

Figure C-28

Figure C-28B: Hazardous substances are stored or transported in a wide variety of containers.

II. Maintaining Hazardous Substance Fact Sheets and Material Safety Data Sheets for All Hazardous Substances at the Workplace in the Right to Know Central File.

What Is a Hazardous Substance Fact Sheet (HSFS)?

Once the fire department has submitted a completed survey for each of its facilities, the DHSS will send a HSFS for each hazardous substance reported on the RTK Survey. A sample fact sheet is found in Appendix D. The HSFS contains the following information:

- Chemical name, Chemical Abstracts Services (CAS) Number, DOT number, and other names (synonyms) that the hazardous substance is known by.
- Definitions and common questions and answers.
- How to identify the number.
- Solubility in water, vapor pressure and flash point.

- Toxicity, carcinogenicity, mutagenicity, teratogenicity, flammability, explosiveness, corrosivity and reactivity (including with water).
- A description in non-technical language of the acute and chronic health effects from exposure to the chemical, including medical conditions that may be aggravated by exposure.
- Potential routes and symptoms of exposure.
- Proper precautions, work practices, necessary personal protective equipment, and other necessary measures for safe handling and storage.
- Information on how to control and extinguish
  a fire that involves the hazardous substance.
- Appropriate emergency and first aid procedures for spills, fires, explosions and accidental air emissions.

What Should We Do with the Hazardous Substance Fact Sheets?

If a fire department has reported any hazardous substances present at its facilities, it must maintain the fact sheets in a central file, and make them available to all employees. This will allow firefighters and other employees access to information that is very specific to the hazardous substances that are present at the worksite. Additionally, the fire department may request an entire set of 1,055 HSFS for free from the DHSS for emergency response purposes. Page 6 of the fact sheet is specially prepared to provide important information to firefighters. The fact sheets are also available on http://www.state.nj.us/health/ems/index.html. Contact the DHSS for further information.

What Is the RTK Central File?

If the fire department has reported any hazardous substances present at its facilities, it is required to establish and maintain a central file at each facility containing a completed RTK Survey, appropriate HSFS and MSDS, and the RTK Hazardous Substance List.

Right to Know Poster

Every fire department is required to post on a bulletin board readily accessible to its employees, a poster giving notice of the availability of the RTK survey, HSFS, MSDS, and the RTK Hazardous Substance List for those substances found at the fire station. The poster can be obtained from the DHSS.

Figure C-29. Exterior product labels may not indicate correct contents o the container.

III. Labeling All Containers in the Workplace

A pamphlet explaining RTK labeling requirements is available from the DHSS. In general, all containers in the workplace must be labeled. There are exemptions for certain consumer products and products labeled according to certain federal labeling laws (such as for pesticides, Figure C-29). Labeling information can be found in Appendix VI. Contact the DHSS for further information if needed.

IV. Providing Right to Know Training for Firefighters

What Type of Training Is Required for Firefighters?

All municipal, county, and state employers, including fire districts, must develop an education and training program to inform all employees who are exposed or potentially exposed to hazardous substances of the hazards of those substances and of the provisions of the Worker and Community RTK Act. All firefighters, both paid and volunteer, are considered employees and are considered potentially exposed to hazardous substances in their work. Paid firefighters must receive RTK training within one month of hire. Volunteer firefighters must receive RTK training within six months of acceptance and both paid and volunteer firefighters must receive refresher training every two years. Fire departments may want to check with their municipality or fire district to see if an existing program already exists. Information on training and education requirements can be found in Appendix VI.

Municipalities are required to certify on their Right-to-Know survey, every year, that new paid

and volunteer firefighters have received initial Right to Know training that year, and to certify, every other year, that existing paid and volunteer firefighters have received refresher Right to Know training within the prior two years. (N.J.A.C. 8:59-6.1(d))

A similar training requirement for paid and volunteer firefighters exists under the Hazardous Waste Operations and Emergency Response Standard (pursuant to the New Jersey Public Employees Occupational Safety and Health Act). 29 CFR 1910.120(q)

In order to prevent duplication of training, the Right to Know regulations allows much of the 1910.1204 training to substitute for Right to Know training. The regulations say:

- Firefighters will be in compliance with Right to Know training requirements by taking the New Jersey Haz-mat Emergency Response Course—Awareness, and the New Jersey Haz-mat Emergency Response Course—Operations (using the manual dated May 10, 1990 or later), both developed by a committee under the auspices of the New Jersey State Police, Office of Emergency Management.
- In addition, firefighters should receive training on any hazardous materials in the firehouse which do not fit within the solid article or consumer product exemptions, if not already covered in other training.
- Training in the use of personal protective equipment must be given if not covered in other training, Figure C-30.
- Instructors must provide documentation to the fire company that they are "technically qualified persons" and a signed attendance roster must be maintained at the firehouse.
- (Biennial) Right to Know training can be combined with the annual refresher training required by 29 CFR 1910.120(q), however, "demonstrated competency" will not be allowed as a substitute for Right to Know (biennial) training.
- A Right-to-Know brochure must be distributed to all firefighters during the (biennial) training course.
- Awareness and Operational courses developed by other organizations may be used in place of the State Police program for Right to Know compliance upon submission to and approval by the Department of Health and Senior Services, Right to Know Program.

Figure C-30. An example of hazardous material personal protective equipment.

Maintenance of Right to Know Records

Training records are required to be maintained by the employer. Fire departments should check with their municipality or fire district to determine where training records will be maintained. Information about the training records that must be maintained can be found in Appendix VI.

SECTION 3

The Fire Department as a Planner and Responder to Emergencies

Right to Know Surveys

All fire departments will receive copies of RTK Surveys completed by public employers and Community RTK Surveys completed by private employers for facilities located within their jurisdiction every year. The surveys tell what hazardous chemicals are present at those facilities, their quantities and locations, and their DOT Guidebook number from the Emergency Response Guidebook, Figure C-31.

What Should a Department Do With the Right to Know Surveys That it Receives?

Fire departments should use both the RTK surveys and Community RTK surveys to help develop an emergency operations plan for facilities within its jurisdictions that report having hazardous substances. A sample Emergency Operations Plan (EOP) is available from the NJ State Police, Office of Emergency Management. HSFS are available from the DHSS for the hazardous substances reported on the surveys. You may request a complete set of HSFS from DHSS.

How Do You Use a Hazardous Substance Pact Sheet or Material Safety Data Sheet?

The fire department may maintain a file of the complete set of 1,055 HSFSs or MSDSs which it receives from certain reporting facilities, or both. This will allow firefighters to look up specific information on hazardous substances for any facility that they may be required to respond to. The HSFS and MSDS information can also be used in training and can be carried on apparatus or otherwise made available to officers during an incident.

If a firefighter is subject to hazardous chemical exposure during an incident, the HSFS and MSDS can be used in diagnoses and treatment at the hospital and in subsequent medical monitoring. Fire departments should drill their firefighters and officers in the use of RTK surveys, community RTK surveys and the accompanying HSFS and MSDS so that all are familiar with how to locate chemical information as well as the pertinent response information required during an emergency.

Drills could both be in-house and practical evolutions using hazardous substance scenarios that would require the use of surveys as well as HSFS and MSDS. Walkthroughs of specific facilities to confirm the information on the surveys and check container labels would also be beneficial.

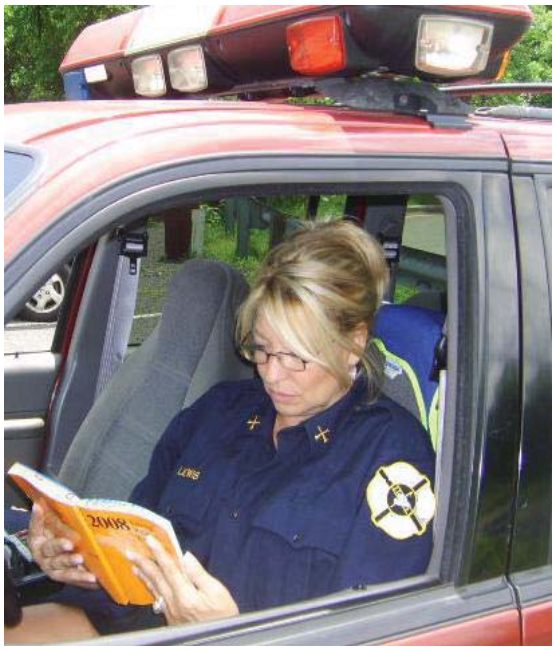


Figure C-31. A Fire Officer consulting the DOT *Emergency Response Guidebook.*

HAZARD COMMUNICATION STANDARD

PEOSH ADOPTS THE HAZARD COMMUNICATION STANDARD (N.J.A.C. 12:100-7)

The purpose of this bulletin is to inform public employers and employees that the federal Hazard Communication Standard, 29 CFR 1910.1200, has been adopted with amendments under the New Jersey Public Employees Occupational Safety and Health Act, at N.J.A.C. 12:100-7. The Standard overlaps with the New Jersey Worker and Community Right to Know (RTK) Act, N.J.A.C. 8:59, administered by the Department of Health and Senior Services Right to Know Program in the area of education and training of public employees. In order to prevent public employers from being subjected to two sets of rules regarding education and training, certain provisions of RTK education and training have been added to the Hazard Communication Standard and all education and training requirements are being removed from the RTK rules. This bulletin provides an overview of the Public Employees Occupational Safety and Health Program (PEOSH) Hazard Communication Standard (HCS) and explains the public employer's responsibilities under the Standard.

BACKGROUND

On January 11, 2001, the US Department of Labor, Occupational Safety and Health Administration (OSHA) approved New Jersey as a State-Plan State for public employees only. In accordance with the federal OSHA-approved PEOSH State Plan, New Jersey must operate an occupational safety and health program that is at least as effective as the federal program. Therefore, the New Jersey Department of Labor (DOL), PEOSH Program, has adopted the Hazard Communication Standard (HCS) with amendments to bring New Jersey's regulatory requirements and standards in line with OSHA requirements.

PEOSH HCS AND THE RIGHT TO KNOW ACT

OSHA adopted the federal Hazard Communication Standard in 1983, after the New Jersey Worker and Community Right to Know (RTK) Act had already been enacted. The *public sector* was not covered *under the* federal OSHA Standard, but was covered by the RTK Act. As a result of New Jersey's OSHA-approved State Plan and the adoption of the Hazard Communication Standard by the PEOSH Program, *public* employers *are now required* to *comply with both the PEOSH* HCS *and the RTK* Act.

All references to RTK education and training are being removed from the RTK rules while certain provisions have been added to the federal Standard to create the PEOSH HCS. The New Jersey Department of Labor and Department of Health and Senior Services agreed to this change in order to eliminate confusion among public employers regarding the need to educate and train employees about hazards in the workplace.

Public employee training will now be solely enforced under the Hazard Communication Standard adopted by the PEOSH Program. The PEOSH HCS amendments are listed below. It is strongly recommended that you read the PEOSH HCS and Appendix E of the PEOSH HCS in its entirety to become familiar with all of the Standard's requirements.

PEOSH Hazard Communication Standard Summary of Amendments

- N.J.A.C. 12:100-7.3 new definitions added: Hazardous Substance Fact Sheet (HSFS); RTK Hazardous Substance List (RTK HSL); RTK Survey; Technically Qualified Person; Workplace Hazardous Substance List; Workplace Survey
- N.J.A.C. 12:100-7.8(a) refresher training must be provided every two years, during regular working hours, and at no cost to employees
- N.J.A.C. 12:100-7.8(a) chemical specific information must be made available to employees through HSFSs I N,J.A.C. 12:100-7.8(b)(3) employees must be informed of the location and availability of HSFSs, the RTK Survey, and the RTK HSL
- N.J.A.C. 12:100-7.8(c)(5) training must include an explanation of applicable provisions of the RTK Act (RTK Survey, RTK HSL, labeling, HSFS, central file, poster)

- N.J,A.C. 12:100-7.8(c)(6) a copy of the RTK brochure must be provided to employees
- N.J.A.C. 12:100-7.8(d) a "technically qualified person" must be used to conduct training
- N.J.A.C. 12:100-7.8(e) a list of the items to be included in training records
- N.J.A.C. 12:100-7.8(f) training records must be maintained
- N.J.A.C. 12:100-7.8(g) an employer is required to make available all training records
- N.J.A.C. 12:100-7.8(h) training materials must be appropriate in content and vocabulary to the educational level, literacy, and language of employees

WHO IS COVERED?

The PEOSH HCS applies to all public employees in New Jersey who use or store hazardous chemicals or products containing hazardous chemicals. A hazardous chemical is defined as a chemical which is a physical hazard or a health hazard (See N.J.A.C. 12:100-7.3). Refer to the PEOSH HCS for sources of information that are used to identify hazardous chemicals, N.J.A.C. 12:100-7.4, and those products to which the PEOSH HCS does not apply, N.J.A.C. 12:100-7.2(f).

PURPOSE OF THE HAZARD COMMUNICATION STANDARD

The purpose of the PEOSH HCS is to ensure that the hazards of all chemicals produced or imported are evaluated, and that information regarding the hazards of the chemicals is passed on to employers and employees. Under the PEOSH HCS, communication of the hazards of chemicals is achieved through a comprehensive hazard communication program which includes:

- A written hazard communication program;
- Container labeling and other forms of warning;
- Use of Material Safety Data Sheets (MSDSs) and HSFSs; and
- Employee training.

The evaluation of chemical hazards is the responsibility of manufacturers and importers. **Employers who use hazardous chemicals must comply with the parts of the PEOSH HCS that require development and maintenance of a written hazard communication program and the communication of the hazard information to their workers.**

EMPLOYERS WITH LIMITED PEOSH HCS COVERAGE

Sealed container operations and laboratories have limited coverage under the PEOSH HCS. These limitations are explained below and are found in N.J.A.C. 12:100-7.2.

1. Chemicals in sealed containers— Employees who handle hazardous chemicals in sealed containers which are not opened under normal conditions of use, such as in warehouses and transportation facilities, are exempt from the full requirement of the Standard, but the employer is still required to:

- Ensure that labels are not defaced or removed from incoming containers;
- Obtain and maintain Material Safety Data Sheets (MSDSs) and make them readily accessible to employees in their work areas during each workshift; and
- Provide information and training for employees, except for the location and availability of the written hazard communication program, so they know how to protect themselves in the event of a chemical spill or leak from a sealed container.

2. Laboratories—Employers are required to perform only the following under the PEOSH HCS:

- Ensure that labels are not defaced or removed from incoming containers;
- Obtain and maintain Material Safety Data Sheets (MSDSs) and make them readily accessible to employees in their work areas during each workshift; and
- Provide information and training for laboratory employees in accordance with the PEOSH HCS, except for the location and availability of the written hazard communication program.

For laboratories covered under the Occupational Exposure to Hazardous Chemicals in Laboratories Standard, 29 CFR 1910.1450 (laboratories where chemical manipulations are carried out on a "laboratory scale," multiple chemical procedures or chemicals are used, the procedures involved are not a part of a production process, and protective laboratory practices and equipment are available and in common use), the requirements of the PEOSH HCS are superseded. In this case the more specific Standard 29 CFR 1910.1450 applies. However, these laboratories are still required to comply with the provisions of the RTK Act.

Note: Laboratory employers that ship hazardous chemicals are considered to be either chemical manufacturers or distributors. They must, therefore, ensure that any containers of hazardous substances leaving the laboratory are labeled as required by the PEOSH HCS, and that an MSDS is provided to distributors and other downstream employers as required by the PEOSH HCS.

PROVISIONS OF THE PEOSH HCS

1. Chemical hazard evaluation
2. A written hazard communication program
3. Container labeling and other forms of hazard warning
4. Preparation, distribution, and maintenance of Material Safety Data Sheets (MSDSs)
5. Development and implementation of employee information and training programs
6. Trade Secrets

Each provision of the PEOSH HCS is summarized below. For a more detailed explanation of each provision, review a copy of the standard N.J.A.C. 12:100-7, available from the PEOSH Program at the address listed on page 6. The standard may also be obtained from the website listed in the box below.

Note: The PEOSH Program has developed a document, "Public Employer's Guide and Model Written Program for the Hazard Communication Standard," to assist public employees in complying with the PEOSH HCS. A sample written program is included in this Guide, If you choose to use the model written program provided, it must be adapted to reflect policies and work practices at your specific workplace, To obtain a copy, visit our web site *www.nj.gov/health/eoh/peoshweb,* or call 609-984-1863.

Hazard Evaluation

Each hazardous chemical must be evaluated for its ability to cause adverse health effects and its potential to cause physical hazards, such as flammability, based on established criteria for defining a hazardous substance. Conducting this hazard evaluation is a responsibility of the producers, importers, and distributors of hazardous chemicals. This section may not apply to public employers unless you create or ship hazardous chemicals to others. **The majority of public employers will only need to focus on items 2-6 above under "Provisions of the PEOSH HCS."**

Written Hazard Communication Program

All employers must develop and maintain a written hazard communication program at each workplace. The employer must describe in the program how the PEOSH HCS requirements for labeling, training, and MSDSs will be met. The written program must be made available upon request to employees, the employees' representative, the Commissioner of the New Jersey Department of Labor and the Commissioner of the New Jersey Department of Health and Senior Services or their designees. The written Program must contain, at a minimum:

1. **A list of hazardous chemicals** in the workplace;
2. A description of how employees will be informed of the hazards of non-routine tasks and the hazards of chemicals contained in unlabeled pipes;
3. Information about the availability of MSDSs and HSFSs and methods to provide access to MSDSs and HSFSs;
4. A description of container labeling and other forms of warning;
5. A description of the employee training program;
6. Procedures for training new employees initially, when new products are introduced, and for refresher training;
7. Methods for providing hazard information and protective measures to other employers on site who may be exposed.

A **list of hazardous chemicals** (List) must be compiled using the identity of the hazardous chemical or product that appears on the container and MSDS. The PEOSH HCS is a performance-based Standard. It allows the public employer flexibility in using existing lists of hazardous chemicals, such as the RTK Survey, to comply with the requirements to compile a list of hazardous chemicals. **The public employer has the option under the PEOSH HCS to develop a separate List to be included in the written Program or to use their RTK Survey as the List.**

The employer must be certain, however, that their RTK Survey contains all of the hazardous chemicals in the workplace if it is to be used as the required list. This would require them to have a complete inventory RTK Survey. They can also attach a supplemental page to the RTK Survey listing any hazardous substances that may not be on their RTK Survey to comply with the PEOSH HCS.

HCS Labeling Requirement and Other Hazard Warnings

Products containing hazardous chemicals must be labeled to inform employers and employees of the hazards associated with the product or chemical. **Chemical manufacturers, importers, and distributors** must label, tag or mark containers with the identity of the hazardous chemicals contained in the product and must show hazard warnings to protect the employee. The identity of the hazardous product must correspond to the name listed on the MSDS for that product. The warning may be in the form of words, pictures, or symbols, and must be legible and prominently displayed. Any target organs affected by the product or chemical must be identified. The name and address of the manufacturer or importer must also be included on the label.

Under the PEOSH HCS, public employers are required to make certain that the chemical products entering their facility are labeled and the labels are not defaced or removed. Generally, the employer receives the product or chemical already labeled by the producer based on OSHA HCS labeling requirements. In addition, public employers must check that the product is labeled according to the PEOSH HCS and the RTK law. Public employers must comply with the labeling requirements of both PEOSH HCS and the RTK Act. Refer to the PEOSH HCS for specifics on container labeling. N.J.A.C. 12:100-6.6.

Material Safety and Data Sheets

Employers must obtain and maintain an MSDS for each product containing hazardous chemicals. The MSDS is an informal bulletin that describes in detail: the physical and chemical properties, physical and health hazards, routes of exposure, precautions for safe handling and use, emergency and first aid procedures, and control measures for the hazardous chemical or product. It is provided to the distributor and employers who use the product or chemical.

Under the PEOSH HCS, public employers must obtain an MSDS for each hazardous chemical or product and make them readily accessible to employees in their work area during each work shift. If the RTK Central File provides the required accessibility for employees in their work area, it meets the PEOSH HCS requirement.

If MSDSs are not received with a shipment of products containing hazardous chemicals, the public employer must contact the manufacturer for the missing MSDSs. A sample letter requesting an MSDS is included in the Public Employer's Guide and Model Written Program for the Hazard Communication Standard.

Employee Training

Employers must develop an information and training program for those employees who are exposed to hazardous chemicals under normal conditions of use or in a foreseeable emergency. Exposure means the employee comes in contact with the hazardous chemical during their job activities by any route of exposure (e.g., inhalation, skin absorption, or ingestion).

Under the PEOSH HCS, employees must be trained at the time of their initial assignment to work with hazardous chemical and when physical or health hazard is introduced into the workplace. This requirement differs from the RTK training requirement which allowed the employer 30 days to initially train the employee, Refresher training shall be provided every two years for all employees who continue to be exposed to hazardous chemicals. Refresher training is an abbreviated version of the initial training. The training must be provided during working hours and a no cost to the employee.

The public employer shall ensure that all employees participate in a training program conducted by "**a technically qualified person.**" A technically qualified person means, for training purposes:

- A person who is a registered nurse, Certified Safety Professional, or Certified Industrial Hygienist, or a person who has a bachelor's degree or higher in industrial hygiene, environmental science, health education, chemistry, or a related field, and understands the health risks associated with exposure to hazardous substances; or
- A person who has completed at least 30 hours of hazardous materials training and understands the health risks associated with exposure to hazardous substances, and has at least one year of experience handling hazardous or working with hazardous substances; or
- For teaching the recruit firefighting training course established by the New Jersey Department of Community Affairs (DCA), a

person who has fulfilled the requirements of Firefighter Instructor Level I as certified by DCA.

The definition of a "technically qualified person" can be found in the PEOSH HCS, at N.J.A.C. 12:100-7.3.

The PEOSH HCS information and training program must be appropriate in content and vocabulary to the educational level, literacy, and language of the employees in the training session and contain, at a minimum:

1. An explanation of the requirements of the PEOSH Hazard Communication Standard;
2. A description of operations in the work area where hazardous materials are present;
3. The location and availability of the written hazard communication program and other health and safety information (MSDS, HSFS, RTK HSL);
4. Details of the facility's hazard communication program;
5. An explanation of the applicable provisions of the RTK act (RTK Survey, RTK Labeling, HSFS, RTK HSL and Poster);
6. Methods used to identify and recognize hazardous materials in the work area (e.g. labels, MSDS, HSFS);
7. A discussion of the physical and health hazardous chemicals;
8. Control measures and specific procedures used to prevent exposure;
9. Standard operating procedures regarding the use, storage, and emergency clean up of hazardous chemicals; and
10. A copy of the RTK brochure.

Additionally, Hazardous Substance Fact Sheets (HSFSs) are required to be made available to employees for chemical specific information, N.J.A.C. 12:100-7.8.

Recordkeeping

Public employees' training records shall be maintained by the employer for the duration of the employee's employment, and shall be made available to the Commissioner of Labor or the Commissioner of Health and Senior Services or their designees for examination and copying. The training records shall be provided upon request for examination or copying to employees and employee representatives.

Training records shall include:

- Date of the training session;
- Location of the training session;
- Type of training (initial or refresher);
- Name and qualifications of the trainer;
- Names and job titles of the persons attending the training session;
- The content or summary of the training session.

Trade Secrets

Under the PEOSH HCS chemical manufacturers, importers, or employers are allowed to withhold the specific chemical identity of a hazardous chemical from an MSDS if certain conditions are met:

1. The trade secret claim can be supported;
2. The MSDS contains information on the properties and effects of the hazardous chemical;
3. The MSDS indicates that the specific chemical identity is being withheld as a trade secret; and
4. The specific chemical identity is made available to health professionals, employees, and designated representatives under certain specified situations.

In general, a request for the disclosure of a trade secret must be in writing and a statement to maintain the confidentiality of the disclosed information must be included in the request. The identity of a trade secret chemical must be released in cases of medical emergencies or first aid treatment regardless of the existence of a written statement. Review the PEOSH HCS for more specific details regarding the trade secret provision. Appendix D of the Standard provides the definition of a trade secret.

APPENDICES

There are appendices to the PEOSH HCS to assist employers with compliance. Appendices A (p. 176), B (p. 179), and D (p. 179) are mandatory. Appendix A provides definitions and an explanation of health hazards. Appendix B explains the criteria for evaluating hazards. Appendix D sets forth the definition of a "Trade Secret." Advisory information is provided in Appendix E (p. 180) to assist employers with compliance.

For Additional Information Contact:

NJ Department of Health and Senior Services
Public Employees Occupational Safety and Health Program
PO Box 360 Trenton, NJ 08625-0360
(609) 984-1863
http:/www.nj.gov/health/eoh/peoshweb

NJ Dept. of Labor and Workforce Development
Division of Public Safety and Occupational Safety and Health
PO Box 386 Trenton, NJ 08625-0386/ (609)-6332587

SECTION C

REVIEW QUESTIONS

1. What is the difference between United States Federal OSHA and the State of New Jersey PEOSHA?
2. Describe the protective clothing that firefighters wear and its limitations.
3. Explain which departments of the New Jersey State government enforce standards and regulations pertaining to firefighters.
4. List the types of bloodborne pathogens that can threaten the health of firefighters.
5. What is the role of the Safety Officer at an emergency scene?
6. What do the terms, Mayday and LUNAR stand for?
7. How and why does a Firefighter issue a Mayday message?
8. Explain the evacuation signal regulation and its use as a fireground resource.
9. What is a Rapid Intervention Crew (RIC)? How is it utilized at an emergency incident
10. List three reasons how a personal alert safety system (PASS) enhances the safety of firefighter.

PUBLIC UTILITIES, PROPANE AND CARBON MONOXIDE HAZARDS

SECTION D

INTRODUCTION

The following three chapters discuss the potential hazards associated with electric, natural gas, and propane facilities and carbon monoxide emergencies. What first responders do not know about utility hazards can and has killed them. It is vital that potential hazards associated with electric, natural gas, propane facilities, and carbon monoxide be integrated into your fire departments emergency standard operating guidance ("SOGs") and hazard assessments. These chapters on utility and energy safety provide a starting point for first responders to recognize and avoid potential utility hazards. It is strongly recommended that fire departments meet periodically with utilities and energy providers in their emergency response area to review capabilities and specific facility concerns and establish SOGs based on the specific potential utility and energy hazards in their area. The purpose of this program is to:

- help you to understand the properties of energy,
- give you a basic knowledge of how the utilities and energy systems work,
- make you aware of the hazards associated with those systems, and
- offer approaches for responding to utility and energy emergencies.

Utilities and energy services may be encountered while responding to virtually every emergency. The primary and first assessment focus is always life safety. When electric, natural gas, or propane facilities are involved, the only effective emergency response may be to secure the area, protect nearby properties, and wait for the power or gas to be shut off or dissipate. Life safety includes your personal safety and that of the other first responders. The most difficult aspect of the emergency response may be waiting for the electricity, gas, or propane to be rendered safe before proceeding. Detection and utility emergency response equipment has to be calibrated, tested, and maintained to ensure that this equipment is safe and personnel are trained to use such equipment. Attempting to shut off the electric, natural gas, or propane facilities without the proper training, equipment, or experience may be fatal. Having the utility provider shutoff the power or energy is the safest approach. While the next three chapters will offer approaches for responding to emergency situations, not all potential hazards can be described. Only through training, experience, practice, and continuous learning will a first responder be able to remain safe and effectively manage an emergency. Many of the potential hazards may be hidden or not apparent at first. Being aware of the broad safety aspects of emergency response and careful evaluation of the specific emergency will reduce your exposure to these hidden hazards. It is hoped that these chapters will help you better understand and determine what precautions need to be taken when responding to utility and energy emergencies.

It is our fervent hope that you start your path as a first responder with the information, knowledge, and training needed to keep you and your fellow responders safe. The information in these three chapters is the first step on that path.

CHAPTER I RECOGNIZING AND AVOIDING THE HAZARDS OF ELECTRICAL EQUIPMENT

INTRODUCTION

Over the past years there have been many documented firefighter fatalities caused by electrocution. The purpose of this program is to:

- give you a basic knowledge of how electricity works,
- help you to understand basic construction,
- explain configurations of the electric utilities,
- make you aware of the hazards of electricity.

This chapter will help you better understand what precautions need to be taken when working around electrical equipment.

Electricity is invisible. When you look at an electric wire that could be energized from 120 volts all the way up to 500,000 volts, it seems harmless enough. That is why electrical energy is often referred to as the "silent killer" and remains a hazardous form of energy that has to be dealt with safely.

No matter what the voltage is in an electrical conductor, it is dangerous and can injure and/or kill emergency workers.

Some people believe that 120 volts (normal household current) is harmless. However, throughout the electrical industry there have been people killed when they have made contact with 120 volts. Any voltage can kill! It all depends on the situation, the amount of current involved, the part of the body affected, the duration of contact, and environmental conditions (wet or dry) at the time of contact.

Electricity is a blessing that is often taken for granted and must be treated with respect. *Electrocution is the fifth-leading cause of workplace death*. The majority of these fatalities are caused by the failure to recognize and avoid electrical hazards.

Solar Power or Photovoltaic (PV) as Alternate Electrical Sources

As Photovoltaic electrical systems become more popular (NJ is now the second largest market in the US) firefighters must become familiar with the hazards associated with alternate energy sources during an emergency. Unlike traditional electrical systems that are connected to the power grid and can be de energized by disconnecting from the grid portions of a PV system are always energized.

For firefighters to gain a better understanding of PV electrical systems and their hazards go to the NJ Division of Fire Safety Website and review the power point program titled " Solar Power and its Effects on the Fire Service" at http://www.nj.gov/dca/divisions/dfs/offices/training.html

ELECTRICITY – THE BASICS

This section provides a general summary of electricity and electrical equipment. Key safety and tactical points are indicated.

Suppose nothing is coming out of a hose, but there is water under pressure inside it. If you open the valve, the force of that internal pressure releases a spray of water. An energized wire is similar. The force that causes electrons to flow is called voltage, and like water, the greater the pressure pushing electricity through a line, the higher the voltage. In water terms the pressure is measured in pounds per square inch. With electricity, pressure is measured in volts.

- Voltage is the electric force that causes the free electrons to move from one atom to another. Just as water needs pressure to force it through a hose, electrical current needs a force to make it flow. A volt is the measure of electric pressure. Voltage is usually supplied by a battery or a generator.
- Current is electricity in motion. It measures the amount of electrons that can flow through a material like a conductor. Electric current is measured in amperes, or "amps" for short. Amperes is like the amount of water flowing through a hose in a certain amount of time or the amount of electricity flowing through a wire.

- Resistance — The opposition to electrical current flow, measured in ohms.
- Conductors — These are made of materials that electricity can flow through easily. These conductors are made up of atoms whose electrons can move away freely.

Tactical Point If you discover someone who has made an electrical contact, do not attempt to pull the victim away from the source of contact with your hands. The power supply should be disconnected by the power company first. This may be done remotely by phoning the power company.
If someone is working from an elevated aerial apparatus and makes contact with an energized electrical conductor, do not climb onto the vehicle to lower the injured person by using the lower controls of the aerial apparatus until the power source has been de-energized or the aerial apparatus is clear of the electrical conductor.

The risk of electrical shock or contact can be reduced by:

- Being able to identify what a safe working distance from any electrical wires or equipment is.
- Maintaining a safe working distance from any electrical component

Some Examples of Conductors Are

- Copper Aluminum
- Platinum
- Gold
- Silver Water
- People and Animals
- Trees

Electricity will always take the shortest path to the ground. Your body is 70 percent water, and that makes you a good conductor of electricity. If a power line has fallen on a tree and you touch the tree you become the path or "conductor" to the ground and could be electrocuted.

- Insulators are the opposite of conductors. The atoms in these materials are not easily freed and are stable, preventing or blocking the flow of electricity.

Some Examples of Good Insulators Are

- Glass
- Porcelain
- Plastic
- Rubber

The rubber or plastic on an electrical cord provides an insulator for the wires. By covering the wires, the electricity cannot go through the rubber and is forced to follow the path on the aluminum or copper wires.

As mentioned above, electricity flowing through a conductor is similar to water flowing through a pipe.

If you take a water pipe with the faucet shut off, there is water in the pipe putting pressure (volts) on the pipe. However, there is no flow of water (amps) since the faucet is turned off. This is the same situation found in a home when the electrical wiring is connected to a TV or other appliance and the switch is turned off.

When the faucet is opened, water starts to flow (amps). The rate at which the water flows depends on two things:

The size of the pipe. (electrical comparison—resistance)

The pressure of the water. (electrical comparison—volts)

Once you have pressure (volts) and flow (amps) you have accomplished work (power watts). Just like the water that comes out of a faucet to fill a pot, water the lawn, and so on, the electricity is running the TV, VCR, lighting, and so on. Electric power is the term used for the product of the voltage and current in a circuit.

The length of time that you let the water flow will determine the gallons that are used; this is measured by the water meter. Likewise, the length of time the power is used is measured in watts by the electric meter and billed as a kilowatt-hour (1 kw = 1,000 watts).

Electricity is always trying to reach earth, which is ground, through the path of least resistance. In order to control electricity, insulators are used to isolate the energized conductors from all sources of ground potential. Air is a natural insulator; once an electrical arc has started, the air becomes ionized and is now contaminated. The arc will continue until it is interrupted.

Caution Consider all downed wires as ENERGIZED until the Utility representative confirms they are safe.

THE ELECTRIC SYSTEM

Generation

Electricity generating plants or power plants may be large or small, and generation is produced by several means: fossil, hydro, or nuclear. Appearance of the power plants differs, as does the equipment in the plant. However, there are certain conditions and equipment that are somewhat common to all power plants, such as the turbine, boiler, condenser, and electrical switch rooms.

The voltage that is produced by the generators is stepped, or raised up, through the use of power transformers to levels used to transmit the power by electrical transmission lines to locations miles from the generating stations. These transmission line voltages range from 115,000 to 500,000 volts. Transmission line towers are usually 100 to 200 feet high and run in a straight line along utility right of ways. In most cases, the wires with the highest voltage are those at the tops of utility poles. Keep in mind that most poles also have other utility wires, such as telephone and cable.

The electrical power is carried great distances on these towers to large substations. An electric substation performs one or more of the following functions: (1) It transforms electric energy from one voltage to another, (2) it serves as a control center and switching facility, and/or (3) it serves as a center for distributing electric energy to end-use customers.

Substations can be classified into three categories: inside, outside, and a combination of both. Some are hidden from site by constructing a three-sided house around the station.

All substations contain electrical equipment, which are insulated with mineral oil, and/or pressurized insulating gas, such as sulfur hexafluoride (SF-6).

At these substations the voltage is stepped down, again by the use of power transformers, to 34,500 volts. The 34,500-volt electrical conductors are carried to smaller substations on high utility poles ranging from 60 to 90 feet in height that run along power right of ways.

At these smaller substations, the voltage is once again reduced, this time to the primary voltage level (2,400 to 19,900) volts. These conductors are carried on smaller utility poles (40 to 50 feet in height) along residential streets.

Safety Firefighters should never enter a substation property unless accompanied by a utility representative.

The first objective of fire personnel is to size-up and communicate as much information to the utility as possible. Transmission substations, located with generating stations, are used to step-up the voltage from the generator; for example, 24,000 volts up to the transmission voltage of 115,000 volts or higher.

Distribution substations are located throughout communities; it steps the voltage down for distribution throughout neighborhoods. Distribution voltage may vary from 2,400 to 34,000 volts.

In order to reduce the voltage for residential use, there are transformers located on these poles that step the voltage down to 120 volts. This is the voltage that is carried on the wire running from the utility pole to the weatherhead connection on the residence.

As you turn on a light switch in your home the electrical power is transmitted to the light bulb. Electric utility primary (higher voltage) lines contain 0 to 500 amps and their secondary (household current) lines contain 60 to 400 amps. Even though the voltage is lower in household currents the amperage is the same or higher than in higher voltage lines. There is enough amperage in secondary lines to cause serious injury or a fatality if contact is made.

At the top of a utility pole are the power company's primary conductors. These conductors may be bare or covered with non-insulated weather jackets. The voltage in these conductors could range from 2,400 volts to 19,900 volts. There could be one to four wires at this location on the pole at this location on the pole.

The next area down from the primary location is the power company's secondary conductors. The voltage in these conductors is usually 120 volts in and as high as 480 volts in industrial areas.

Voltage in the primary lines usually is 2,400 volts to 19,900 volts and secondary voltages range from 120 volts to 480 volts (Figure 1-1).

Insulators are made from high di-electric or insulating materials, such as glass, porcelain, polymer, plastic, and so on. Insulators provide a mechanical means of clearance to prevent voltage from tracking to ground or another energized phase.

The number of insulators ganged, or joined together at any given point may give you a general indication of the voltage level. The more insulators on a single string, generally the higher the voltage.

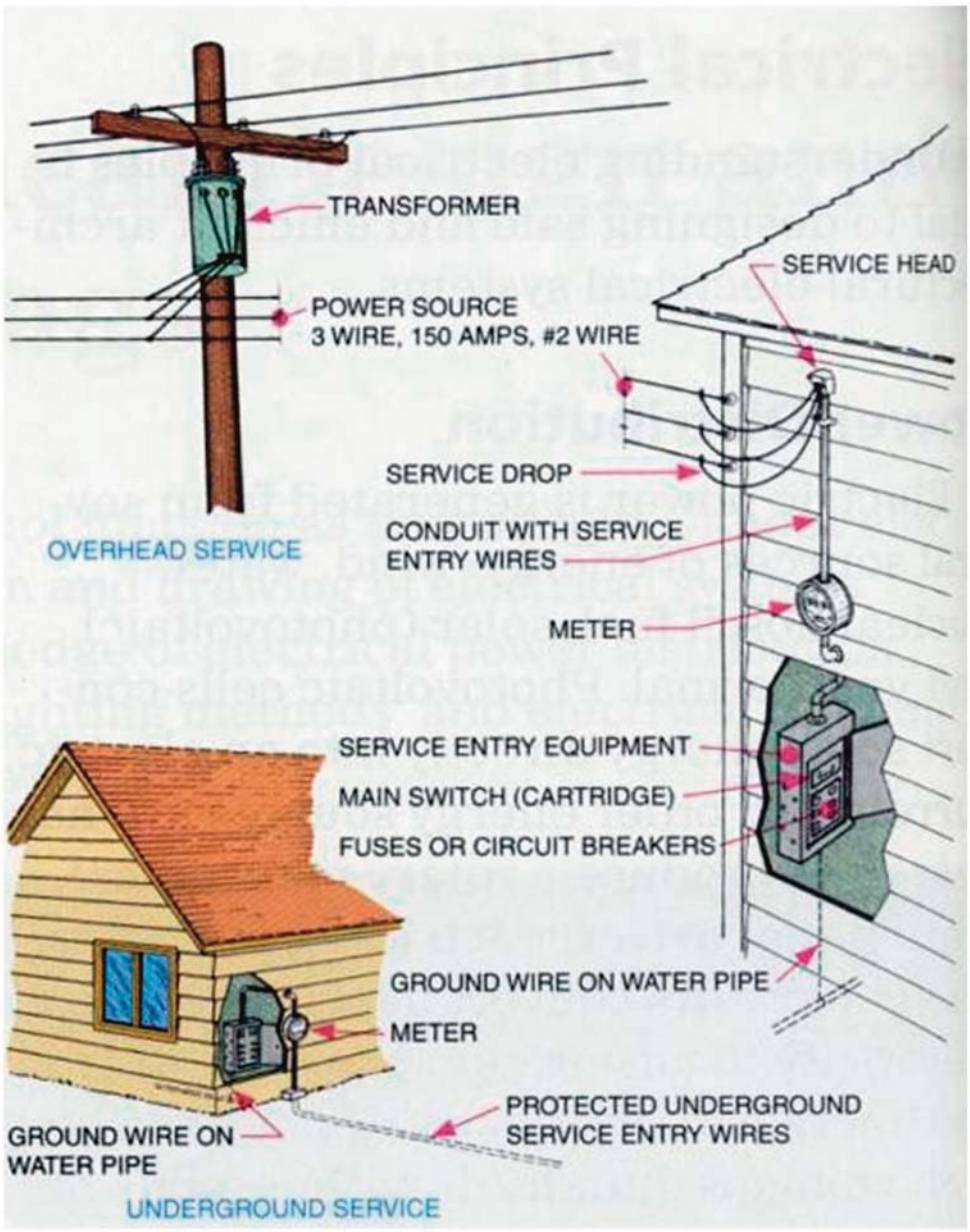


Figure D-1

Overhead electrical wires are all installed under strain. That is one of the reasons fire apparatus should be staged no closer than two pole lengths to either side of a pole that is involved in the incident. If a line under tension should snap it could recoil back for several hundred feet placing firefighters and fire apparatus in danger.

Pole-mounted equipment can contain mineral insulating oil; if there is a spill, immediately notify the electric utility, Figure 1-4. Extreme caution always should be taken during storm conditions. Downed power lines may or may not be energized.

A: Distribution power lines - generally are 23,000 volts – carry electricity from substations -- are located approximately 40 feet above ground.

B: Transformers – reduce high voltage to secondary voltage, are located approximately 35 feet from the ground.

C: Secondary lines – generally are 120/240 volts – carry electricity to homes and businesses -- are located approximately 32 feet from the ground.

D: Telephone/Cable Television Wires – generally about 20 feet from the ground.

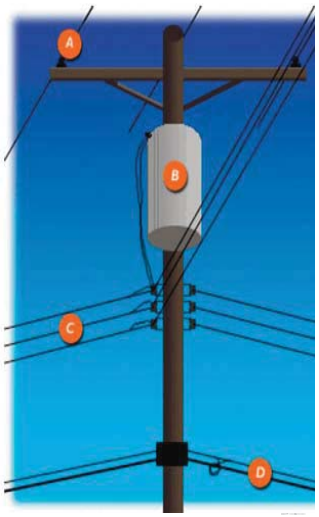


Figure 1-4: Pole top utility facilities.

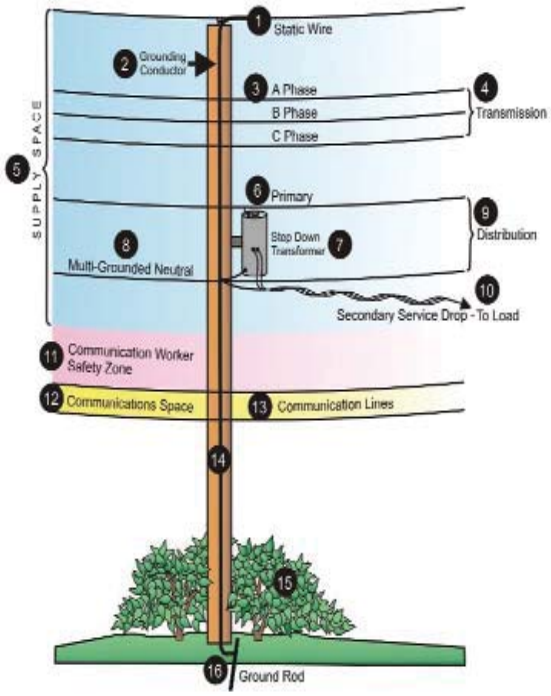


Figure 1-5 Secondary wires.

Safety Protect with diking techniques any water runoff area that could be affected by the oil spill. Do not attempt to wash away the oil spill.

Safety Never position yourself or an apparatus directly under a pole involved in the incident.

Positioning of aerial apparatus must be considered upon arrival: survey the area, locate overhead wires, and position the apparatus, maintaining a minimum of 10 feet from all overhead conductors.

Safety Consider all downed wires as ENERGIZED until the utility representative confirms they are safe.

Identifying the type of a downed wire (power, phone. fire alarm, or cable TV) is difficult when the lines are covered with debris, ice, or snow. Again, just stay away and call for help.

Whenever there is a downed energized electrical line, a phenomenon known as "step voltage" may be present on the ground around the fallen power conductor. The downed conductor may energize the ground causing a rippling effect around the point where it is making contact with the ground and the voltage decreases as you go out from the center of this point.

In a residential underground system, the power, gas, phone, and cable television companies all have underground cables in certain areas to serve their customers. The first sign that you might be in an underground area is that there are no utility poles around.

Safety Do not take chances: call the local power company for help. During a storm, stay away from any downed lines.

The voltages in the power company's underground system are the same as their overhead systems.

Many times the power, phone, cable television, and even the gas company's lines and cables look alike and identification may not always be easy. Underground distribution lines are distribution lines that are directly buried underground to padmount transformer installations. The voltages can range from 2,400 volts to 34,500 volts. Pad mount transformers are locked and should only be handled or opened by a utility representative.

ELECTRICAL SHOCK

Electrical shock remains the greatest hazard in an electrical contact. Besides the pain that is suffered, there is often a loss of muscle control and continued contact could lead to a fatal injury.

Electric shock will occur when a person, by contacting an energized conductor or other energized objects, provides a path for the flow of electricity to a ground. Simultaneous contact with two energized conductors will also cause electric shock, which may result in serious injury or death.

When you unintentionally become part of an electrical circuit, current flows through your body, which could cause electrical burns and/or death.

The human body provides limited protection from electricity. The first line of defense is our skin, which has a high resistance to shock. Recall that resistance is measured in "ohms," and dry, unbroken skin can have up to 50,000 ohms in resistance. But inside the body, which is about 70 percent water, this resistance drops to only 300 to 500 ohms in resistance.

Anatomy of an Electric Shock

To measure the effect of electricity on the body, let's take common household voltage, 120 volts, and divide it by a resistance factor of 40,000 ohms, which is typical for human skin. The result of voltage divided by resistance is "amperes," the amount of current which flows through human skin. Only here, the amount is small, only 3/1000 of an ampere, or 3 milliamps of current.

- Resistance of the human body
- Voltage/Resistance = Amperes

Current (amps) plays a major part in the electrical shock killing factor. Voltage is important only because it determines how much current will flow through the resistance of the human body. The current necessary to operate a 10-watt light bulb is eight to ten times morethan the amount that would kill the average person.

- Effects of current on body

1 milliamp or less--Causes no sensation and is not felt.

1 to 8 milliamps—Sensation of shock, not painful. Individual can let go at will, as muscle control is not lost (5 ma is the acceptable maximum harmless current intensity).

15 to 20 milliarnps — Painful shock. Cannot let go. Muscle control is lost.

20 to 50 milliamps—Painful. Severe muscular contractions. Breathing is difficult.

100 to 200 milliamps— Ventricular fibrillation. A heart condition that could result in death.

The severity of a shock determines the severity of the injuries received. Three factors affect the severity of a shock:

Firefighter Fact a 7-watt night light draws 60 milliamps of current, enough to cause ventricular fibrillation.

Electric utility primary (higher voltage) lines contain 10 to 500 amps and their secondary (household current) lines contain 60 to 400 amps. Even though the voltage is lower in household currents the amperage is the same or higher than in higher voltage lines. There is enough amperage in secondary lines to cause serious injury or a fatality if contact is made.

1. **The amount of current passing through a body.** The higher the current, the more potential for injury. A current as little as 50 milliamps-50/1000 of an amp—can cause death.
2. **The path of the current through the body.** A shock that takes a path through one finger and out another finger on the same hand (such as when touching the prongs on a plug) might cause only a painful, temporary injury. However, the same current flowing through the chest can cause death through ventricular fibrillation.
3. **The length of time that current flows through the body**. Obviously, the longer the duration of a shock, the greater the potential for an injury.

Other Electric Hazards

Electric arcs or flashes are another form of an electrical hazard. Heat generated from an electrical flash could be as high as 43,000°F. This is equivalent to the temperature on the surface of the sun.

An electrical arc will occur when there is a fault on a line, usually caused by a tool or piece of metal equipment getting across the lines. The resulting electrical arc is similar to an arc weld.

Electrical arcs or flashes may also be the result of a failed or faulted piece of equipment.

Electrical burns are another form of an electrical hazard that results from contact with an energized conductor or from the heat generated from an electrical arc.

Firefighter Fact A small electric drill draws 1,550 milliamps. This is seven times enough current to burn you and 31 times enough current to cause your heart to go into ventricular fibrillation.

Caution Rain gear (jackets, boots, gloves, and so on) and firemen's turnout gear provide virtually no protection against electricity.

Electricity, because it cannot be seen, must be approached with extreme care. To assume that a wire is not energized could be a deadly mistake. Always assume the wire is energized until it is tested by a qualified person.

RESPONDING TO INJURIES

Anytime someone has been shocked there are any number of possible injuries that you may need to address: first, second, and third degree burns; broken bones from a fall due to electrical contact; and most seriously cardiac arrest. Once you are certain the victim is not still in contact with any' energized item (energized fence, ladder, car, etc.), you can then treat the victim accordingly.

When electrical shock traumatizes a nerve center in the brain, breathing often stops, and your response needs to be appropriate. Time is of the essence, but do not sacrifice yourself in the process.

When checking a victim for life signs remember not to move the victim unless he/she is in imminent danger. If no life signs are found (breathing or a pulse), treat the victim accordingly.

Current entering the body produces heat, which can cause damage at the entrance and exit points. Electrical burns are doubly dangerous, because tissues and organs beneath the skin may also be burned.

For any burn, the burning process must first be stopped. For a major burn where skin has been destroyed, apply dry sterile dressings.

When a powerful electrical current passes through the air or gas and reacts with particles in it, an intense arc can result, instantly emitting huge amounts of radiation and ultraviolet light. During a new arcing event exposed skin can be severely damaged, as if from an intense sunburn, as well as the eyes. By cooling the skin additional damage can be reduced. Superficial skin burns are treated like a sunburn, with cool compress.

Talk to the victim to assure him or her that you have things under control. Talking also helps to calm victims down and helps keep them from going into shock.

Safety Points to remember (electric contact):

- Electrical burns are another electrical hazard that results from contact with an energized conductor or from the heat generated from an electrical arc.
- Protect yourself from electric arcs or flashes, which are other forms of electrical hazard. Heat generated from an electrical flash could be as high as 43,000'F. This is equivalent to the temperature on the surface of the sun.
- An electrical arc will occur when there is a fault on a line, usually caused by a tool or piece of metal equipment getting across the lines. The resulting electrical arc is similar to an arc weld.
- Electrical arcs or flashes may also be the result of a failed or faulted piece of equipment,
- Electrical shock remains the biggest hazard from electrical contact. Besides the pain that is suffered, there is often a loss of muscle control; continued contact could lead to a fatal injury. Electric shock will occur when a person, by contacting an energized conductor or other energized objects, provides a path for the flow of electricity to a ground. Simultaneous contact with two energized conductors will also cause electric shock that may result in serious injury or death.
- Eye damage may not show up immediately, but symptoms to look for are burning and a sensation of sand irritation.

APPROACHING ENERGIZED AREAS

Overview

As a first responder, you are most likely to be on scene before the local electric company. Safety is extremely important.

Coordination between the first responders and the local electric company is extremely important. The safest way to make sure that a wire is de-energized is to have the on-scene representative from the electric company do the actual disconnection of the wire. The electric company will de-energize their facilities and

Caution All downed wires should be treated as if they were energized.

advise first responders that it is safe to proceed with their duties.

It is very important that the local electric utility be notified of any downed wires. Even if it is suspected that they are not electric lines (i.e.. cable TV or phone), they could be energized due to a downed wire not in sight of your location. It is better to be safe than sorry by having the local electric company come out and secure it. Always consider all downed lines to be energized; contact the electric company and wait until they have given notice that it is safe to proceed.

Precautions When Approaching Downed Lines

A long-held misconception is that the rubber in the tires of vehicles will insulate you from electric contact. This is not true. Due to steel-belted radials, the tires can actually conduct electricity. The rubber protection that the utility uses is tested twice a year and is designed to protect against conductivity. The same goes with rubber fire boots or rubber rain boots. They are not designed to protect against electric shock.

Regardless of whether or not you know if the downed wire is Cable tv, telephone, or electric, you should always consider the wire to be live. You should never attempt to move it or handle it in any way. Let utility people do the work.

Circle of Safety

When approaching a downed wire, great care needs to be taken. A general rule of thumb is to maintain a minimum distance of 30 feet away. This is known as the "circle of safety." When in doubt, keep away and wait.

Storm Conditions

Extreme caution should always be taken during storm conditions. Downed power lines may or may not be energized. Do not take chances: call the local power company for help. During a storm, stay away from any downed lines.

Identifying the type of a downed wire (power, phone, fire alarm, or cable TV) is difficult when the lines are covered with debris, ice, or snow. Again, just stay away and call for help.

Whenever there is a downed energized electrical line, a phenomenon known as "step & touch" may be experienced while walking on the ground around the fallen power conductor. Firefighter should pay particular attention to the possibility of this occurring and the ground becoming energized in the area of the downed power line.

VEHICLE RESCUE FROM DOWNED POWER LINES

Vehicle accidents involving utility poles are very common. In cases where energized lines land on the vehicle the best practice is to instruct the driver and occupants in the vehicle to remain in the vehicle and wait for the power company to arrive. Remember the circle of safety. Keep at least 30 feet away and try to keep the occupants calm.

If the vehicle is operational, instruct the driver to attempt to move the vehicle. There are a few safety points to remember. Keep all personnel far away until the car is at least 30 feet away from the downed line. One important factor to note is wire coil memory. This means that the wire that may be pinned under a tire, when released, will recoil back to where it is connected. Be very aware of this. Keep all personnel far away until the wire comes to rest and stops moving.

A vehicle on fire with a wire downed and people trapped inside can be a very dangerous situation. The first responder's initial reaction may be to rush right in to get the fire out and help the people. This can be fatal. DO NOT USE WATER! If you do this the water, hose, engine, and all personnel making physical contact to it can become energized. If you have a situation where you have to suppress the fire, use dry chemical extinguishers. Don't forget to keep a safe distance away from the vehicle. A dry chemical usually has a stream of about 15 to 20 feet. Therefore, when you're approaching, be very aware of your surroundings. Use a spotter/safety officer to keep extra eyes on the situation. Remember that foam has water in it, so it too, can become energized. If there is no one in the vehicle and it is on fire, let it burn. Protect exposures and wait for the electric company.

Once the fire is out, wait, the lines still may be energized; forgetting this may result in you becoming a victim or fatality.

Safety People in vehicles that may be energized should be told to remain in the vehicle.

Caution All downed wires should be treated as if they were energized.

Environmental changes can trigger fires in the passages and vaults housing electrical wires and equipment. If you detect signs of fire, but don't observe any workers, vehicles, or signs of work at the reported location, most likely no one is in the underground vault or manhole. Don't make any attempt to investigate further, but report what you have seen to the utility company. Once on sight, the utility company, after de-energizing the area, may need some assistance from the fire department to clear the smoke out from the chamber so they can enter it to make repairs.

When work is being done, as a rule, someone from the crew will always be above ground. Instinct may tell you to rush down into the chamber, but don't; you have no idea of what may be energized. Make sure the utility company has been notified, and wait for them to de-energize the area.

Once power has been shut off, the chamber can be entered with full protective equipment and breathable air supplied and monitored. All the rules for confined space entry must be followed, and extra caution has to be taken to avoid any sparking, such as from flashlights being turned on, or metal scraped, because of the possible presence of combustible gases. Explosions in these underground areas can result in the street level manhole/vault covers being blown in to the air. Firefighters should remain aware of this possibility.

ELECTRICITY IN BUILDING FIRES

Most electrical fires are caused by excessive heat from wires, machines, and appliances, which have been overloaded or poorly insulated. When fires break out in buildings, you're almost always exposed to energized electrical wiring and power lines.

Industrial facilities have heavy-duty electrical systems with equipment operating at over 10,000 volts.

Residential systems mostly have 120- and 240-volt service. While much lower than industrial voltage, it is still very dangerous. Here are some guidelines that should be followed at all times:

1. When you enter a building, you may want to keep power on to aid you in investigating the fire.
2. However, because visibility is usually limited, keep your palm, turned inward. Why? If you come into contact with any energized sources, and you experience muscle contractions, your arms and hands will be pulled toward your body, and away from the source of electricity. Many firefighters believe that when responding to fire emergencies, the pulling of an electric meter is an acceptable procedure. It isn't. Meters can arc and explode.
3. What you want to do if possible is locate the main breaker box, or panel, and shut off the power from there. When doing so, turn away from the power source to avoid being burned if it arcs.

All electrical wires should be approached as if they were energized. As shown earlier, while electrical wires are weather coated, don't make the mistake of thinking that means they are insulated. Firefighter gloves are not designed to handle energized electric lines. Don't be fooled into thinking it's safe to touch the lines — it's not. Nor is it safe to use any of your tools to cut power lines. This attempt to de-energize power to the burning structure is extremely dangerous.

Even after you have cut the power, take care not to come in contact with machinery or appliance especially in commercial and industrial facilities, as there may be alternate emergency sources still supplying electricity. When you're fighting any kind of fire with overhead electric lines in the area, special precautions need to be taken.

Dense smoke often has carbon particles and moisture in it, which can become energized and produce a potentially lethal arc. This guideline also applies to any equipment and tools you are using. Make absolutely sure you're keeping that safe distance before jumping into action. Because of these dangers, only essential crew members should be anywhere near vehicles exposed to this risk.

Large scale fires involving multiple vehicles and possible different companies and agencies compound the complexities in responding.

Firefighter Fact If a ladder or bucket extension needs to go over or near any power lines, a minimum safe distance of 10 feet from the energized line is required by OSHA regulations.

Caution Anyone working on the vehicle must avoid any contact with the ground because of the possibility of electrical arcing.

Safety A "prefire plan" should be in place to ensure that everyone is aware of the location of power lines and other electrical sources, so coordination of all parties' actions creates a safe outcome.

When the utility company experts arrive, they will probably cut the service wire taps on the utility pole, or open a switch to cut power to the area. Only when they test to make sure all sources of electrical energy are removed will you get an all clear to move about safely.

SUBSTATION, PLANT, AND TRANSMISSION FIRES

An electric power substation has transmission and distribution lines coming in and out of it. Typically, some of the components include a control building, large transformers, structures to keep the lines elevated, and circuit breakers. Both transformers and circuit breakers are filled with oil, which insulates the internal electrical components. If a fire breaks out, the high voltage levels mandate special guidelines for responding safely.

Components of a Substation

The transmission and distribution substation consists of many components such as transformers, distribution breakers/reclosers, power circuit breakers, voltage regulators, reactors, capacitors, circuit switchers, switchgear, and switches that should be located and arranged in the substation yard in the most effective manner. The following subsections discuss the various aspects of the types of substation equipment used in the subtransmission and distribution substation.

Power Transformers

All substation-type power transformers are liquid-filled transformers. Most all transformers that are used are of the core form, circular coil winding construction. In the core form type of construction, the transformer windings are surrounded by the core steel. The liquid is generally oil and may be flammable.

Power Circuit Breakers

A power circuit breaker is a device used to open or close an electric power circuit either during normal power system operation or during abnormal conditions. Circuit breakers used are vacuum, oil filled, or insulating gas filled.

Distribution Circuit Breakers / Reclosers

Interrupting devices used in the low voltage portion of a distribution substation consist of circuit breakers and/or circuit reclosers. These devices may use vacuum, insulating oil, or SF6 gas as the interrupting medium. Both devices are used to protect transformers, circuits, and other equipment in a distribution substation. Both have all relaying such as reclosing, phase, and neutral relaying included in their own control cabinet.

Control Buildings

Control buildings are generally deemed necessary when the installation of large batteries and relaying/control equipment on switchboard control panels is required for substation operation. Both transmission and distribution substations may have control buildings.

The purpose of switchboard panels or frames is to provide a convenient and vertical surface for mounting and wiring control, as well as protective equipment for the various line exits, transformer circuits, and transfer circuits located within a particular substation, Figures 1-7 and 1-8.

Under no circumstances should you attempt to enter the substation before the utility company experts are on the scene. Because of the high voltage and possibility of explosion, the danger zone is extended much further: a minimum of 300 feet.

Figure D-4 Substation Control Room

Figure D-5 Substation Control Room

Make sure your vehicles are parked at a safe distance, and be careful to avoid putting them underneath a power line. When utility company personnel arrive, they will provide guidance in approaching all the structures and equipment safely. They may decide to let the equipment burn itself out, while directing firefighters to protect exposures.

The utility company may de-energize only the affected section within the substation, choosing to keep as many customers as possible in service. Therefore, they will work with you to set up a safe corridor of operations, which avoids areas that will remain energized. Following the advice of electric power experts produces the safest outcome.

The equipment, which has most likely been severely damaged by fire, will not be repaired, and the utility company doesn't want anyone being injured in trying to rescue it. Therefore, unless it poses a wider threat, it will be left to burn itself out. However, if the heat is intense enough, other structural systems may collapse, so these exposures need to be protected.

Upon entering an area involved in an event of this nature, the responder needs to be immediately aware of the condition and presence of overhead conductors. The overhead conductors should therefore be considered to be energized until proven otherwise by the owner or utility personnel. Isolation at the point of the emergency should not be considered as sole evidence of safety as the conductors may be fed in both directions and therefore may be energized at any time. The best advice is to ensure that they are isolated from both ends by competent and authorized personnel.

Most often the fire is coming from oil in the circuit breakers or transformers. Because large amounts of oil are housed inside, it is a major concern, which requires special guidelines.

With equipment de-energized, the oil fires can be extinguished by using protein foam sprays and water fog streams. Never use a solid stream of water on oil or any pools of oil, which could actually spread the fire.

The fire may continue burning inside the equipment. Reignition is not uncommon, and the oil may burn for an extended period of time. Continued on and off burning could go on for days. Be aware that the oil vapors are also capable of exploding, so full PPE and safe distances from equipment need to be maintained. The high concentration of carbon particles that give the smoke its characteristic color will also conduct electricity from high-level energized equipment to the ground. Further, any firefighting operations will add to the conductivity by providing a steam component in the plume. Even dry chemical particles have been known to become conductive in high humidity environments by absorbing moisture and therefore acting like "airborne mud." Typically, this effect is seen between high-energy points such as exposed conductors or bushings on transformers.

Metal ladders should not be used, only ladders made of nonconducting materials. A good guideline to follow when inside the substation is to have no equipment extend beyond shoulder height, because any overhead equipment may be energized.

Safety
Complete personal protective equipment for operating personnel should be mandatory including SCBA.

Caution
Another danger: because glass and ceramics are excellent insulators, this equipment, under intense heat, can explode when water is applied.

There are other hazards to be aware of, such as toxic gases that can arise from insulation or batteries, so it is best to limit the number of people involved to only the most essential and to confine the fire within the substation fence line.

Safety Pre-fire plans include plant layout: know where chemical and oil tanks are located, as well as hydrant and fire pump locations.

Transmission towers

Transmission towers are constructed in "right of way" corridors that isolate them from traffic, construction, and trees. However, a large fire and smoke condition can extend upward far enough to present a different and dangerous scenario. Smoke contains carbon and carbon is a conductor of electricity. At a distance of approximately 6 feet, with enough heat, the particles of smoke can trigger arcing, with an intense burst of electrical energy flashing to the ground. Therefore, when you recognize these conditions forming, put at least a hundred feet of distance between you and the fire.

Generating stations

Generating stations that burn fossil fuels to produce electricity rely on you to bring fire emergencies under control. If such a facility is in your coverage area, you need to be meeting with the utility company to discuss emergency preparedness to deal with possible dangers associated with the generation plant.

Inside these generating stations you could encounter hazards from water, steam, natural gas, and toxic substances. If a fire starts at a generating plant, you will be met by a utility company specialist. This person will work with you to make sure that all of the contingencies you have discussed for this situation are addressed so that the safest course of action can be followed in a dangerous situation.

Power plants

Power plants use some of the same equipment as found in a substation. The same guidelines apply in carrying tools and equipment: be sure to keep everything at shoulder height or below.

Electric Dos and Don'ts

DO

- Treat all utility lines as high voltage.
- Look for overhead lines when arriving at emergency scenes.
- Check for and avoid utility lines on the ground, in trees, or on vehicles.
- Notify the electric utility when there are downed lines or other electrical problems.
- Beware of step voltage and keep at least 30 feet away from downed lines.
- Have occupants remain in vehicles that are in contact with downed lines until the “all clear" is given by the electric utility.
- Instruct occupants of energized vehicles to jump clear and hop away from their vehicles.
- When utility electrical equipment is on fire, let it burn, protect the exposures, and contact the utility company.

DON'T

- Park emergency vehicles under or near overhead lines.
- Touch downed lines, even with gloves, sticks, or tools.
- Assume the electric utility has already been notified when you encounter downed lines.
- Allow aerial device equipment such as ladder trucks to approach closer than 10 feet to an overhead utility line.
- Pull electric meters or cut service lines.
- Apply water or foam to burning electrical equipment.
- Enter electric utility substations without the OK from the electric company.
- Enter underground vaults or manholes until the "all clear" is given by the electric utility.

DEFINITIONS

AC Voltage: Alternating Current changes at a rate of 60 times a second, major source is generators.

Circuit: A conductor or system of conductors through which an electric current is intended to flow.

Communication Lines: The conductors and their supporting structures for telephone, telegraph, railroad signal, data, clock, fire, police alarm, community television antenna and other systems that are used for public or private signal or communication service.

Conductor: A material, usually in the form of a wire or cable suitable for carrying an electrical current.

Current: The flow of electricity through a conductor.

DC Voltage: Direct current steady consistent voltage, major source is batteries.

Direct Contact: When any part of the body touches or contacts an energized conductor or an energized piece of electrical equipment.

Ground (noun): A conductive connection by which an electric circuit or equipment is connected to ground.

Ground (verb): The connecting of an electric circuit or equipment to ground.

High Voltage: Greater than 600 volts.

Indirect Contact: When any part of the body touches any object that is in contact with an energized electric conductor or an energized piece of electrical equipment (EXAMPLES: Tree limbs, tools, equipment, trucks, etc.)

Insulated: Separated from other conducting surfaces by a dielectric substance offering a high resistance to the passage of current.

Low Voltage: 600 volts or less

Manhole: A subsurface enclosure which personnel may enter and is used for the purpose of installing, operating and maintaining submersible equipment and or cables.

Step & Touch Potential: The area around an energized conductor that is in contact with the ground and how far the voltage field extends from the contact point.

Resistance: The opposition to the flow of electricity measure in ohms.

Voltage: The speed that electricity flows through power lines.

REVIEW QUESTIONS

1. What is the minimum electrical voltage that can kill a human being?
2. Electricity will always take the shortest path to ground; if you get between the electrical source and the ground you would become a conductor and be _____.
3. What is the classification for a fire in energized electrical equipment?
4. What is the OSHA Standard that ground ladders and aerial ladders should be kept from high-voltage lines or equipment.
5. What is the only way to make sure that a wire is de-energized?

CHAPTER II RECOGNIZING AND AVOIDING THE HAZARDS OF NATURAL GAS AND CARBON MONOXIDE

INTRODUCTION

First responder fatalities have involved natural gas and carbon monoxide. The purpose of this program is to:

- help you to understand the properties of natural gas and carbon monoxide,
- give you a basic knowledge of how the gas system works and what causes carbon monoxide,
- make you aware of the hazards of natural gas and carbon monoxide, and
- offer approaches for responding to natural gas and carbon monoxide emergencies.

This chapter will help you better understand and determine what precautions need to be taken when responding to natural gas and carbon monoxide incidents.

Natural gas cannot be seen and is odorless in its natural state. Natural gas and carbon monoxide can be dangerous and can injure and / or kill emergency workers. For specific facility and emergency response needs in your service area, meeting with your local gas company on a periodic basis is strongly recommended.

Firefighter Fact Natural gas has a flammable or explosive range from just below 5 percent in air to just below 15 percent in air. These percentages are known as the "LEL" (Lower Explosive Limit) and "UEL" (Upper Explosive Limit).

PROPERTIES AND CHARACTERISTICS OF NATURAL GAS

This section provides a general summary of the properties of natural gas. Key safety and tactical points are indicated.

Natural gas is a petroleum-based compound that was created just as the name implies, naturally. Like crude oil, natural gas formed underground from the breakdown and decay of organic matter (plant and animal material) over millions of years due to pressure and heat from the changes that have taken place during the evolution of our planet. Natural gas, a hydrocarbon, is primarily methane with small amounts of propane ethane, and butane. The small portion of ethane is considered the identifier for natural gas; it is not found in sewer gas or swamp gas. For this reason ethane detection equipment is utilized whenever an investigation needs to confirm the actual presence of natural gas. Natural gas is found underground, sometimes on top of reservoirs of oil or by itself in a pocket of gas. When natural gas burns, the products of combustion include carbon dioxide, water, and of course heat. When the combustion is incomplete, traces of CO (carbon monoxide) are produced. Carbon monoxide is an extremely dangerous gas and will be discussed at a later point.

See Table D-1 for selected flammable ranges and Figure D-6 for gas percentage vs. LEL percentage. In other words, if the concentration of the gas mixed with air reaches a level just below 5 percent, the gas can ignite. If the concentration increases to a point just above 15 percent gas in air, the gas will not ignite. While natural gas will ignite anywhere within this range, the ideal gas-

TABLE D-1		
Material	Lower Explosive Limit	Upper Explosive Limit
Acetylene	2.5	100
Carbon Monoxide	12.5	74
Ethyl Alcohol	3.3	19
Fuel Oil No. 1	0.7	5
Gasane	1.4	7.6
Hydrogen	4	75
Methane	5	15
Propane	2.1	9.5

Source: NFPA 325, Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, 1994 edition.

COMPARISON OF GAS DETECTION READINGS % GAS VS. % LEL

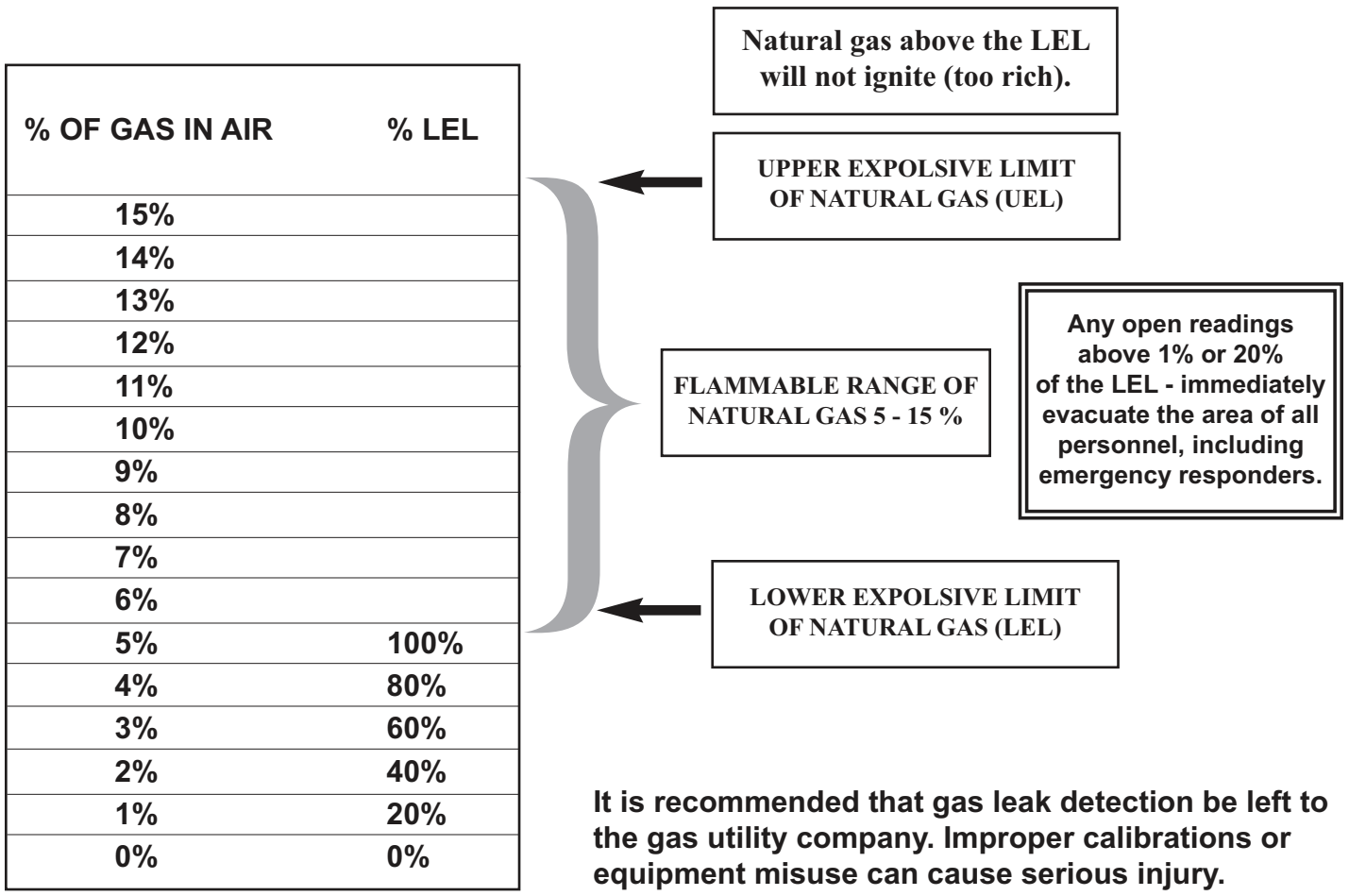


Figure D-6

air mixture for the burning of natural gas is approximately 10 percent. Keep in mind that if one encounters a natural gas concentration below the "LEL," whether outdoors or indoors, there may very well be a flammable concentration in an area nearby. Do not assume that an area is safe just because it appears safe where you are standing at any given moment.

Natural gas will ignite at a temperature of approximately 930 degrees Fahrenheit. Sources of ignition capable of generating 930 degrees are all around us. It is important that we look at some of the items and conditions that can cause an ignition, as we may never think of many of these potentially dangerous ignition sources. A lit cigarette is hot enough to ignite natural gas. Matches, lighters, and even the sparks generated by the starter or alternator of motor vehicles can ignite natural gas. It goes without saying that warning flares used for traffic control supply more than enough heat than is necessary to ignite natural gas. A vehicle driving through a natural gas concentration within the explosive range could in turn ignite the gas. Cell phones, pagers, and radios all have switches that, when activated, can generate sparks sufficient to ignite natural gas. In and around a structure the list of sources of ignition grows even longer. Doorbells, light switches, smoke alarms, telephones, pilots on appliances, and filaments in light bulbs (including flashlights) if the bulb or lens breaks can all generate an arc or heat source sufficient to ignite natural gas. Even static electricity arcs from your clothes, body, or other sources can create sparks of sufficient heat to ignite the gas.

Never take cell phones, pagers, radios, or two-way radios into the suspected leak area. Never ring a doorbell to contact occupants of a structure; knock on the door. Do not operate any appliances or turn anything off or on (including lightswitches) in a suspected gaseous atmosphere. The arc created when unplugging an appliance from a wall outlet is sufficient to ignite natural gas. First responders have a difficult and often hazardous job. Remember, controlling sources of ignition in a possibly explosive area can keep a dangerous situation from becoming a deadly one.

After processing, natural gas is odorless, colorless, and tasteless. However, if you walk into a room or area where there is a gas leak, you will usually smell the telltale "rotten egg" odor since natural gas has odor added to it. The first code in the United States for the odorization of natural gas was brought about by a 1937 incident in Texas. An undetected natural gas leak led to an explosion in a school causing tremendous loss of life. Today, all natural gas, as well as propane, is odorized using chemicals such as mercaptans or sulphides. These odorants are absorbed by the gas, have no effect on its properties for burning, and are harmlessly burned up with the gas. Odor is one of our warning signs for a gas leak. However, keep in mind that there are conditions that can counter the effectiveness of this warning sign. Certain conditions in the gas piping can actually remove the odor from the gas. In some cases, the chemicals and solvents used in the manufacture of plastic pipe, natural odors in farm or rural areas, and some manufacturing odors can mask the odor of natural gas.

Caution Whenever possible one should approach a suspected natural gas leak from an upwind direction. All vehicles should be kept a safe distance from the suspected leak area.

In some cases your own olfactory abilities may be compromised by allergies, illness, or interference from other odors. It is usually necessary to use some type of gas detection equipment for the confirmation of natural gas in an area. It is recommended that the gas company evaluate the gas leak. Gas detection equipment requires training, calibration, and compliance with the manufacturer's procedures for use.

This and other issues regarding propane will be discussed later. Whether from an underground leak trying to make its way to the surface or a leak in a structure, natural gas will always try to travel up. Underground, the gas may be diverted by obstacles such as rocks, frost, paving, or other objects that can stop its upward travel. The more dense the soil and the more the gas is diverted, the larger the spread or migration of the gas.

These paths can often create highways into structures. Leaking natural gas inside a structure will again try to find a way to go up. For example, gas leaking from an appliance in a basement will work its way up stairways, holes through floors for electrical cables and water and sewer pipe, and even up the interiors of walls. Once on the next floor, the process continues to the next floor or attic, and the process continues.

Caution Never rely solely on your sense of smell to determine the hazard or lack of hazard in a gas leak area.

Firefighter Fact Keep in mind that natural gas is lighter than air. The specific gravity of natural gas is approximately (.6) while the specific gravity of air is (1.0). Propane with a specific gravity of (1.5), however, is heavier than air.

Firefighter Fact Natural gas can be diverted to the point that an underground leak can migrate into a structure from great distances. Natural gas can very easily follow sewer lines, underground electrical and phone conduits, and even the more loosely packed soil around underground pipes and cables.

Firefighter Fact Natural gas is not toxic. It can, however, displace oxygen; in high concentrations, it can displace enough oxygen to cause asphyxiation. Be especially aware in confined spaces and structures that, while natural gas will not poison you, it can still kill you by removing your life-supporting oxygen.

When checking for natural gas indoors, always check near ceilings and in openings through floors, under cabinets, and so on. Remember, always maintain control of potential ignition sources. Never use an elevator in a high-rise type structure where a natural gas leak is suspected. The gas most likely will collect in the top of the elevator shaft and ignite as soon as you press a button to call the elevator, as the motor and controls are usually in the top of elevators, and cars.

It is well-known that the more you know about a subject, the better you are able to handle and work with that subject matter. The preceding information is intended as a tool to assist you in dealing with emergency situations involving natural gas.

THE NATURAL GAS DELIVERY SYSTEM

This section provides an overview of the natural gas delivery system. Key safety and tactical points are identified. For specific facility and special emergency response needs in your service area, meeting with your local gas company on a annual basis is strongly recommended.

The gas delivery system is depicted in Figure 11-2. Natural gas is transported from the wellhead via a pipeline to a processing plant where it is cleaned by having water and other contaminants removed. From that point it begins its journey across the country in a complex system of high pressure, transcontinental pipelines. This steel pipeline can be as large as 4

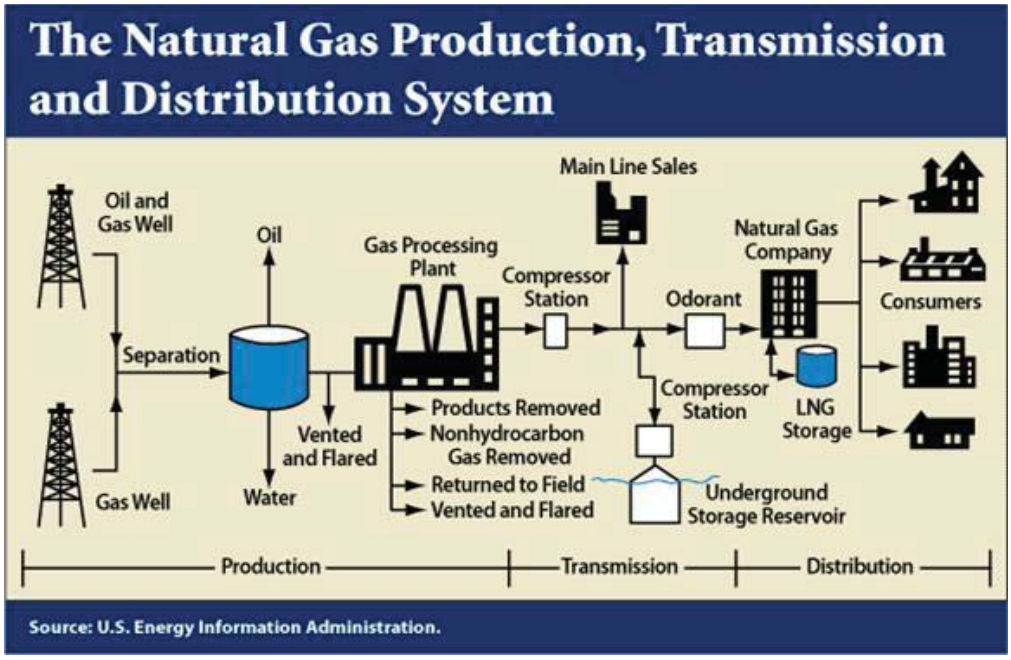


Figure D-7

in diameter and carry product at pressures as high as 1200 psi. Along the way the friction in the pipe causes the natural gas to slow down. To counter this, every 50 to 60 miles, the natural gas goes through a "compressor station" where the pressure is boosted and the gas is moved quickly along its way. These transmission lines follow "right-of-ways" or property that is dedicated to the use of the pipeline. These -right-of-ways" are identified with markers to verify their location. While the style of the markers may vary, the information they impart is similar: "Warning: Underground Gas Pipeline." In most cases there will be "Emergency Contact" phone numbers included on pipeline markers, Figures D-8.

Figure D-8 Underground Gas Pipeline Warning

Following this stage of its journey the natural gas arrives at a location known as a gate station or border station. Two important things happen to the natural gas at these stations. The odorant is added and the pressure is reduced for delivery to the utility company's local distribution lines. All natural gas is odorized by the cross-country transmission companies before it enters New Jersey. The distribution lines, called mains, can range in size from 2 to 20 inches and sometimes larger. These means carry the gas to business, residential, and industrial customers. In the early years of natural gas distribution, mains were actually made of wood (hollowed out tree trunks) and handled very low pressures. Over the years, this material was gradually replaced by cast iron, and then steel and plastic. Today the primary material for natural gas piping is wrapped or coated steel and plastic. Pressures in these mains can vary greatly depending on the application and demand in a given area. A utility company's "transmission mains" can be pressurized in excess of 1,000 psi while at the other end of the scale, "low pressure" (usually older cast iron) mains can be regulated at pressures as low as 1/4 psi. The vast majority of these "mains" are located underground. The exception to underground mains is the occasional bridge crossing. It is sometimes much more economical and practical to suspend a natural gas main from a bridge than to utilize directional drilling to cross under a waterway.

The pressures in these different "mains" or "distribution lines" are set and controlled by "regulator stations." The regulator station is a collection of valves and regulators that maintain correct pressures for a given section of distribution and also include safety devices to prevent over pressurization. These safety devices are known as "relief valves." Relief valves are mechanical devices that stay closed up to a preset pressure. If the preset pressure is exceeded, the "relief valve" begins to open and vent off the over pressurized natural gas. Once the pressure returns to the normal preset pressure the valve will close automatically, Figure D-9.

You may create an even larger problem on another part of the distribution system if you interfere with the operation of a relief valve. If a "relief valve" is venting or blowing, notify the utility company immediately.

The "regulator station" may be located above ground or below ground, in a pit or vault. These pits and vaults, commonly known as "confined spaces," present a whole new set of safety concerns and problems. Before entering a confined space one must perform many safety checks and procedures. It is strongly advised that when responding to a situation at a pit or vault that you only take actions to keep the area around the pit or vault as safe as possible, under your control with restricted access.

Safety
If a “relief valve” is venting or blowing, it is doing its job properly. Do not try to shut it off.

Figure D-9 Safety Valve

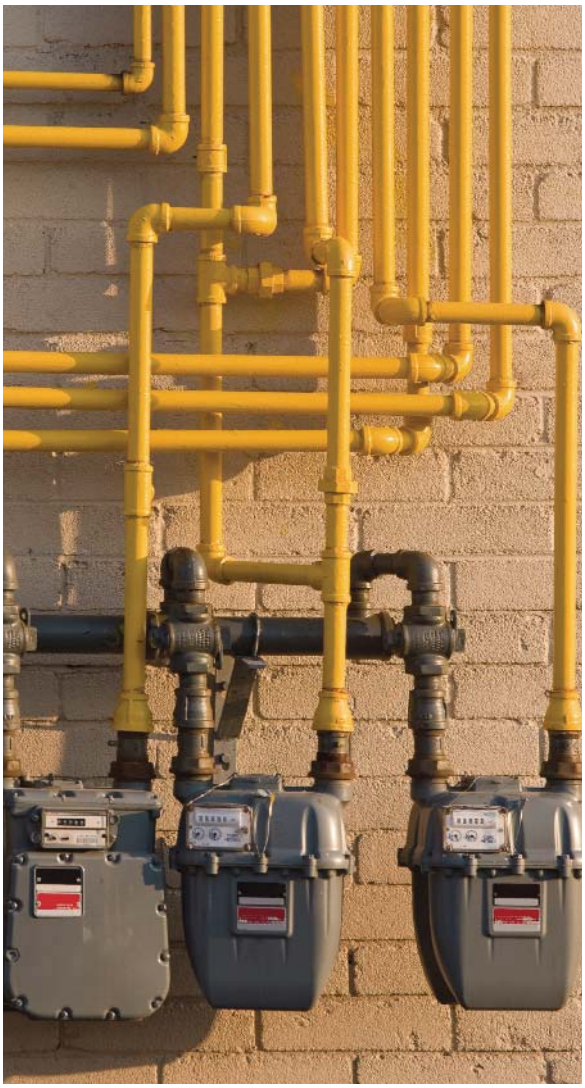
Safety
Notify the utility provider and wait for their response. Do not enter these areas; if a fire is active in the vault or pit, do not fill it with water to try to extinguish the flames..

Safety
By extinguishing a natural gas fire you may only be trading a known, visible hazard for an invisible cloud of natural gas that can create a potentially explosive situation in another area. Protect the exposures and let the gas burn. The best way to extinguish a natural gas fire is to shut off the source of natural gas.

Keep in mind, if a natural gas fire is not affecting life or property, it may be better to let it burn until the utility company can bring the situation under control.

The flow of natural gas throughout the utility company's "distribution mains" is controlled by valves and regulators. The final control before the customer's equipment is the customer regulator and shutoff valve. The customer regulator lowers the pressure to a level that is appropriate for the equipment used by the customer. Whether indoors or outdoors the shutoff valve is usually located just before the regulator or just before the gas meter. These valves are the only valves that you should operate. They are the primary valve for stopping gas flow to a structure. In most cases, the gas shutoff valve is a 1/4-turn valve. In other words, one quarter rotation is all that is necessary to close or open this type of valve. When the wing on the valve is aligned with or parallel to the gas pipe, the valve is open. When the valve wing is positioned across or perpendicular to the gas pipe, the valve is closed. The simplest tool for operating these valves is either an adjustable wrench or properly sized end wrench.

In some cases where the fire is confined to an individual appliance, it may be just as practical to only turn off that appliance's shutoff valve rather than shutting down an entire structure. Figure D-10 is an example of an outside utilization pressure gas service meters and valves.



FigureD-10 Outside Gas Meters

Safety
If it is necessary to shut off meter valves for stopping gas flow to a fire, be sure to lock and tag the valve such that it can NOT be turned back on. Only the utility company should turn on a gas service valve after it has determined the safety of such an action.

service on the right hand side. As can be seen, the regulator and vent indicate a pressure gas service.

In some cases one may find a gate style valve in these locations. Gate valves require several full rotations to either open or close. It should be noted that while the function of these valves is the same as 1/4-turn valves, be sure you know the difference. If you only turn a gate valve 1/4 turn, the gas will continue to pass through the valve. Generally, gate valves are used on larger commercial and industrial gas services. A change in the meter index may provide a means of determining if a gate valve has been closed. If there is no gas flow and no change can be determined by the meter index, you will not be able to determine the position of the gate valve. Gate valves are generally used for commercial and industrial customers and for larger-sized gas services.

While there are many valves used to control a natural gas distribution system the first responder should never attempt to turn, close, or open any underground valve. Whether service valves, street valves, main valves, or regulator station valves, you should never turn or attempt to close or adjust any valve other than a shutoff valve on an outdoor or indoor meter.

Caution
Without the knowledge of the function of a particular valve, operating any underground valve can create potentially severe hazards and potentially dangerous consequences in another section of the distribution system. Never turn (operate) underground natural gas valves.

FigureD-11

NATURAL GAS UTILITY OVERSIGHT

This section provides a reference of the regulations applicable to the natural gas distribution and transmission system in New Jersey.

The United States Department of Transportation and the New Jersey Board of Public Utilities regulate the natural gas industry and the gas delivery system. Title 14 of the New Jersey Administrative Code and Section 49 of the Code of Federal Regulations Part 192 are the applicable codes. Gas utilities are required to report certain gas incidents to the New Jersey Board of Public Utilities and/or the National Response Center. The National Transportation Safety Board and the New Jersey Board of Public Utilities investigates the most serious transportation incidents including natural gas and liquid pipeline incidents.

KEEPING THE GAS SYSTEM SAFE-DAMAGE PREVENTION AND RESPONSE

This section provides information on preventing damage to gas facilities.

Understand that one of the primary causes of gas incidents is excavating equipment damaging underground gas facilities. Preventing damage to utility facilities can prevent an emergency response. There are on average around 3,000 cases of gas facilities being damaged each year in New Jersey. Many states have enacted laws to protect underground facilities. In New Jersey the law is entitled the Underground Facility Protection Act. Excavators are required to notify the New Jersey One-Call Center at 1.800.272.1000 prior to excavating and obtain a mark-out request at no cost. The One-Call Center is toll-free and available 24-7. After a mark-out request has been obtained, underground facility owners and utilities are required to mark their facilities according to the law and in colors that identify the facility type. The color coded system that identifies the different types of buried utilities can aid you when you respond to a hazard call at or near a construction site. It is important for you to know what systems could be affected. For more detailed information or training call the New Jersey Board of Public Utilities at 973.648.2066.

Figure D-12 Utility marking color code.

Figure D-12 depicts the color code for facility markings. A yellow flag or paint tells you that there is a gas, oil, or steam line underground. Red flags or paint identify electric lines. Buried cable television, telephone, and fiber optic cables are marked by an orange flag or paint. When you see a blue flag or paint, there is a water main or service underneath. Green markings indicate a sewer line.

Prevention

The best approach to avoid a damaged facility incident is damage prevention. Calling New Jersey's One-Call Center at 1.800.272.1000 prior to excavating and/or ensuring excavators have markings are actions that can avoid an incident.

If you encounter an excavator who you believe does not have a mark-out request, notify the New Jersey Board of Public Utilities at 973.648.2066. Besides endangering the public, a willful violation of the Underground Facility Protection Act carries civil fines from $1,000 to $500,000 and criminal penalties. In addition, excavators can be liable for the incident damage and associated costs. Local utilities can also assist in determining if a mark-out has been requested.

CASE STUDY II-1 NTSB/PAB-04/01

Excavation Damage to *Natural Gas Distribution Line Resulting in* Explosion *and* Fire, Wilmington, *Delaware, July 2, 2003,*

Remember: A gas leak can occur away from the construction activity.

Or July 2, 2003, a contractor hired by the city of Wilmington, Delaware, to replace sidewalk and curbing dug into an unmarked natural gas service line with a backhoe. The gas leak was not observed at the damage contact. Although the service line did not leak where it was struck, the contact resulted in a break in the line inside the basement of a building across the street, where gas began to accumulate. A manager for the contractor said that HL: did not smell gas and therefore did riot believe -.here was imminent danger and delayed calling the gas company. A subsequent explosion destroyed two residences and damaged two others to the extent that they had to be demolished. Other nearby residences sustained some damage, and the residents on -.he block were displaced from their homes for about a week. Three contractor employees sustained serious injuries. Eleven additional people sustained minor injuries.

Anytime you respond to a call where a gas odor is reported, and there is construction in the area, check the markers along the ground, because they might indicate that the source of the leak is construction related. Remember that the damage may have caused multiple leaks or damage to the gas facilities at the construction site and/or away from the construction site in locations like across the street or inside buildings. Besides the normal emergency response precautions and evacuation criteria, check nearby buildings and buildings across the street or surrounding the construction area. If you detect any odor of gas, evacuate as a precaution. Work with the local gas company to determine the full extent of the gas leak and safe area. The two case studies that follow provide examples of why a complete evaluation of the emergency situation is required to safeguard your life and public safety.

Damage to underground facilities is a top priority of the United States Department of Transportation's Office of Pipeline Safety due to a high number of significant incidents that have occurred. Annually, New Jersey experiences up to 5,000 incidents where underground facilities are damaged. Sixty percent involve natural gas facilities. Many involve multiple facilities being damaged, including water and gas. Damage to water facilities can affect fire hydrants in the area.

The two case studies investigated by the National Transportation Safety Board are typical incidents that have occurred in many states. Similar incidents have occurred in New Jersey. New Jersey, besides being the most densely populated state, also has the highest underground facility density of any other state.

DETECTION METHODS FOR NATURAL GAS

This section provides approaches for detecting natural gas. As a general rule when a gas odor is detected in a building, evacuate the building and work with the gas company to evaluate the gas leak.

When checking for gas leaks, an invaluable apparatus is the Combustible Gas Indicator, mostly referred to as a "CGI." Many fire departments, and an increasing number of police and EMT units, have this equipment, which is used to capture samples of the air and display any concentrations of natural gas. The first step is taking a clean air sample to have a reference point for the CGI. This is called "zeroing out," and is done before samples are taken in the area of the suspected gas leak. While the CGI and other sampling equipment are critical for evaluating a gas leak, equally important is the proper use and calibration of such equipment.

Caution Improper use or the use of an out of calibration device can place you in serious risk or jeopardize your life.

CASE STUDY II-2 NTSB/PAB-00/01

Natural Gas Service *Line and Rupture and Subsequent Explosion and Fire, Bridgeport, Alabama, January 22,* 1999

Remember: Damage to the gas service can cause multiple gas leaks.

On January 22, 1999, while digging a trench behind a building at 406 Alabama Avenue, a backhoe operator damaged a 3/4-inch steel natural gas service line and a 1-inch water service line. This resulted in two leaks in the natural gas service line, which was operated at 35 psig. One leak occurred where the backhoe bucket had contacted and pulled the natural gas service line. The other was a physical separation of the gas service line at an underground joint near the meter, which was close to the building. Gas migrated into the building, where it ignited. An explosion followed, destroying three buildings. Other buildings within a two-block area of the explosion sustained significant damage. Three fatalities, five serious injuries, and one minor injury resulted from this accident.

Most gas companies and providers have established evacuation protocols for gas leak investigation personnel. Generally any open-air CGI reading of 1 percent or 20 percent of the Lower Explosive Limit (LEL) in a structure means that all persons must be evacuated including those evaluating the gas leak. In addition, a gas mixture may be too rich to ignite (greater than the Upper Explosive Limit—UEL) in places and will be moving through the explosive range as the areas are vented.

Sampling needs to be done throughout the house, but before doing this, responders should be in full "PPE" personal protective equipment. You need to protect yourself against any possibility of an accidental ignition. When the utility company personnel arrive, additional sampling with a CGI may also take place, including outside areas. They have additional tools to take underground samples where gas may be migrating. However, if the smell of natural gas is strong throughout the outside area, checking for levels inside neighborhood houses would be a sound precaution. It is vitally important to know that this equipment is sophisticated and sensitive. In order to be confident that what you're reading is accurate, periodic calibration testing ensures reliability and, with many companies producing CGI equipment, each sets its own maintenance guidelines and training. Different brands may require different procedures for taking gas samples. It is recommended that you rely on the local gas company for gas leak evaluation.

WHEN GAS ESCAPES THE SYSTEM

This section provides approaches for responding to natural gas emergencies.

Despite every effort to monitor and maintain the integrity of the natural gas system, its size and complexity, combined with the forces of nature, prevent it from being totally immune to uncontrolled gas leaks. Understand that whenever a natural gas emergency presents itself, it will be classified in one of four ways:

Gas escaping outside
Gas escaping inside
Gas burning outside
Gas burning inside

The majority of calls involving natural gas don't involve fires; typically, when someone such as a homeowner smells gas, that person will dial "911" to report the problem. The first responder might be the closest person to the scene. What's important is that all responders coordinate their activities and take every precaution to protect lives . . . including

your own. If some of the guidelines and ignition sources seem overly cautious, they're not. Expect the unexpected. Investigating gas leaks presents a number of hidden dangers.

Initial Response

Before you arrive on the scene and prior to starting a gas leak investigation there are actions to take:

- Contact the local gas company or gas provider and request assistance
- Position emergency vehicles to avoid potential gas leak sources such as:
  - Catch basins
  - Manholes
  - Storm drains
  - Areas too close to houses
- Position emergency vehicles away from any building with leaking gas in case the building were to explode and park the vehicles upwind of the gas leak (any breeze should be at your back, and blowing any gas away from your vehicle.)
- Eliminate sources of ignition before investigating a gas leak:
  - Shut off vehicles
  - No smoking
  - No flares
  - No portable radios
  - No cell phones, pagers, or other electronic equipment
  - No doorbells—knock instead
  - No operating light switches (leave as it was found)
  - No telephone calls to the residence
  - No static charge
- Turn on emergency equipment prior to investigating a gas leak
  - Combustible Gas Indicator or detection equipment
  - Flashlight

Secure the Site

Establish a site perimeter and reroute vehicle traffic as necessary. Eliminate sources of ignition. When the presence of gas is strong, the best rule is to evacuate people from the dwelling and move them across the street or a distance far away that would prevent injuries if the structure were to explode. Also be aware that shuffling your feet on many types of surfaces can cause a static electricity discharge. Remember you are evacuating and securing the area in case of an explosion. Check surrounding houses for gas odors. Keeping in mind the capability of natural gas to migrate, evacuate other residents who live in any adjoining properties at least one house away. If the presence of gas is detected in any of these structures continue checking until you get two "clean" houses or buildings from the last known detection, or when the end of a row of houses or buildings is reached. If you have either called for backup, or have been called, ensure all responders follow all the "make-safe" procedures just described.

Safety Any time you respond to a possible gas emergency, first responders shall verify the response of gas company personnel through your local fire dispatch center.

As other responders and agencies arrive, it is important that everyone's activities are coordinated and contribute to preserving life. If assisting in evacuation or traffic control, remember not to ring doorbells or use radio communications, unless from a safe distance.

Many times utility companies have "hotlines" dedicated solely for emergency situations, and their role is to assist you in any way to make the situation safe. Whoever is responding, whether first or last those individuals have a duty to protect life and property.

Periodic meetings with your local gas providers to discuss emergency response, local gas facilities with special needs or response criteria, your expectations, and teamwork are the best methods to follow prior to an incident occurring. In addition, these meetings will aid in developing the most effective resolution when an incident occurs.

Leaking Gas

There are many different types of gas leaks. The most dangerous is a blow to the pipe, causing a puncture and rapid venting. Environmental conditions like freezing and thawing cause cracks in cast iron pipes, also resulting in the rapid escape of gas. However, the most prevalent kind are slow leaks brought on by corrosion, producing slow seepages, which are obviously much harder to detect. Underground leaks usually mean migrating gas. The odorant added to the gas can become less effective, making the gas difficult to detect due to the odorant being scrubbed in the soil. The gas travels laterally, through the ground, following the path of least resistance, because it wants to vent. It can enter into any number of

spaces and accumulate. These spaces include, sewer lines, storm drains, underground utility lines, construction trenches, or a building. It also seeps naturally through the ground over time, and once it permeates the surface, it will rise into the environment. Not until then will the telltale odor be detected. Of course, there are factors that can make detection difficult. Natural causes are wind, which can carry away the odor; rain, snow, or frost, which may keep it from coming up through the surface or man-made barriers like concrete and asphalt. Conversely, cracks in the streets are places where migrating gas can be detected as it rises into the air. Inside, the "lighter than air" property of gas causes it to rise and collect near ceilings. The risk is even greater in cold weather, since ventilation is restricted to prevent heat loss.

Secure the area and protect the surrounding structures. Leave all repairs to the gas company/provider.

When Gas Is Escaping Outside a Building

- If gas is escaping from the ground, excavation, or an open pipe outside a building, notify the gas utility immediately.
- Areas surrounding the location should be cleared, roped off, or barricaded to make the location safe.
- Extinguish all open flames. Prohibit smoking. Restrict the use of electronic devices (i.e., pagers, cellular telephones, cameras, and portable radios). If working in the vicinity of the gas leak check surrounding buildings, basements in particular, for any presence of gas odor. Restrict or reroute all traffic until personnel from the gas company are able to control the gas flow.
- If a fire or gas leak situation requires the gas to be shut off immediately and the Fire Department cannot wait any longer for gas company personnel to respond, shut the service valve supplying the hazard area.
- Emergency responders should never operate underground valves. Only gas company personnel should operate underground valves.
- For services feeding multiple dwellings, it is preferred that aboveground service valves are not operated without utility assistance.

Damage to Gas Facilities

- Remember that when responding to any damage to gas facilities, emergency personnel should make every effort to keep the area safe while waiting for gas company assistance. This includes checking the extent of the gas leak in the immediate area and monitoring buildings on both sides of the street, since multiple leaks could become active at the same time.
- Under no circumstances should the Fire Department attempt to make a repair of any damage to gas facilities. Only gas company personnel have the proper personal protective equipment and knowledge to safely control the gas flow.

When Gas Is Burning Out of Doors

- Personnel, other than those from the gas company, should make no attempt to extinguish a gas fire unless a life is in jeopardy.
- When gas is believed to be involved in a fire, don't assume the fire is consuming all of the gas. Always check nearby buildings and sewers to make sure gas is not migrating. Clear the danger area and rope or barricade it. Notify the gas company immediately. Never operate an underground gas valve. Operating the wrong valve could further endanger life or property. Leave the decision to operate valves to gas company personnel. They are properly trained in operating gas valves and handling gas emergency procedures. Remember that gas may also be leaking elsewhere, so check the surrounding structures.
- Spray any surrounding combustibles if there is a danger of ignition. If it is necessary to extinguish a fire because a life is in jeopardy, use dry chemical and water fogging equipment. Do not direct a solid water

stream onto burning gas at the source of ignition. Remember—burning gas will not explode.

- Shut off the gas source.

When Escaping Gas Is Found in Buildings

When escaping gas is found in buildings, shut off the meters and notify the gas company immediately. Ventilate the building by opening the doors and windows if the gas level is below the LEL. Remember that if the gas level is above the explosive limit, venting the building could result in an explosion. Evacuate and wait for the gas company in the safe zone. Do not turn electrical switches or appliances on or off. Rubber boots should be used when entering a building where a gas leak is suspected, as shoes with nails could create a spark. Walking across a carpet could result in the development of a static electric charge or spark. Turn on flashlights before entering the building. Clear the buildings of occupants if a strong odor is found.

When Escaping Gas Is Burning in Buildings

When escaping gas is burning in buildings, notify the gas company immediately. The official in charge should determine if the gas can be shut off at the service entrance inside the building, at the regulator (in pressure system), or at the meter, depending on the type if installation.

- If there is an above-ground service valve at one or more of these locations, the valve can be shut off with a wrench.

- Reliance on the gas company to help evaluate the proper action is the best procedure. If the supply cannot safely be shut off, keep the surrounding combustibles wet by spraying them until the gas company emergency crews can control the flowing gas.

- It is possible that turning off the gas in certain industrial or commercial areas might create further hazards or seriously interrupt important and costly industrial processes.

- Never turn on a valve that was previously shut off. *Leave this to the gas company*.

- If it appears that the inside gas piping or meter may be endangered from the fire, notify the gas company immediately. The gas company is best equipped to shut off the supply of gas. However, if safety requires immediate action, the official in charge may proceed with shutting off the gas supply at an inside shutoff valve, if it can be done without exposing the person to undue hazard.

- In rare cases, gas may be burning out of control at an appliance. In such cases, shut off the valve on the line to the appliance if it is accessible, or shut off at the gas meter. In an apartment house where there may be difficulty in selecting the proper meter there is usually a valve where the gas service enters the building (service entrance) that can be shut off. Again, notify the gas company immediately and explain to the service person upon arrival what you have done. Do not turn on the valve at the service entrance, the meter, or appliance once it has been shut off; leave this to the gas company.

General Condiseration for Electric Power Disconnection (limit potential ignition source.)

- Do not disconnect the electric. Have the electric utility disconnect the electricity when needed.

- Building emergency back-up generators may operate if electric is disconnected.

- If a larger area of electric is to be disconnected, work with the electric utility to minimize the impact on critical customers, customers on life support, and water pumping stations.

.

DEALING WITH NATURAL GAS FIRES

This section provides approaches for responding to natural gas fires.

- Classes of fires

Burning natural gas is a Class B fire. However, it can cause other materials to burn around it such as wood, paper, and vegetation, which are all Class A fires; or energized electrical wires, creating a Class C fire. So, you may be facing a multiple class fire. For machinery or fires involving electrical components, the safest way to extinguish the fire is to de-energize the circuit, and eliminate the gas supply.

- Ways burning gas can be extinguished

Water is not an effective method for extinguishing a natural gas fire. Dry chemical extinguishers should be used with proper technique. Shutting off the gas supply and allowing residual gas in the pipe to burn out is often the best approach. Shut off the meter supply valve or service valve when accessible.

- Dangers of interactions with electrical systems

A gas-fed fire may cause the insulation on overhead wires to burn. This damage may cause the live wires to fall in some cases. Don't approach fallen electrical lines until the power company disconnects them. Gas piping may also share a commmon underground trench with electrical facilities. In some cases both may be damaged by the blaze.

COMPRESSED NATURAL GAS VEHICLE EMERGENCY RESPONSE

This section provides information for approaching natural gas vehicle emergencies.

- How to recognize a compressed natural gas vehicle

Vehicles that use natural gas as a supplementary fuel to gasoline will have a blue symbol attached to the rear of the vehicle. The gas is stored in a cylinder, usually in the trunk of a sedan or rear of a van. Figure 11-14 provides an example of the decal.

- Gas dissipates quickly

If the natural gas delivery system is damaged in a collision, leaking natural gas should dissipate quickly. Natural gas is lighter than air and will tend to rise up away from ground level. Note: Propane gas is heavier than air and may accumulate over the ground surface. Know which gas you are dealing with; the sticker on the vehicle's rear will indicate this. Figure I1-15 shows the shutoff valves by the natural gas fuel cylinders.

- How to find and operate a manual shutoff valve

Look for the shutoff valve below the driver's side door; if it is not there, check the passenger side. Use this valve to shut off the gas supply in the engine compartment. The shutoff valve under the driver's or passenger's door is depicted in Figure 11-16.

FigureD-13 a-f

DO

- Notify the gas company immediately—utilize the gas company expertise
- Treat all gas leaks as hazardous until determined otherwise by the gas company
- Only shutoff aboveground meter valves
- Evacuate structures
- Secure affected areas
- Use only properly calibrated detection equipment
- Use only intrinsically safe communications and other electrically operated equipment
- Turn off radios, two-way radios, pagers, and cell phones prior to entering structures

DO NOT

- Park over manhole covers or storm drains
- Park in front or downwind of emergency locations
- Operate any in-ground valves
- Operate doorbells, light switches, or other electrical devices
- Turn off venting relief valves
- Extinguish gas fires until fuel sources have been secured
- Turn on gas valves
- Shut off gas service to industrial facilities without knowing what effect it can have regarding additional damage

REMEMBER

Natural gas has a flammable or explosive range from just below 5 percent in air to just below 15 percent in air; these percentages are known as the "LEL" (Lower Explosive Limit) and "UEL" (Upper Explosive Limit)

CARBON MONOXIDE - CAUSE, EFFECT, AND RESPONSE

This section provides information and approaches for carbon monoxide emergency response. Carbon monoxide (CO) is a colorless, odorless, and tasteless gas that is potentially deadly. CO is also slightly lighter than air (specific gravity is 0.97) and is flammable at the limits of 12.5 to 74 percent gas-to-air mixture with an ignition temperature of 1128 degrees Fahrenheit. One of the primary causes of (CO) gas is the incomplete or improper burning some of carbon-based fuels/fossil fuels. Sonic types of carbon-based fuels include wood, tobacco, coal, kerosene, gasoline, and natural gas. The threat of CO poisoning is most insidious when the gas collects unnoticed from the normally safe sources that have gone bad. Appliances should be inspected and serviced regularly if a problem is suspected. CO detectors are now mandatory in New Jersey, and must be installed prior to real estate sales. They are highly recommended to provide additional safety for occupants within all types of structures. CO detectors must be installed per the manufacture's instructions to avoid false alarms. Some improper locations are often too close to an appliance and a correct location in many cases is in the hallway near the bedrooms.

In excess of 8,000 annual CO calls are received by New Jersey utilities. It is important to understand the dangers and causes of CO.

Cause

Although all gas equipment has been tested under rigid ANSI Standards for safety and proper combustion, it is imperative to keep in mind that the years of operation takes its toll and tends to cause breakdown and malfunction. Other causes of malfunction result from renovations of structures or blockage in flues by outside forces. Besides gas appliances other sources of CO may be kerosene heaters, internal combustion engines, fireplaces, and even smoking. Many times CO is associated with a sharp pungent odor. This odor, however, is the result of aldehydes and alcohols that are also produced as a result of incomplete combustion. In addition, condensation found on the inside windows of a home could result from the humid condition, which arises from incomplete combustion. The risk of CO is greatest in cold weather, when homes are closed up, preventing hazardous gases from being ventilated, especially in newer, more-insulated homes. According to the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) (Ventilation Standard 62-89), a concentration of no more than 9 parts per million (PPM) (0.0009%) of CO is permissible in residential living spaces. CO is measured in parts per million with respect to the atmosphere.

Effect

Carbon Monoxide (CO) Exposure Symptoms

- Headaches
- Shortness of breath
- Queasiness
- Flu-like achiness without fever
- Drowsiness
- Flushed face
- Chronic fatigue
- Confusion
- Dizziness
- Nausea
- Unconsciousness
- Burning eyes

Warning Signs That CO May Be Present

- Presence of aldehydes and alcohols, which produce an acrid odor similar to vehicle exhaust.
- Condensation on walls and windows.
- Dead houseplants
- Lethargic pets.
- Less/hot water produced by fuel-burning appliances.

  The best way for an emergency responder to detect CO in the atmosphere is through the use of an approved portable CO detection instrument, calibrated according to manufacturer instructions. This instrument is effective for monitoring for personal safety, measuring atmospheric CO concentrations for further actions, and locating and mitigating major sources of CO.

Table D-2 shows typical symptoms based on concentration and time of exposure.

- Each year some 200 people die from accidental poisoning from CO and another 5,000 are treated for it in hospital emergency rooms. The real toll is surely higher, since many of the symptoms of CO exposure are mistaken for the flu or another illness. CO readily inhibits the blood's capacity to carry oxygen simply because the body welcomes the flow of CO into the bloodstream easier than oxygen. It

TABLE **D-2**

Carbon Monoxide (CO) Exposure Limits and Symptoms

CONCENTRATION IN PARTS PER MILLIONS (PPM)	SYMPTOMS
50	No adverse effects with 8 hours of exposure.
200	Mild headache after 2 to 3 hours of exposure.
400	Headache, nausea, and dizziness after 1 to 2 hours of exposure.
800	Headache, nausea, and dizziness after 45 minutes; collapse and unconsciousness after 2 hours of exposure.
1,000	Loss of consciousness after 1 hour of exposure.
1,600	Headache, nausea, and dizziness after 30 minutes of exposure.
3,200	Headache, nausea, and dizziness after 5 to 10 minutes of exposure; collapse and unconsciousness after 30 minutes of exposure.
6.400	Headache, nausea, and dizziness after 1 to 2 minutes of exposure; unconsciousness and danger of death after 10 to 15 minutes of exposure.
12,800	Immediate physiological effects, unconsciousness, and danger of death after 1 to 3 minutes of exposure.

combines with hemoglobin,the oxygen-carrying pigment in the red blood cells, to form carboxyhemoglobin (COHb). CO could kill in minutes or hours depending on the level of CO and the time of exposure. The victim inhaling the toxic concentration of the gas becomes helpless before realizing that danger exists.

After being exposed to 50 PPM, most people start feeling the effects, although even lower levels can harm people with a heart condition. Also, small children, pregnant women, and elderly people are affected more rapidly. Some of the symptoms are headaches, queasiness, flu-like achiness without fever, drowsiness, flushed face, chronic fatigue, confusion, and dizziness. Very often pets evidence these symptoms more quickly than humans, especially birds. Since death could occur within 1 to 3 minutes in a concentration of 12,800 PPM it is extremely important to monitor the air space with a calibrated CO-detection instrument before entering a suspected CO residence.

Emergency Response

When responding to a CO call, the main thought is safety. You must maintain your safety if you're going to save lives. If any CO reading are found at any entrance or window of the property with the CO detector, a breathing apparatus (SCBA) needs to be put on before entering the premise. If you don't have CO-detection equipment that has been calibrated to the manufacturer's specifications, but suspect CO poisoning, check for condensation on the windows. Again, don't enter without breathing apparatus.

Safety If you can't make a determination and suspect CO, evacuate immediately.

Remember, when in doubt, get them out. When you have the proper equipment, the premises are aired out completely, or you have the utility company to assist, search for anyone who may be sick or

overcome by CO. CO is lighter than air, which means that it will rise slowly in the home. Once the victims have been removed from the residence, efforts should be made to find the source

of the CO. The local utility is equipped to find the source from appliances and is also knowledgeable of the other gases that give false CO readings.

False Carbon Monoxide Reads from Different Sources

- Nitrous oxide (bleaching of rayon in new carpeting)
- Nitrogen dioxide (used to bleach flour)
- Hydrogen (most abundant element known, oils; and automobile battery when charging)
- Chlorine (dyes, insecticides, bleach powders, cleaning solvents, plastics, fire extinguishants)
- Hydrogen cyanide (almonds, seeds in peaches, apricots, plums, insecticides, plastics, burnt silk or wool)
- Welding gases, ethylene, and acetylene (ethylene is used to ripen fruits)
- Hydrogen sulfide (decaying organic matter)
- Sulfur dioxide (used in preserving fruits, disincentives, bleaching textile fibers, straw, wicker, gelatin, glue, and beet sugar)
- New computer circuit boards
- Aerosol disinfectant
- Rubbing alcohol

REVIEW QUESTIONS

1. What are the properties of natural gas and gas leaks that a first responder must consider when responding to a natural gas incident?
2. Describe the Do's and Do Not's of natural gas emergency response.
3. What are the properties of carbon monoxide ("CO") a first responder must consider when responding to a CO incident?
4. What are the symptoms of CO poisoning?
5. Describe the exposure limits and levels of CO.

CHAPTER III RECOGNIZING AND AVOIDING THE HAZARDS OF PROPANE

INTRODUCTION

Fatalities to first responders have involved propane. The purpose of this program is to:

- help you to understand the properties of propane;
- give you a basic knowledge of how the propane system works;
- make you aware of the hazards of propane; and
- offer approaches for responding to propane emergencies.

This chapter will help you better understand and determine what precautions need to be taken when responding to propane incidents. Propane can be dangerous and can injure and/or kill emergency workers. For specific facility and special emergency response needs in your service area, meeting with your local propane provider or the propane association on a periodic basis is strongly recommended.

PROPERTIES AND CHARACTERISTICS OF PROPANE

This section provides a general summary of the properties of propane. Key safety and tactical points are indicated.

Propane is a liquefied petroleum gas found trapped in pockets with either crude oil or natural gas. About 30 percent produced today is refined from crude oil, with the other 70 percent processed from natural gas. Propane is odorless, tasteless, and colorless in its natural state; an odorant (ethylmercaptan) is added, similar to natural gas, so that leaks may be detected.

Propane belongs to a family of chemical compounds known as hydrocarbons. This means they are made up of hydrogen and carbon atoms only. Natural gas (methane) has one carbon atom and four hydrogen atoms; propane has three carbon atoms with eight hydrogen atoms. This chemical composition makes propane similar to natural gas in many characteristics.

At a temperature colder than -44°F and open to the atmosphere, propane will reside in its liquid state. It would appear to be water. Propane due to its chemical characteristics is portable energy as we can store it as a liquid in a container under moderate pressure and then use it as a gas when withdrawn from the container. Each unit of liquid propane in a container produces 270 units of propane vapor.

The ignition temperature of propane in air is 920°F. The heating value of propane is about 2,500 Btu/cf, with its flammability range in air 2.15 to 9.60 percent. As natural gas, propane is non-toxic. However, it presents a possible inhalation hazard if released in a confined space, as it displaces oxygen and acts as a simple asphyxiate. Liquid propane is an effective refrigerant. It rapidly absorbs heat from the skin and can cause severe burns to the body.

Firefighter Fact Propane in its liquid state is about half the weight of water, while in its vapor state it is heavier than air and natural gas. Thus, when present, propane tends to go down and lay in low areas, while natural gas, being lighter than air, tends to travel upward.

Natural Gas	SG = .6
Air	SG = 1.0
Propane	SG = 1.5

PROPANE DELIVERY SYSTEM

This section provides an overview of the propane delivery system. Key safety and tactical points are identified. For specific facility and special emergency response needs in your service area, meeting with your local propane provider or the propane association on a periodic basis is strongly recommended.

Propane is shipped from the refinery or natural gas processing plant to a local terminal and from there to the end user. Shipment to the local terminal can be via truck, railcar, or pipeline. All propane is shipped under pressure in its liquid state. From the local terminal ("bulk plant") to the residence or commercial property, delivery is effected by a bulk delivery truck, called a "bobtail." This truck would hold about 2,000 to 3,500 gallons of propane.

The "bobtail" truck transfers propane via truck hose to the consumer's storage container. This container could either be a United States Department of Transportation ("DOT") cylinder, or an ASME storage tank. The design pressure of the American Society of Mechanical Engineers ("ASME") storage tank is 250 psig, while that of the DOT house cylinder would normally be 240 psig. Either type of container would have a filler valve, pressure relief valve, service valve, and liquid level gauge located within the cylinder neck-ring or the tank dome. Some of the individual process features can be combined in one valve on the container. All process connections are protected either by an excess flow valve or a check valve in the event of a downstream piping breakage. The DOT cylinders would normally be placed adjacent to the residence or commercial building with a pressure regulator installed within the cylinder neck-ring (collar) along with the cylinder valve. The cylinder propane capacities would normally be 47 gallons (200 lbs) or 100 gallons (420 lbs). Two or more cylinders could be manifolded together. Entry to the building would be via aboveground copper tubing or steel piping from the cylinder with a shutoff valve in the gas service line. A gas meter or second stage regulator would be optional.

The ASME storage tanks could be installed aboveground or underground. The tanks would normally be a 500 gallon or 1,000 gallon (w.c) size. Propane is filled in a container to about 85 percent of its water capacity (i.e., a 1,000 gallon water capacity storage tank would be filled to a maximum propane volume of 850 gallons). The ASME container would be installed 10' or further away from the building, with basically the same piping characteristics as the DOT cylinder installation, except that the piping run to the building from the ASME tank would normally be underground. It is important to note that all propane containers are never completely filled. The approximate 15 percent of the gross capacity (w.c.) of the container is used as a space for propane vapor. This allows for expansion of the propane liquid within the container. The propane pressure within the container is dependent on the outside ambient temperature. At 20°F the propane container pressure would be 40 psig; at 100°F, the pressure would be 172 psig.

Large multiple stationary ASME propane storage tanks ranging in size from 30,000 to 60,000 gallons (w.c.) are employed at various industrial plants and gas utility plants where propane is employed as a supplemental fuel to natural gas.

KEEPING THE SYSTEM SAFE

This section provides a reference of the regulations applicable to the propane distribution system in New Jersey.

Responsibility for system maintenance would be that of the user and the propane supplier. The governing regulation in New Jersey, established by the Liquefied Petroleum Gas Act (N.J.S.A. 21:1B-1 et seq.), for propane systems is N.J.A.C. 5:18 administered by the New Jersey Department of Community Affairs ("NJDCA"). The State has adopted NFPA pamphlet #58, the LP-Gas Code, as part of the state regulation. The propane supplier at the time of residential/commercial delivery is to inspect the container and outside system for acceptability and continued usage, Figure 111- 1.

GENERAL EMERGENCY RESPONSE PROCEDURES

This section provides approaches for responding to propane incidents.

Upon arrival at the scene, a security perimeter should be established. Special care should be used to position emergency vehicles so that equipment is parked well outside the area of greatest risk. Control all ignition sources immediately. If

Figures D-4, a-e Various propane facilities

possible, rescue should be performed from an upstream location.

Large releases of propane may travel great distances, find ignition sources, and flash back to the source of the leak. During approach to the incident scene, avoid committing or positioning personnel and vehicles in a hazardous position or situation. Remember – unignited propane is heavier than air.

For escaping gas, hose streams with fog nozzles are to be used to disperse the propane gas away from any possible sources of ignition. Approach the leak from upwind and keep out of any cloud. A combustible gas detector should be used to determine if hoselines are effective in dispersing the propane gas. When the gas indicator is considered within a safe range (below 10 percent of the Lower Flammable Limit LFL) rescue and repairs to shut off the flow of gas can be made by the fire service and the propane gas supplier.

For burning gas, approach the fire from upwind, making sure to stays out of the range of any possible flashback. The top of the container (vapor space) supplying the fuel should first be cooled with hose streams (water should also be applied to

the balance of the container). Cooling the container will cause the pressure to be reduced, thus closing any relieving container relief valve that might be feeding the fire. Do not extinguish the fire until the propane fuel supply can be shut off. If a container service valve is controlling the fuel feeding the fire, the surrounding atmosphere should be cooled with converging fog streams while the fire service attempts to close the valve. Continue to cool the container well after the fire has been extinguished. The area around the container should be monitored for flammable gas using a combustible gas indicator.

If the source of the fuel cannot be shut off, let the fire burn. Continue to cool the propane containers and adjacent exposures, Figure 111-2.

A propane tank contains liquid and vapor. Any external fire creating direct flame impingement on the vapor space will heat the tank's shell. If a vessel gets intense, concentrated heat on the shell area on top (vapor space) of the vessel, the metal will get hot and start losing its tensile strength. The vessel will start to swell in the hot area. This is an indication that the high pressure will soon blow out as the hot steel is being drawn thinner. When the blister rips, the whole tank contents will erupt upwards, causing a brief tower of fire. BLEVE is an acronym for Boiling Liquid Expanding Vapor Explosion. A BLEVE is defined as a container failure with a release of energy, often rapidly and violently, which is accompanied by a release of gas to the atmosphere and propulsion of the container or container pieces into adjacent areas due to an overpressure rupture.

Caution Any decision to approach a propane tank showing direct flame impingement on its vapor space must be made on a case-by-case basis after evaluating the hazards and risks and determining if an adequate supply of water is available to support firefighting operations. Bulk storage tanks can fail within 10 to 20 minutes of direct flame impingement if the containers are not adequately cooled, Figure 111-3.

PROPANE CARGO TRUCK EMERGENCY RESPONSE

This section provides approaches for responding to propane cargo truck incidents.

For example, a propane truck is involved in a traffic accident and a gas cloud is escaping from the vehicle. After securing the site, the objective for this operation is to control or stop the propane from escaping the truck. Firefighters in full protective clothing should deploy hoselines to disperse and dilute the flammable gas while an approach is made to ascertain exactly where the leak is. A combustible gas detector should be used to determine the effectiveness of the hoselines in dispersing the gas. If there is severe damage to the truck's piping, the truck may have to be unloaded. Considerable time may pass until a compatible vehicle is available on scene for product transfer. Some attempt to stop the leak via a fiberglass wrap or a freeze wrap may be attempted by the fire service employing a water fog envelope. As there is no fire situation, if the ambient temperature is about 90°F, hose water fog played on the top of the tank can be effective in keeping the tank's shell cool. If the ambient temperature is below 40°F, hose water application should not be applied as it would only raise the temperature of the propane inside the vessel and thereby increase the tank pressure and the leak. Water should be available in case of fire development and the need to cool the vessel shell.

PROPANE VEHICLE EMERGENCY RESPONSE

This section provides approaches for responding to propane vehicle incidents.

Propane motor fuel tanks may be installed in cars, vans, pick-up trucks, and buses. Propane motor fuel tanks are manufactured in a variety of sizes and shapes to accommodate different vehicle designs. Fuel tank capacities normally range from 20 to 65 gallons. For automobiles the tank is mounted in the trunk. The motor fuel tanks are DOT cylinders with a design pressure of 312 psig. The container relief valve is vented to the outside with the relief valve discharge directed up or down within 45 degrees of vertical. An automatic fuel shutoff valve located as close as possible to the carburetor is provided to close propane flow when the engine is not running, though the ignition switch may be in the on position. Each vehicle powered by propane is identified with a diamond-shaped label located on the lower right rear of the vehicle (the word propane is centered in the diamond in silver or white reflective material on a black background).

In the event of a vehicle accident and fire, the responders should cool the propane motor fuel tank on the vehicle. if there is a propane fire in the engine compartment, this can be controlled by shutting off the engine, which should automatically close the propane fuel supply valve. Rescue of people from the burning vehicle must be evaluated/rendered while the fire is attacked and extinguished. While the propane storage tank is continuously being cooled, the responders should locate the fuel supply valve on the storage tank and close it. Continue to cool the cylinder until well after the fire has been extinguished. The cylinder metal surface should be cool enough to touch. The area around the container should be monitored for flammable vapors using a combustible gas indicator.

BARBECUE GRILL FIRE/LEAK RESPONSE

This section provides approaches for responding to propane grill incidents.

Most barbecue gas grills are fitted with a 20-lb DOT propane cylinder. In the event of leaking propane gas, hose streams with fog nozzles are to be used to disperse the gas away from any possible sources of ignition. Approach the leak from upwind and keep out of any vapor cloud. A combustible gas detector should be used to determine the effectiveness in dispersing propane gas with the hose streams. When the gas indicator is considered within a safe range (below 10 percent of the LEL) the fire service should attempt to close the propane cylinder valve (note that this cylinder valve is right-to-tight), thus shutting off the flow of gas.

In the event of fire, the first objective is to cool the outside of the cylinder so that the cylinder pressure is reduced and the cylinder relief valve resets. Adjacent exposures should also be protected. The responders should then approach, from opposite the relief valve discharge, the cylinder under the protection of hand lines so as to manually close the cylinder valve (note that this cylinder valve is right-to-tight). Continue to cool the cylinder until well after the fire has been extinguished. The cylinder metal surface should be cool enough to touch. The area around the grill should be monitored for flammable vapors using a combustible gas indicator.

REVIEW QUESTIONS

1. What are the properties of propane and propane leaks that a first responder must consider when responding to a propane incident?
2. Describe your response to a propane fire?
3. What is a BLEVE?