Command and Control Decision Making at Multiple Alarm Incidents

CCDMMAI-Student Manual

2nd Edition, 12th Printing-December 2015

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U.S. DEPARTMENT OF HOMELAND SECURITY

UNITED STATES FIRE ADMINISTRATION

NATIONAL FIRE ACADEMY

FOREWORD

The U.S. Fire Administration (USFA), an important component of the Department of Homeland Security (DHS), serves the leadership of this Nation as the DHS's fire protection and emergency response expert. The USFA is located at the National Emergency Training Center (NETC) in Emmitsburg, Maryland, and includes the National Fire Academy (NFA), National Fire Data Center (NFDC), and the National Fire Programs (NFP). The USFA also provides oversight and management of the Noble Training Center in Anniston, Alabama. The mission of the USFA is to save lives and reduce economic losses due to fire and related emergencies through training, research, data collection and analysis, public education, and coordination with other Federal agencies and fire protection and emergency service personnel.

The USFA's National Fire Academy offers a diverse course delivery system, combining resident courses, off-campus deliveries in cooperation with State training organizations, weekend instruction, and online courses. The USFA maintains a blended learning approach to its course selections and course development. Resident courses are delivered at both the Emmitsburg campus and its Noble facility. Off-campus courses are delivered in cooperation with State and local fire training organizations to ensure this Nation's firefighters are prepared for the hazards they face.

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SIX-DAY SCHEDULE

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
AM	8:20-9:35 Unit 1: Introduction 9:45-11:10 Unit 2: Incident Command System Review 11:20-12:00 Unit 3: Decision Making Review	8:00-9:00 Simulation 3 (Mandatory): Strip Shopping Centers Frontload 9:00-10:30 Strip Shopping Simulation 10:40-11:40 Simulation 4 (Mandatory): Lumberyard Frontload	8:00-9:00 Simulation 6 (Mandatory): Hazardous Materials Facilities Frontload 9:00-10:30 Hazardous Materials Facilities Simulation 10:40-11:40 Simulation 7 (Mandatory): Commercial Building Frontload	8:00-10:30 Optional Simulation 10:40-12:00 Enclosed Mall Simulation Optional Simulation	8:00-11:30 Simulation 11 (Mandatory): Planning Process: Developing an Incident Action Plan	8:00-8:45 Highrise Frontload (cont'd) 9:00-11:30 Highrise Simulation
Lunch						
PM	1:00-2:45 Unit 4: Walkthrough Simulation 1: Warehouse 3:00-5:00 Simulation 2 (Mandatory): Garden Apartments Frontload Garden Apartments	12:40-2:10 Lumberyard Simulation 2:20-3:20 Simulation 5 (Mandatory): Vacant Commercial Frontload 3:20-4:50 Vacant Commercial Simulation	12:40-2:30 Commercial Building Simulation 2:40-3:40 Optional Simulation 3:40-4:10 Optional Simulation Walk-thru, QAP, and Assignments	1:00-2:00 Simulation 10 (Mandatory): Transportation Accident Frontload 2:00-4:00 Transportation Accident Simulation	12:30-3:30 Simulation 12 (Mandatory): Highrise Frontload 3:40-5:00 Course Evaluations	12:30-1:30 Course Summary 1:30-2:30 Clean-up 4:00 Graduation
Evening	Do all frontloads for Monday.	Do all frontloads for Tuesday.	Do all frontloads for Wednesday.	Do all frontloads for Thursday.		

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FIREFIGHTER CODE OF ETHICS

Background

The Fire Service is a noble calling, one which is founded on mutual respect and trust between firefighters and the citizens they serve. To ensure the continuing integrity of the Fire Service, the highest standards of ethical conduct must be maintained at all times.

Developed in response to the publication of the Fire Service Reputation Management White Paper, the purpose of this National Firefighter Code of Ethics is to establish criteria that encourages fire service personnel to promote a culture of ethical integrity and high standards of professionalism in our field. The broad scope of this recommended Code of Ethics is intended to mitigate and negate situations that may result in embarrassment and waning of public support for what has historically been a highly respected profession.

Ethics comes from the Greek word ethos, meaning character. Character is not necessarily defined by how a person behaves when conditions are optimal and life is good. It is easy to take the high road when the path is paved and obstacles are few or non-existent. Character is also defined by decisions made under pressure, when no one is looking, when the road contains land mines, and the way is obscured. As members of the Fire Service, we share a responsibility to project an ethical character of professionalism, integrity, compassion, loyalty and honesty in all that we do, all of the time.

We need to accept this ethics challenge and be truly willing to maintain a culture that is consistent with the expectations outlined in this document. By doing so, we can create a legacy that validates and sustains the distinguished Fire Service institution, and at the same time ensure that we leave the Fire Service in better condition than when we arrived.

FIREFIGHTER CODE OF ETHICS

I understand that I have the responsibility to conduct myself in a manner that reflects proper ethical behavior and integrity. In so doing, I will help foster a continuing positive public perception of the fire service. Therefore, I pledge the following…

- Always conduct myself, on and off duty, in a manner that reflects positively on myself, my department and the fire service in general.
- Accept responsibility for my actions and for the consequences of my actions.
- Support the concept of fairness and the value of diverse thoughts and opinions.
- Avoid situations that would adversely affect the credibility or public perception of the fire service profession.
- Be truthful and honest at all times and report instances of cheating or other dishonest acts that compromise the integrity of the fire service.
- Conduct my personal affairs in a manner that does not improperly influence the performance of my duties, or bring discredit to my organization.
- Be respectful and conscious of each member's safety and welfare.
- Recognize that I serve in a position of public trust that requires stewardship in the honest and efficient use of publicly owned resources, including uniforms, facilities, vehicles and equipment and that these are protected from misuse and theft.
- Exercise professionalism, competence, respect and loyalty in the performance of my duties and use information, confidential or otherwise, gained by virtue of my position, only to benefit those I am entrusted to serve.
- Avoid financial investments, outside employment, outside business interests or activities that conflict with or are enhanced by my official position or have the potential to create the perception of impropriety.
- Never propose or accept personal rewards, special privileges, benefits, advancement, honors or gifts that may create a conflict of interest, or the appearance thereof.
- Never engage in activities involving alcohol or other substance use or abuse that can impair my mental state or the performance of my duties and compromise safety.
- Never discriminate on the basis of race, religion, color, creed, age, marital status, national origin, ancestry, gender, sexual preference, medical condition or handicap.
- Never harass, intimidate or threaten fellow members of the service or the public and stop or report the actions of other firefighters who engage in such behaviors.
- Responsibly use social networking, electronic communications, or other media technology opportunities in a manner that does not discredit, dishonor or embarrass my organization, the fire service and the public. I also understand that failure to resolve or report inappropriate use of this media equates to condoning this behavior.

Developed by the National Society of Executive Fire Officers

STUDENT INFORMATION CARD

NAME: ____________________

RANK: ____________________

DEPARTMENT: ____________________

DEPARTMENT ADDRESS: ____________________

____

DEPARTMENT SIZE: VOLUNTEER PERSONNEL: ____________________

PAID PERSONNEL: ____________________

NUMBER/TYPE OF APPARATUS: ____________________

NUMBER OF STATIONS: ____________________

NUMBER OF FIRE CALLS/YEAR: ____________________

PRESENT POSITION AND RESPONSIBILITIES: ____________________

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A Student Guide to End-of-course Evaluations

Say What You Mean ...

Ten Things You Can Do to Improve the National Fire Academy

The National Fire Academy takes its course evaluations very seriously. Your comments and suggestions enable us to improve your learning experience.

Unfortunately, we often get end-of-course comments like these that are vague and, therefore, not actionable. We know you are trying to keep your answers short, but the more specific you can be, the better we can respond.

Actual quotes from student evaluations:	Examples of specific, actionable comments that would help us improve the course:
1 "Update the materials."	• The (ABC) fire video is out-of-date because of the dangerous tactics it demonstrates. The available (XYZ) video shows current practices. • The student manual references building codes that are 12 years old.
2 "We want an advanced class in (fill in the blank)."	• We would like a class that enables us to calculate energy transfer rates resulting from exposure fires. • We would like a class that provides one-on-one workplace harassment counseling practice exercises.
3 "More activities."	• An activity where students can physically measure the area of sprinkler coverage would improve understanding of the concept. • Not all students were able to fill all ICS positions in the exercises. Add more exercises so all students can participate.
4 "A longer course."	• The class should be increased by one hour per day to enable all students to participate in exercises. • The class should be increased by two days so that all group presentations can be peer evaluated and have written abstracts.
5 "Readable plans."	• The plans should be enlarged to 11 by 17 and provided with an accurate scale. • My plan set was blurry, which caused the dotted lines to be interpreted as solid lines.
6 "Better student guide organization," "manual did not coincide with slides."	• The slide sequence in Unit 4 did not align with the content in the student manual from slides 4-16 through 4-21. • The instructor added slides in Unit 4 that were not in my student manual.
7 "Dry in spots."	• The instructor/activity should have used student group activities rather than lecture to explain Maslow's Hierarchy. • Create a pre-course reading on symbiotic personal relationships rather than trying to lecture on them in class.
8 "More visual aids."	• The text description of V-patterns did not provide three-dimensional views. More photographs or drawings would help me imagine the pattern. • There was a video clip on NBC News (date) that summarized the topic very well.
9 "Re-evaluate pre-course assignments."	• The pre-course assignments were not discussed or referenced in class. Either connect them to the course content or delete them. • The pre-course assignments on ICS could be reduced to a one-page job aid rather than a 25-page reading.
10 "A better understanding of NIMS."	• The instructor did not explain the connection between NIMS and ICS. • The student manual needs an illustrated guide to NIMS.

UNIT 1: INTRODUCTION

COURSE OBJECTIVE

The students will enhance their skills and abilities to manage fire department operations effectively at multialarm incidents.

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LOGISTICS

The course will begin each day promptly at 8 a.m. and will end at approximately 5 p.m. If a student is unable to attend class at the scheduled times because of illness or other reasons, notify instructors through another student or campus security. A 15-minute coffee break will be taken each morning and each afternoon. Normally, lunch will be from 11:30 a.m. to 12:30 p.m. each day.

STUDENT INTRODUCTIONS/BACKGROUNDS

You will be asked to introduce yourselves and give a brief 2-minute description of your background, including the following:

- name and rank;
- department or agency;
- basic information on department/agency;
  - size of department/agency;
  - size of community;
- present responsibilities; and
- what you expect to get from the course.

COURSE OVERVIEW

Course objective: The students will enhance their skills and abilities to manage fire department operations effectively at multialarm incidents. The course objective will be met through lectures, discussions, and activities in specific topic areas related to problems that may be encountered during various types of multialarm incidents. The information and procedures covered during lectures, discussions, and activities will be reinforced by application to simulated emergency incidents.

Course Units

Unit 1: Introduction.

Unit 2: Incident Command System Review. An overview of the National Incident Management System (NIMS) and a review of the ICS and application to the Operations Section.

Unit 3: Decision Making Review. An overview of the Classical and Naturalistic Decision Making (NDM) concepts and a review of the material from the precourse assignment.

SIMULATIONS

In addition to a walk-through simulation designed to provide an orientation to the simulation process, you will participate in a variety of emergency incident simulations designed to provide the opportunity to apply the material discussed during the course. A brief postincident analysis (PIA) will be held after each simulation to identify lessons learned during the simulation.

These simulations include the following types of incidents:

- walkthrough warehouse simulation;
- garden apartments;
- strip shopping centers;
- lumberyard;
- vacant commercial;
- hazardous materials facilities;
- commercial building;
- optional--small hotel;
- optional--enclosed mall;
- transportation accident;
- planning process: developing an Incident Action Plan (IAP);
- highrise;
- optional--industrial building;
- optional--dinner club;
- optional--warehouse;
- optional--nursing homes;
- optional--bulk propane facility;
- optional--school complex;
- optional--courthouse;
- optional--farm complex;
- optional--places of worship; and
- optional--supermarkets.

READING ASSIGNMENTS

Beginning tonight, you will be given reading assignments at the end of each day related to the material that will be covered the following day. If information on specific topics is not covered sufficiently in the reading materials, you are encouraged to ask questions when the topic is discussed the next day. Starting Tuesday morning, random students will be selected by the instructor to answer several questions on each unit prior to presentation.

SUPPLEMENTAL MATERIAL

Articles on the following topics are in the Appendix of this unit. You should read these articles on the first night of the course. Article topics include

- positive-pressure ventilation;
- trench (strip) ventilation; and
- Class A foam.

This material will give you background on these topics relative to their application as tactical solutions to problems that may be encountered during the simulation activities.

STUDENT MANUAL AND SIMULATION MANUAL

The Student Manual (SM) and Simulation Manual may be taken home at the conclusion of the course.

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UNIT 2:
INCIDENT COMMAND SYSTEM REVIEW

OBJECTIVES

The students will:

1. *Determine an appropriate Incident Command System (ICS) Operations Section organization for a fire situation.*

2. *Determine an appropriate ICS Operations Section organization for a multialarm incident.*

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THE NATIONAL INCIDENT MANAGEMENT SYSTEM

On February 28, 2003, President Bush issued Homeland Security Presidential Directive-5 (HSPD-5). One purpose of HSPD-5 is "to enhance the ability of the United States to manage domestic incidents by establishing a single, comprehensive national incident management system." This excerpt from HSPD-5 outlines the tasking given to the Secretary of Homeland Security:

> (15) The Secretary shall develop, submit for review to the Homeland Security Council, and administer a National Incident Management System (NIMS). This system will provide a consistent nationwide approach for Federal, State, and local governments to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity.

On March 1, 2004, after close collaboration with State and local government officials and representatives from across a spectrum of public safety organizations, the DHS issued the NIMS. The NIMS integrates existing best practices into a consistent, nationwide approach to domestic incident management that is applicable at all jurisdictional levels and across functional disciplines in an all-hazards context.

Six major components make up this system's approach. A brief summary of topics in these six sections follows.

1. Command and management:

    - ICS;
    - Multiagency Coordination (MAC) Systems; and
    - public information systems.

2. Preparedness:

    - planning--training--exercises;
    - personnel qualification and certification standards;
    - equipment acquisition and certification standards; and
    - publication management processes and activities.

3. Resource management/Mutual aid:

    - standardized requirements for processes to describe, inventory, mobilize, dispatch, track, and recover resources over the life cycle of an incident; and
    - includes resource typing and mutual-aid concerns.

4. Communications and information management:

    - NIMS identifies the requirement for a standardized framework for:

- communications,
- information management (collection, analysis, and dissemination), and
- information sharing at all levels of incident management.

- Includes agencies and jurisdictions responsible for managing or directing domestic incidents, those affected by the incident, and those contributing resources to the incident management effort.

- Helps ensure that crisis decision making is better informed.

5. Supporting technologies:

    - These include voice and data communications systems, information management systems (i.e., recordkeeping and resource tracking), and data display systems.

    - Supporting interoperability and compatibility.

6. Ongoing management and maintenance:

    - Provide strategic direction for and oversight of the NIMS--supporting both routine review and the continuous refinement of the system and its components over the long term.

    - This is one of the primary responsibilities of the NIMS Integration Center.

Of these components, the concepts and practices for Command and Management and Preparedness are the most fully developed, reflecting their regular use by many jurisdictional levels and agencies responsible for incident management across the country. Resource Management, Communications and Information Management, Supporting Technologies, and Ongoing Management and Maintenance introduce many concepts and requirements that are also integral to the NIMS but that will require further collaborative development and refinement over time. Although technology is relied on heavily to link the components of the NIMS, the success of the NIMS will depend largely on whether State, local, and tribal governments also adopt key implementation strategies that accompany the use of new technologies.

Throughout this course, when "ICS" is used, it should be understood that the reference is to the Incident Management System (IMS) described in NIMS, and includes the application of NIMS principles to the specific scenario being discussed.

Many other agencies besides fire agencies--both public and private--will be adopting the NIMS as required by the DHS.

Differences Between Fire Resources of California Organized for Potential Emergencies and National Incident Management System Incident Command System

The ICS established in the NIMS is not a new emergency IMS. It is based on the *Incident Command System Operational System Description* document (ICS 420-1) developed by Fire Resources of California Organized for Potential Emergencies (FIRESCOPE). The two most significant differences between NIMS and FIRESCOPE ICS are

1. The Command Staff Information Officer position is now called the Public Information Officer (PIO).
2. The Intelligence and Investigation function may be organized in one of the following ways:

   - as an Officer within the Command Staff;
   - as a Unit within the Planning Section;
   - as a Branch within the Operations Section; or
   - as a separate General Staff Section.

Intelligence and Investigation Options in the National Incident Management System

The following discussion helps guide the determination for the most effective placement of the Intelligence and Investigation function in the NIMS.

- Officer in the Command Staff.

  This option may be most appropriate in incidents with little need for tactical or classified intelligence and where incident-related intelligence is provided by supporting Agency Representatives, through real-time reach-back capabilities.

- Unit within the Planning Section.

  This option may be most appropriate in an incident with some need for tactical intelligence and when no law enforcement entity is a member of the Unified Command.

- Branch within the Operations Section.

  This option may be most appropriate in incidents with a high need for tactical intelligence (particularly classified intelligence) and when law enforcement is a member of the Unified Command.

- General Staff Section.

  This option may be most appropriate when an incident is influenced heavily by intelligence factors, or when there is a need to manage and/or analyze a large volume of classified or highly sensitive intelligence or information. This option is particularly relevant to a terrorism incident, for which intelligence plays a crucial role throughout the incident life cycle.

The Intelligence and Investigation function also has the responsibility for coordinating information and operational security matters with public awareness activities that fall under the responsibility of the PIO, particularly where such public awareness activities may affect information or operations security.

Regardless of how it is organized, the Intelligence and Investigation function is responsible for developing, conducting, and managing information-related security plans and operations as directed by the IC. This can include information security and operational security activities, as well as the complex task of ensuring that sensitive information of all types (e.g., classified information, sensitive law enforcement information, proprietary and personal information, or export-controlled information) is handled in a way that not only safeguards the information but also ensures that it gets to those who need access to it so that they can conduct their missions effectively and safely.

Additional Information

National Incident Management System

A downloadable portable document file (PDF) version of the NIMS can be found on the NIMS Integration Center Web site at: http://www.fema.gov/nims/nims.shtm

An online independent study program for the NIMS can be found on the Emergency Management Institute (EMI) Web site. The course, IS-700: *National Incident Management System (NIMS), An Introduction*, is a Web-based awareness-level course that explains NIMS components, concepts, and principles. The course can be accessed at: http://training.fema.gov/EMIweb/IS/is700.asp

Additional information, requirements, and guidelines for fulfilling an organization's NIMS compliance can be found on the NIMS Integration Center's Web site: http://www.fema.gov/nims/ Of particular interest to fire service organizations is NIMCAST (National Incident Management Compliance Assessment Tool)--a Web-based self-assessment system that will allow evaluation of an organization's preparedness and response capabilities against the requirements of the NIMS.

Need for a Common Incident Management System

There must be a professional approach in each department to managing emergency incidents. The use of an IMS enables us to handle incidents more safely and effectively. A system facilitates the use of resources from other agencies.

In this course, teamwork is required from individuals with diverse backgrounds from a variety of different departments. The FIRESCOPE ICS will be used during this course for purposes of discussion and during simulations and other activities. The focus of this course is on the use of the expanded ICS.

THE NEED FOR A SYSTEM

Incident Command

Just a few years ago, most departments had never heard of incident command; now, it has become a byword, and many departments are actively developing some type of Command system. The majority of our incident-scene problems are not the result of poor tactical operations. Front-line troops generally carry out tactical assignments with a high degree of efficiency. The problems occur at the Command and control level. Unfortunately, many departments view emergency operations as so unique that conventional rules do not apply and new ones must be invented. Or worse, they continue to use those rules established many years ago.

Actually, emergency operations have one requirement that is common to all types of operations: all operations must have organization to be successful. Think about the last incident you had that turned out to be a complete fiasco. Did personnel do exactly what they were supposed to do, and did you have a good handle on what was going on? How about the last incident that went well? How did it compare to the fiasco in terms of overall organization and control?

It is recommended in NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, that every department have an ICS in place and train on that system. In the case of a hazardous materials (haz mat) response, the Occupational Safety and Health Act (OSHA) requires that responders be trained in and use an ICS. Refer to the *ICS Self-Study* for applicable laws and standards.

Day-to-Day Fire Department Operations

Most fire departments of any size contain divisions responsible for various areas, such as suppression, emergency medical services (EMS), training, prevention, etc. These are the functional areas.

Generally, these areas come under the Command of a chief officer or other appropriate authority. This is delegating functional responsibility. Personnel assigned to these functional areas answer to their superior in that area, thus maintaining clear lines of authority and communication.

Each area is responsible for objectives according to the overall goals of the department. Generally, each area sets its own priorities for accomplishing those objectives. Company commanders decide what gets done first.

Characteristics of the Incident Command System

All management systems require the establishment of an organizational structure, which provides the hierarchy of responsibility, authority, and formal communications. This structure gives all those in the organization an understanding of their authority, power, and responsibilities.

Common Operating Procedures

In emergency operations, we must have the ability to move rapidly from a nonincident organization to an incident organization. We must have a standard methodology that allows us to react out of habit and to get into the basic level of our emergency scene organization immediately.

Common Terminology

For effective communication, words must have a single definition, functional areas must have one set of responsibilities, and no two words may have the same definition. If this axiom is changed, confusion is introduced into the conveyance of information, orders, etc.

Personnel Qualifications

ICS is not a rank-oriented system, but a performance-oriented one. The best-qualified person is placed into the appropriate functional level for the situation.

All personnel who are going to be involved anywhere, at any level in the system, must be trained in the use of ICS.

Needs an Incident Commander

The only position (function) in the ICS that must be staffed at all times is the Incident Commander (IC). There must always be someone in charge, responsible, and accountable. This position must be assumed by the first or ranking member of the fire department to arrive at the scene.

All-Risk System

The ICS, while originally designed for wildland fires, has evolved into an all-risk, all-situation emergency management system. ICS is a people management tool. We manage people and not fires, floods, tornadoes, plane crashes, haz mat incidents, mass casualties, etc. ICS has been used on all types of emergency situations as well as nonemergency situations. Many State fire schools have adopted ICS as the management tool for their seasonal fire schools to which hundreds of State firefighters attend.

Jurisdictional Authority

Unless Federal, State, or local law states otherwise, the ranking officer from the jurisdiction is the IC. He/She cannot be removed from this position unless the law provides otherwise. However, Command may be transferred to another person from another agency or jurisdiction at the IC's discretion.

Span-of-Control

Span-of-control refers to the number of personnel reporting to any given individual. Optimum span-of-control in the ICS is five, with an acceptable spread of two to seven. On a situation that is not yet under control, no one operating under ICS should have more than five personnel reporting to him/her.

Span-of-control ratios can be driven by a number of factors:

- Training/Experience level of subordinates--Poorly trained or less experienced personnel require more direct supervision, thereby lessening the number of subordinates one can manage effectively.

- Complexity of the incident--A haz mat incident may require more mental concentration, thereby leaving less time available to supervise personnel.

- Type or timeframe of the incident--The speed of operations may influence span-of-control. A fast-moving incident may require a tighter span-of-control with fewer divisions/groups in place, whereas, in a slower moving operation such as overhaul, the supervisor is less pressed for time during decision making and therefore can manage more personnel/divisions/groups.

For span-of-control purposes, these functions are not counted as reporting to a supervisor: Safety Officer, Liaison Officer, PIO, and Staging Area Manager. In ICS, these positions basically are assistants to the IC, or in the case of Staging, to the Operations Section Chief.

Unity of Command

Unity of command is a management term that means that each person has only one boss, and he/she knows who that boss is. When anyone receives orders from more than one person, the receiver's confusion is the only logical outcome. Confusion causes delays in solving problems, and increases life and property losses for fire departments.

Everyday Application

In order to manage the large incidents that we encounter effectively, we must develop the appropriate habits that get us efficiently into the ICS. The only way to develop a habit is to do the same thing over and over. We must implement ICS on every incident, using only those functions that meet the complexity of the incident and the number of resources on scene. Practice reinforces learning.

INCIDENT COMMAND SYSTEM ORGANIZATION AT EXPANDED INCIDENTS

Usually, the ICS organization at routine incidents is simple. There are relatively few problems, a limited number of resources, and the IC can handle all management functions.

Expanding Incident Cues Incident Command System Transition

At a complex incident, more problems need solutions. The increased number of resources results in an increase in management concerns. The IC is unable to do all the jobs and to provide all the answers without assistance.

The basic ICS organization must expand with the needs of the incident. As conditions or needs change so must the organizational structure. The modular design of ICS allows the organization to be structured for specific incidents.

Attempting to deal with all management functions may overload the IC. When overload occurs, the IC may overlook important details, and personnel safety may be compromised.

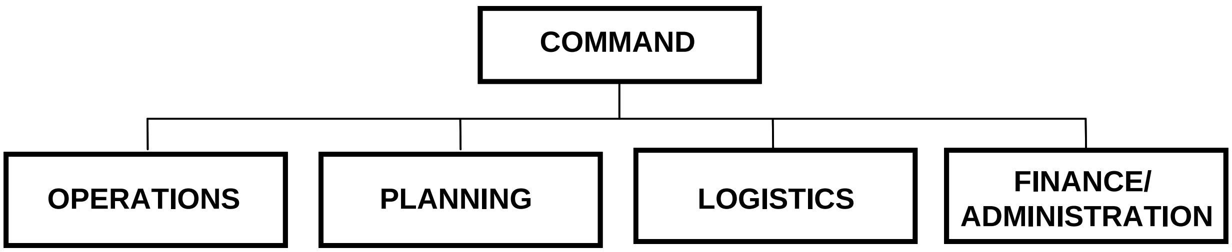
The solution is to use the ICS to delegate specific responsibilities and authority to other personnel. The ICS provides a systems approach to effective incident organization.

Structuring the System Requires Understanding

A Command Officer must understand the functional positions in the ICS, and the responsibilities and roles of each functional position.

INCIDENT COMMAND SYSTEM MAJOR FUNCTIONS: COMMAND STAFF AND GENERAL STAFF

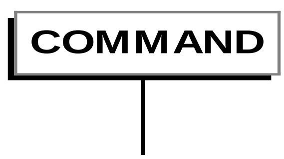
The Five Major Functions



These are the major management functional areas of the ICS.

It is important to remember that the blocks in the ICS are functions or jobs, not positions that **must** be staffed.

Command



The first component of the ICS is Command. No operation can be implemented unless someone is in charge.

Responsibilities of Command

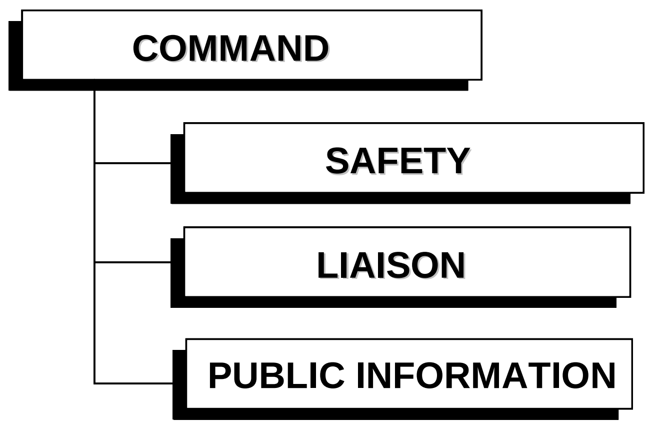
The responsibilities of Command include

- assume and announce Command, and establish an effective operating position (Incident Command Post (ICP));
- rapidly evaluate the situation (sizeup);
- initiate, maintain, and control the communications process;
- establish objectives;
- identify the overall strategy;
- select tactics;
- develop an IAP, and assign companies and personnel consistent with plans and Standard Operating Guidelines (SOGs);
- develop an effective incident command organization;
- manage and coordinate resources and their activities;

- review, evaluate, and revise (as needed) the IAP;
- provide for the continuity, transfer, and termination of Command;
- release information;
- provide for safety and personnel accountability, and
- coordinate with outside agencies.

The IC is responsible for all these functions. As Command is transferred, so is the responsibility for the functions. The General Staff (five major) functions must be addressed immediately from the initial assumption of Command.

Command Staff



These functions cannot be delegated to other major functional areas and are considered Command Staff functions.

Safety

Safety is responsible for enforcing safety procedures and practices at the emergency scene. Safety also identifies present and potential hazardous or unsafe conditions.

Normally, the Safety Officer position is staffed when Command cannot devote sufficient time to safety analysis. As the number of resources and incident complexity increases, the IC must have someone else to focus on safety.

Safety has the authority to stop unsafe acts when time or conditions prevent using regular lines of authority (imminent danger). Safety must notify Command when such an action is taken.

A Safety Officer cannot be just anyone on the incident scene. The Safety Officer for structural firefighting must be very knowledgeable in fire behavior, building construction and collapse potential, strategy and tactics, and department safety rules and regulations, and have considerable experience in incident response.

Liaison

Liaison is the point of contact with outside agency representatives. Liaison is responsible for the identification and coordination of all outside agencies.

The Liaison Officer position is staffed when Command cannot devote sufficient time to talking to outside agency representatives. The Liaison Officer acts as a buffer between the IC and other agencies.

What agencies belong in Liaison versus the Unified ICP? Those agencies that provide assistance, but have no legal responsibility for the outcome, usually are placed with Liaison. Agencies that provide significant human resources to incident operations should be at the ICP.

Public Information

This position is responsible for gathering and releasing of incident information to the media and other appropriate agencies. All media releases must be approved by Command. The PIO has the responsibility to update Command on media needs, and Command should keep the PIO current on the status of operations.

The PIO function normally is staffed when Command cannot take the time to talk to the media. The PIO establishes a media area away from the ICP, and acts as the media point-of-contact.

Single Versus Unified Command

In a Single Command situation, only one agency has legal responsibility. Haz mat incidents, mass casualty incidents, natural disasters, or wildland fires, among others, may involve a number of jurisdictions and/or agencies that have a legal or functional need to be involved directly in the decision making process. The worst thing that can happen is to allow each of these responsible agencies to establish an ICP of its own, separate and distinct from the others. In this instance, it is critical that there be a Unified Command.

What cues the need for a Unified Command?

- More than one agency responsible for decision making within a single jurisdiction.

  Example: A passenger airline crash within a national forest. Local fire, local medical, Federal forestry, and National Transportation Safety Board (NTSB) are all involved.

- More than one jurisdiction is involved. Example: A major flood, hurricane, etc.

  All agencies with responsibility to manage the incident contribute to the Command process. Together they determine overall incident objectives and strategies, and plan tactics jointly. This method ensures the maximum use of assigned resources.

- The location of the incident.

  Example: An inland waterway entirely within the boundaries of a single jurisdiction also could involve U.S. Fish and Wildlife Service and the U.S. Coast Guard (USCG).

Who is involved?

- All agencies with responsibility to manage the incident contribute to the Command process. Together they determine overall incident objectives, determine strategies, and plan tactics jointly. This method ensures maximum use of assigned resources.

- One key official from each jurisdiction or responsible agency.

- Representatives from departments in a single jurisdiction.

  The IC may be determined by local or State law; California law states that the law enforcement agency is the IC for haz mat incidents on the highways. Where there is no law determining who is in charge, agencies should work together to determine which agency takes the lead for each risk a community faces.

Generally, the agency with the greatest jurisdictional involvement is assigned the Operations function. Depending on the type of incident, someone must determine which agencies actually have responsibility. It is important to recognize prior training and experience when staffing the Unified ICP and Operations function.

Single/Unified Command Differences

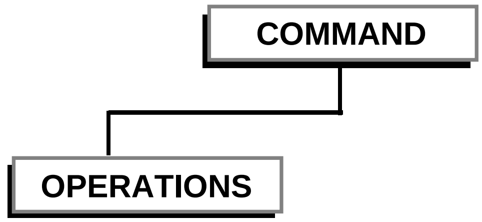
- In a Single Command structure, a single IC is solely responsible for developing management strategy of the incident.

- In a Single Command structure, the implementation of strategy and tactics to achieve operational control is the responsibility of one person--the Operations Section Chief.

- In a Unified Command structure, individuals designated by involved jurisdictions/ departments jointly determine objectives, strategy, and priorities.

- The determination of which jurisdiction/agency the Operations Section Chief represents must be made by mutual agreement of the Unified Command.

Operations



Operations is responsible for the management of all operations directly applicable to the primary mission. Its function is to direct the organization's tactical operations to meet the strategic goals developed by Command. Operations allocates and assigns resources to establish control of the incident, and participates in the development of the IAP.

Staffing Operations

The Operations Section is responsible for the direct management of all incident tactical activities, tactical priorities, and the safety of personnel working in the Operations Section.

The most common reason for staffing Operations is to relieve the span-of-control problems for the IC. These span-of-control problems occur when the number of Branches, Divisions, and Groups, **coupled** with Planning and/or Logistics Section elements, exceeds the IC's ability to manage effectively. The IC then may implement the Operations Section to reduce the span-of-control, transferring the direct management of all tactical activities to the Operations Section. Then the IC is able to focus attention on the overall management of the entire incident as well as interact with the Command Staff and General Staff.

A complex incident, in which the IC needs assistance determining strategic goals and tactical objectives, also may require implementing Operations.

However, Operations should be staffed only to improve the management of the incident. If it is not used to maintain a manageable workload or an effective span-of-control, the IC could end up with a span-of-control of one.

After Operations is implemented, the duties of the IC are modified slightly. Operations will be responsible for all tactical operations, resources, and accomplishment of specific activities. The IC will be responsible for the development of the incident strategy and the communication of that strategy to the Operations Section Chief.

When Operations is staffed, the IC focuses on objectives and the Operations Section Chief focuses on strategies and tactics. The IC no longer talks to the operational companies.

OPERATIONS SECTION EXPANDED

Such terms as engine and truck represent personnel who are doing specific tasks at the scene of an incident. If you do not have truck companies, you still need to perform the tasks discussed.

The ICS organization charts used in this section and those presented in the classroom lecture represent the fire scenes shown on the slides during lectures. These charts are correct, but they are just one way of managing a specific incident using ICS.

Single Resources and Crews

A single resource is an individual company, e.g., engine, truck, rescue, ambulance, etc.

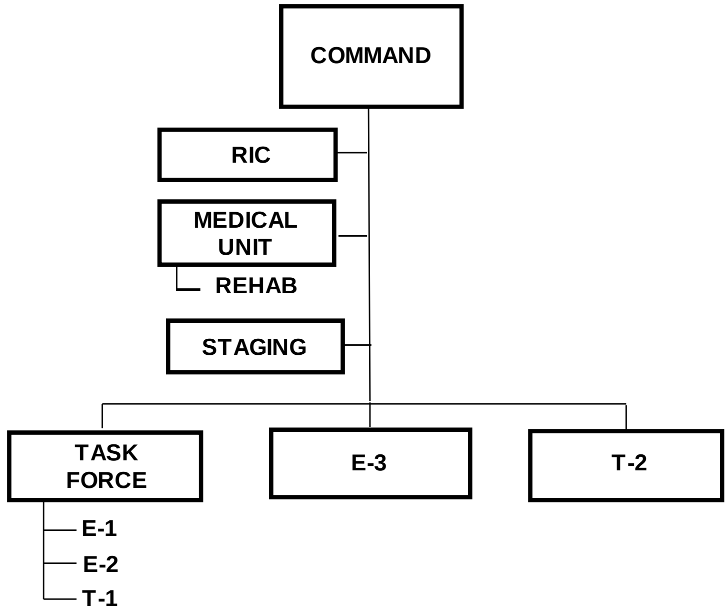
Personnel who arrive at the incident scene on other than a piece of fire apparatus (engine, truck, etc.) are formed into a working unit called a crew, with a crew leader. Crew size should conform to span-of-control guidelines; crews normally are designated by the crew leader's name, or by function (e.g., Crew Burns, Vent Crew).

Task Force

A Task Force includes from two to five different types of single resources and a leader assembled to accomplish a specific task. A Task Force may be one engine and one truck; two engines and a brush vehicle; two engines and two ambulances; three engines and two trucks, etc. A Task Force operates under the supervision of a Task Force Leader.

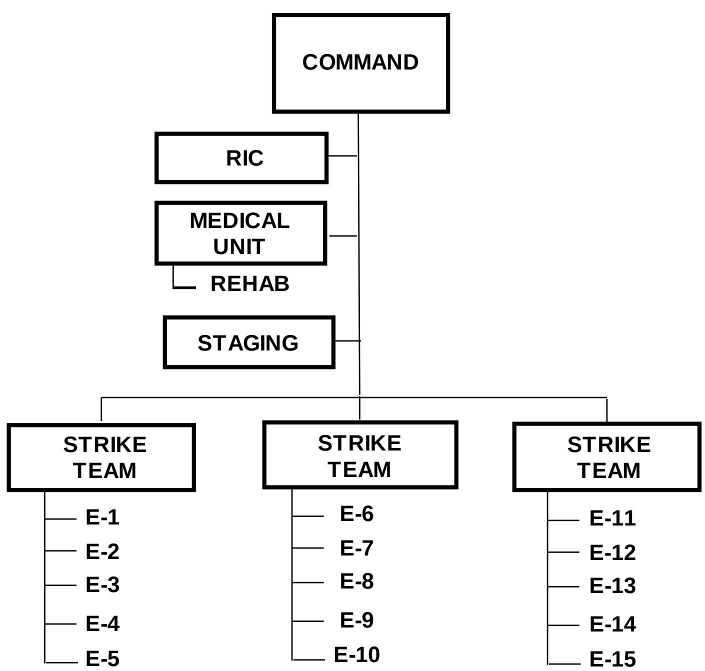
The Task Force may be assembled at the incident scene to provide specialized resources required for a specific job. Task Forces may be assembled before an incident and become part of the department's dispatch philosophy. For example, Los Angeles City dispatches Task Forces of two engines and one truck. These apparatus arrive on the scene with several officers and personnel, but only one officer is designated as the Task Force Leader. All communications for the Task Force units are directed to the Task Force Leader.

Some departments create Task Forces of one engine and one brush unit for response during brush fire season. The brush unit responds with the engine company wherever it goes.



Strike Team

A strike team consists of five of the same type of single resource, with a leader. A strike team may be five engines (Engine Strike Team), five trucks (Truck Strike Team), five EMS ambulances (EMS Strike Team), etc. The Strike Team concept is used frequently at wildland fires. A strike team operates under the supervision of a Strike Team Leader. Strike Teams generally are comprised of engine companies.

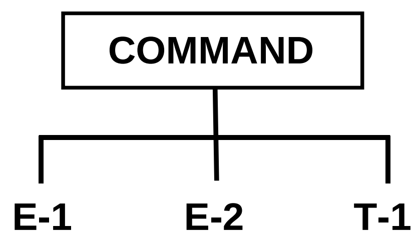


Usually, Strike Teams are assembled for wildland fires. It is the most reasonable way to control 100 to 200 single engine companies, since they would represent only 20 to 40 Strike Teams. Strike Teams may be used at structure fires (just as any ICS function), but this is not the norm.

Strike Teams, and more often, Task Forces may be used by Division and Group Supervisors to correct a poor span-of-control problem.

Incident Command System Example

This organization chart is for the first alarm for a grocery store fire with three companies/crews and a chief officer. There is a 25-percent involvement of the grocery store. This fire is large enough to add resources to show the application of ICS.

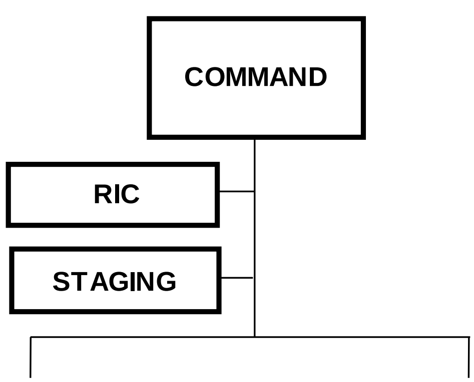


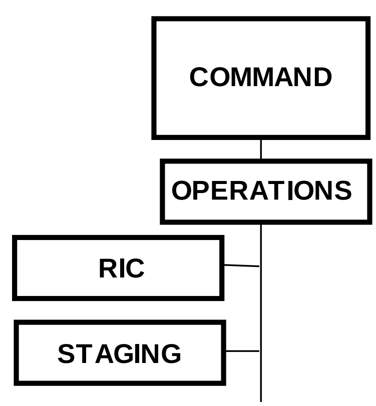
The chief is Command. Engine/Crew 1 has been assigned to advance a hoseline into the building and begin to attack the fire. Engine/Crew 2 has been assigned to provide a backup line and conduct a primary search. Truck 1/Crew 3 has been assigned ventilation.

Why is this ICS? The radio call sign for the IC is "Command," it is not "Chief 1." When assigned a functional responsibility in the ICS, your radio call sign becomes the function name.

This size of ICS organization will handle approximately 90 to 95 percent of your incidents.

Staging





Staging is directly responsible to Operations. If Operations is not staffed, Staging reports to Command. Staging is responsible for the coordination, support, and distribution of incoming resources.

Staging is a location where resources ready for immediate assignment into the incident are placed temporarily. There are two levels of Staging.

Level 1 Staging

Level 1 Staging is used to control the first alarm or initially-dispatched units.

Have you ever responded with three to six pieces of apparatus to find a pot of food burning on a stove? All apparatus park right in front of the dwelling. Personnel from those units trek through the house, over the white carpet, to see the burned food. What a mess we are creating!

Or, your department has the problem of companies assigning themselves on arrival (freelancing).

Or, you are the IC and all the responding units are calling you for assignments at this working fire. You are not ready to make assignments yet, but they keep calling you every 20 seconds until you give them an assignment or they assign themselves.

You can eliminate all of these problems by establishing within your SOGs a policy of Level 1 Staging.

As determined by department policy, only one or two pieces of apparatus can go directly to the scene (excluding chief officers). Any other unit responding must stop one block from the incident in the direction of travel, and report its location. For example, the Engine 2 officer calls Command and states "Engine 2, one block west." Now Engine 2 can get to the incident scene only on an order from Command.

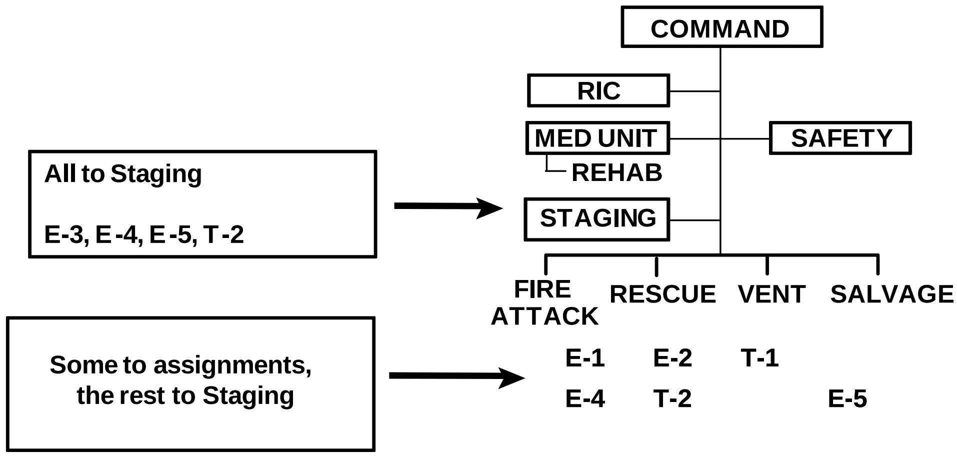
What if you do not get an assignment soon after staging at an obvious working incident? Wait two minutes, then call the IC again, stating "Engine 2, one block west." If after two additional minutes you do not receive an assignment, walk to the ICP and advise the IC that you are ready for an assignment. After receiving the assignment, call the apparatus by radio and tell them what to do and where to meet you.

Level 2 Staging

Level 2 Staging is a location to which all second or greater alarm or mutual-aid companies report. The Staging location should be announced when the additional resources are dispatched. This is the cue to establish the Staging Area Manager function.

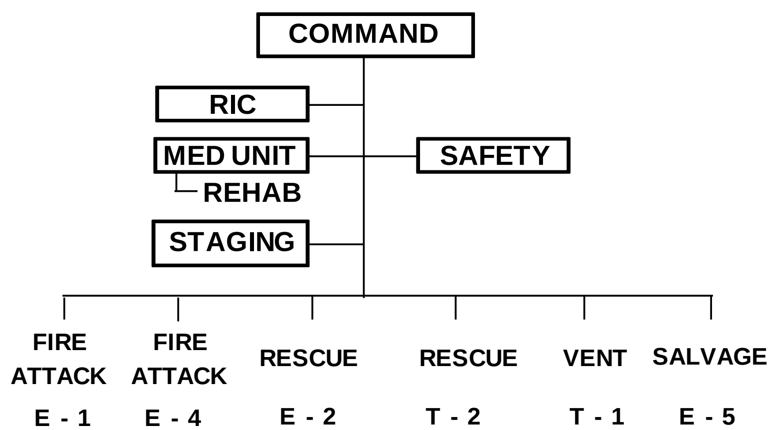
For example, at the grocery store fire discussed earlier, we will add three engines and one truck. How will we distribute these resources as they arrive at the incident scene?

All could be allowed to respond directly to the Staging Area, or some could receive assignments while en route. Those not receiving assignments would go to Staging.



Span-of-Control

Now, we place both alarms on the ICS organization chart.

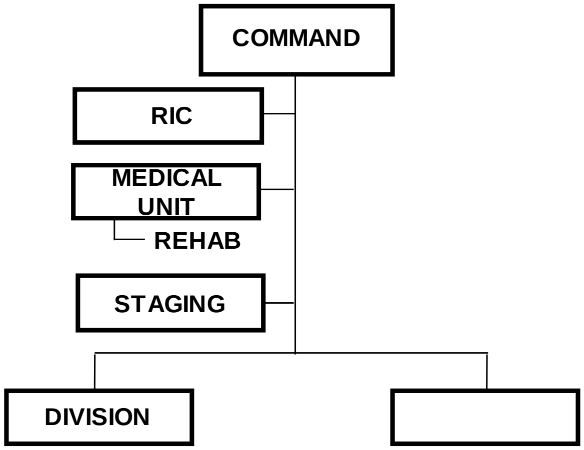


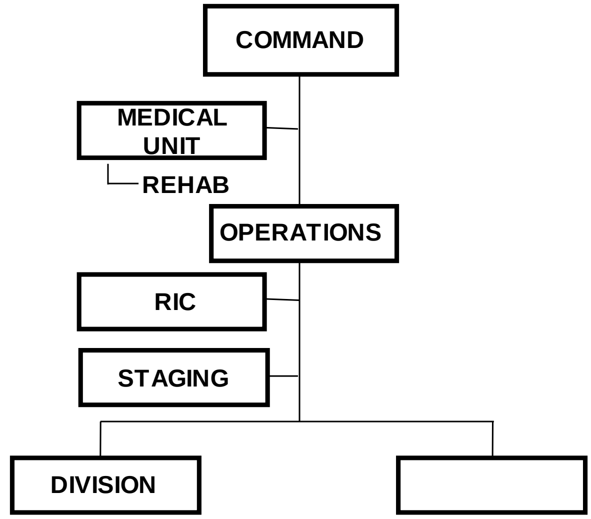
What is wrong with the organization?

Divisions and Groups

<u>Divisions</u>

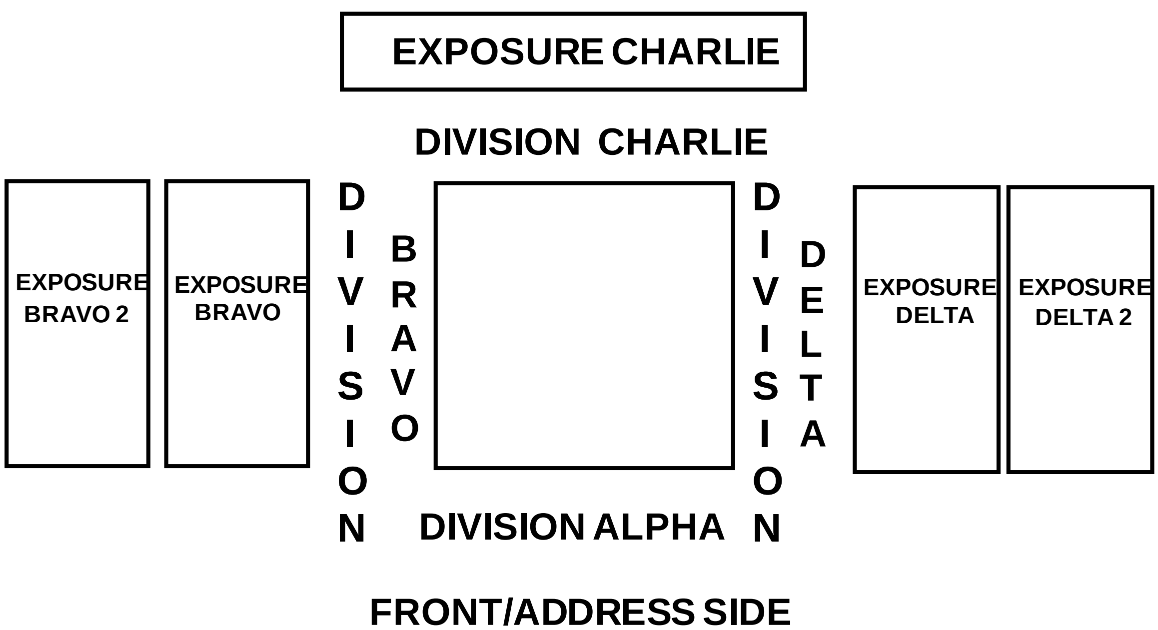
A division is responsible for operations within a defined geographic area. This area may be a floor in a building, the rear of a fire building, or a section of a brush fire. This is the level most often employed during routine fire department emergency operations.

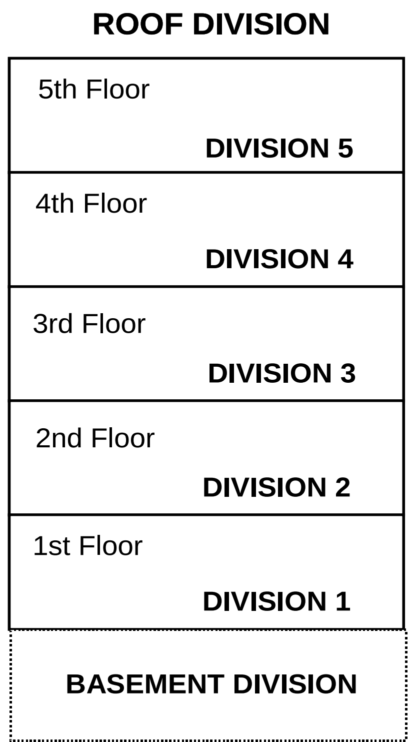




ABCD/Dividing the Incident Scene

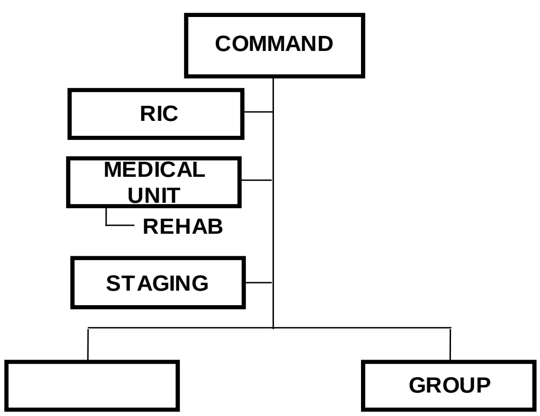
To use division terminology effectively, a department must use a standard system.

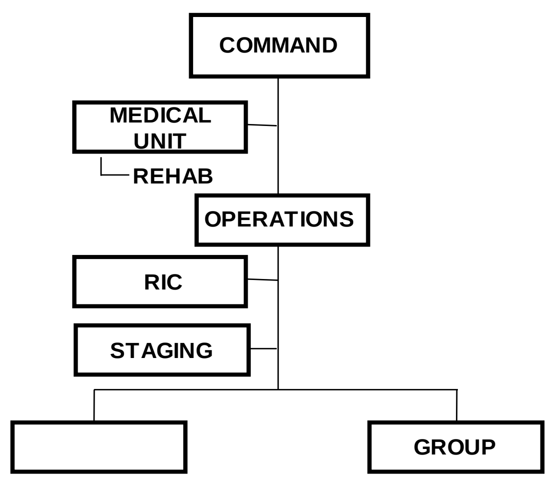




Groups

Groups generally are assigned to a specific function such as ventilation, search and rescue, water supply, etc.





Groups are responsible for an entire job wherever it may be required; therefore, they work across division lines. This being the case, Group Supervisors **must** coordinate with the Division Supervisors when they enter a division or perform work that will affect division personnel, operations, and safety. Groups should do nothing in a division without prior consultation with the Division Supervisor.

Division and Group Supervisors are at the same power level in the ICS. Divisions cannot report to groups, and groups cannot report to divisions.

Application of Division and Groups

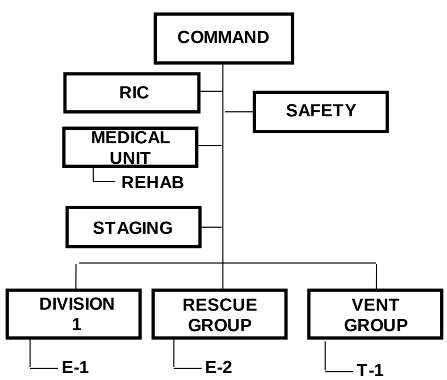
Divisions and Groups

The terms division and group are common designators used by the U.S. fire service to define tactical-level management positions in the Command organization. Divisions represent geographic responsibilities such as Division C (the rear of the facility). Groups represent a functional (job) responsibility such as the Ventilation Group.

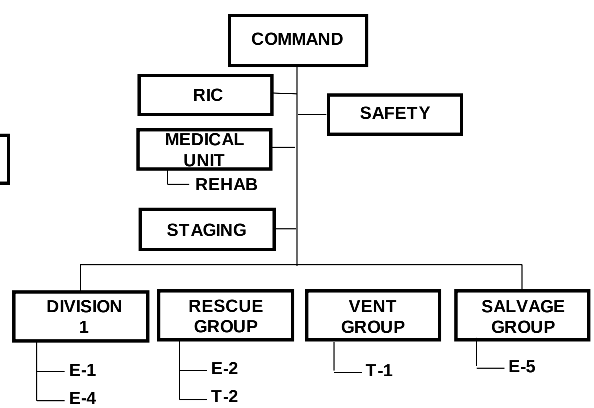
When initial assignments are ordered to incoming resources, the IC should begin assigning Company Officers (COs) to appropriate division and group responsibilities. By doing this at all small incidents, the department is preparing itself to manage effectively the resource-intense incidents that occur much more sporadically.

Note: The term sector was used by many departments in the United States. This term is no longer recognized by NIMS. It has been replaced by Divisions or Groups, which are generic and can be used to represent both geographic and functional responsibilities, such as Division C and Ventilation Group. The National Fire Academy (NFA), due to the need for consistency and application during activities and simulations and a prior agreement with FIRESCOPE, will use the terms division and group in all its courses.

Remember the grocery store fire? Here is a better way to set up under ICS. This is what we mean by establishing a habit of operation that will set the organizational foundation when you have a more serious situation.



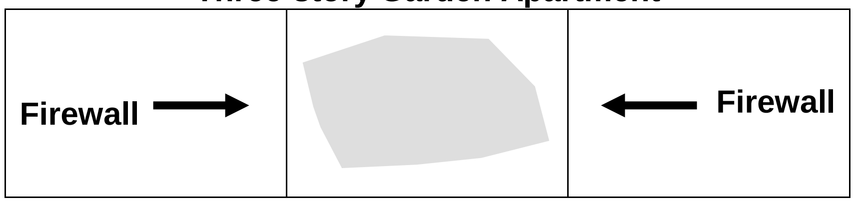
Initial Arrival



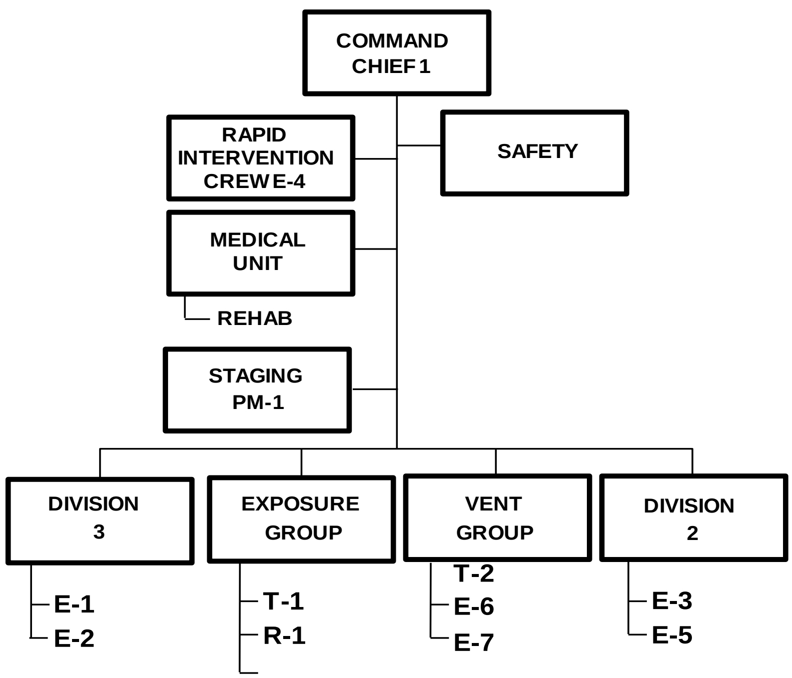
Additional Units

Let's look at a three-story garden apartment fire. The center section of the structure is well involved at the attic and third-floor levels. Seven engines, 2 trucks, and a rescue unit have arrived; approximately 38 personnel, or 10 crews. Other units are responding. Engines carry four people; four on trucks; and two on rescue units.

Three-story Garden Apartment



Center section 50- to 75-percent involved
3rd floor and attic



E-1 arrives. The officer gives a brief initial report and directs the E-1 crew to attack the fire with a 1-3/4-inch hoseline from the third floor and conduct a primary search on that floor. The officer assumes Command. Command requests a second and third alarm. Safety Officer arrives and assumes safety duties.

E-2 arrives. Command directs the Officer of E-2 to assume Division 3. Command assigns E-1 crew to Division 3.

T-1 arrives. Command directs T-1 Officer to assume Exposure Group and stop the fire from spreading past the firewalls on Sides B and D. Exposure Group requests one additional engine and one additional truck.

PM-1 arrives and is assigned Level 1 Staging.

Chief 1 arrives. Chief 1 assumes Command and retains the officer of E-1 to assist at the ICP.

E-3 arrives. Command directs E-3 Officer to assume Division 3 and to complete a primary search and check for downward extension.

E-4 arrives. Command directs E-4 Officer to be Rapid Intervention Crew (RIC).

T-2 arrives. Command directs T-2 Officer to assume Vent Group and perform horizontal ventilation where needed.

E-5 arrives. Command directs E-5 to report to Division 2. Division 2 requests one additional company.

E-6 arrives. Command directs E-6 to report to Vent Group. Vent Group requests one additional company.

R-1 arrives. Command directs R-1 to report to Exposure Group.

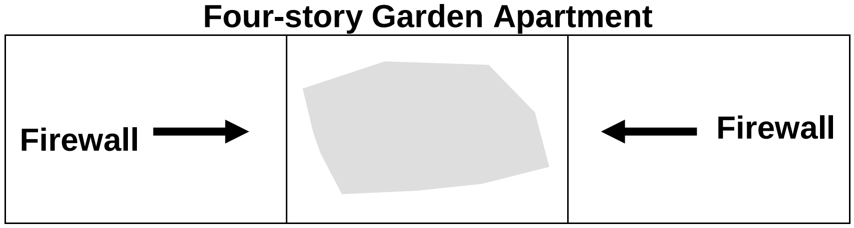
E-7 arrives. Command directs Engine 7 to report to the Vent Group.

Staffing the Operations Section Chief Function

This position is staffed when Command's span-of-control is exceeded or when Command, due to other concerns, cannot focus full attention on tactical operations.

Let's look at a major fire in a four-story garden apartment. The attic and fourth floor are heavily involved. There are additional complexities at this incident. This is a larger building and fire area, and a nighttime situation. There are 48 displaced families, and the complex is served by a dead-end water main resulting in very poor water supply. It is February in a northern State. There is only one access road into the apartment complex. There is no vehicle access to the rear.

Four-story Garden Apartment

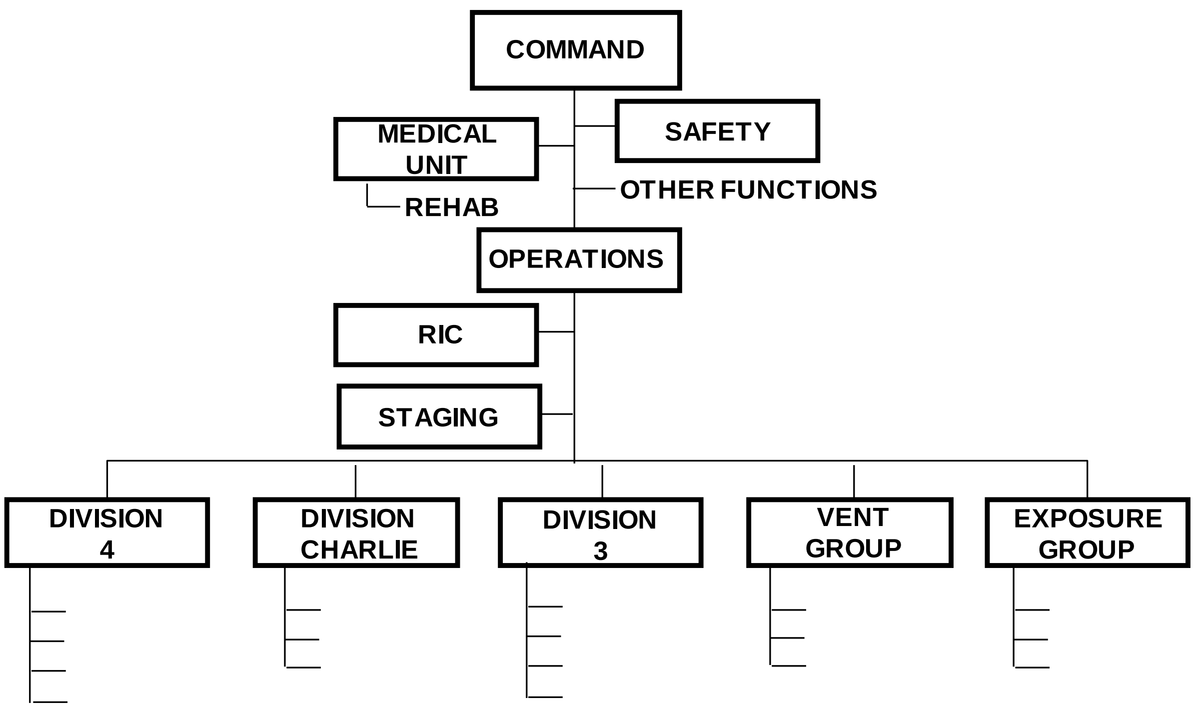


Center section 50- to 75-percent involved
4th floor and attic

Command is faced with many problems:

- planning;
- relocation of and care for displaced residents;
- liaison with other agencies;
- initial water supply problems;
- logistics for fire and EMS units;
- limited access to complex;
- no vehicle access to rear; and
- nighttime fire.

Command chooses to staff the Operations Section Chief function.



E-1 arrives. The officer gives a brief initial report and directs the E-1 crew to attack the fire with a 1-3/4-inch hoseline from the fourth floor and to do a primary search on that floor. The E-1 officer assumes Command. Command requests a second and third alarm.

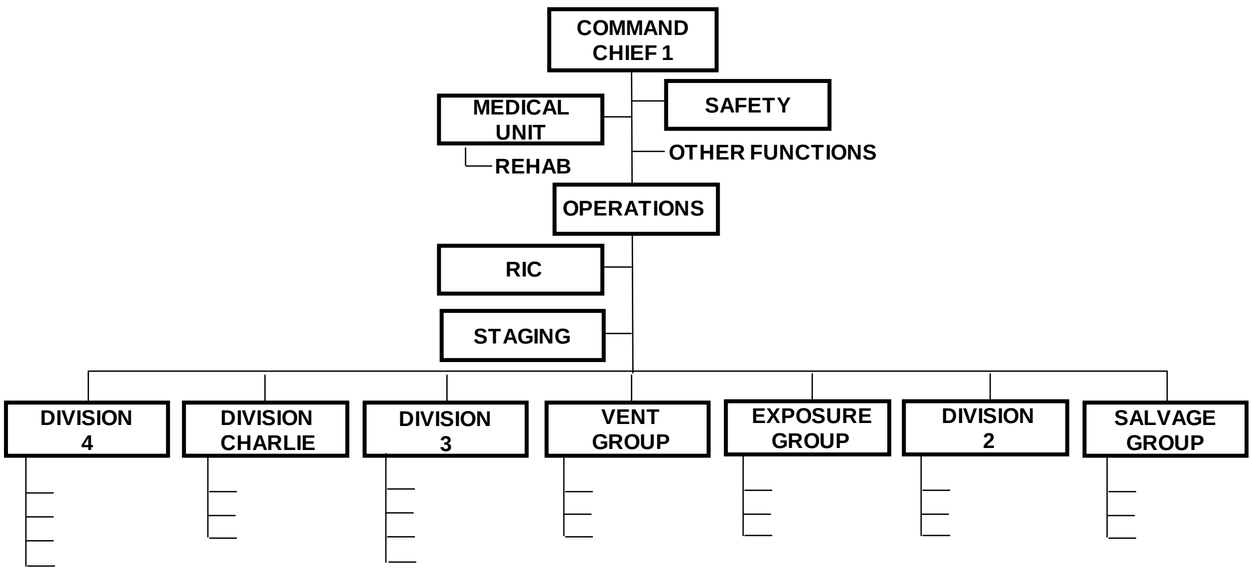
Command initiates Division 4, Division C, Division 3, Vent Group, and Exposure Group as the first and second alarm resources arrive.

Chief 1 arrives. Command is transferred and the Chief assigns the E-1 officer to Operations. With the need to deal with the 48 families, the poor water supply, and access problems, Command cannot continue to be involved with tactics. Command must step back and handle those other problems while Operations handles the tactics.

We could have assigned the E-1 officer to Planning/Logistics, but our goal here is to show how to establish Operations. Also, another Chief Officer arriving on the scene could have been assigned Operations.

Branch Director

At the four-story apartment fire, Operations wants to add a Division 2 and a Salvage Group.



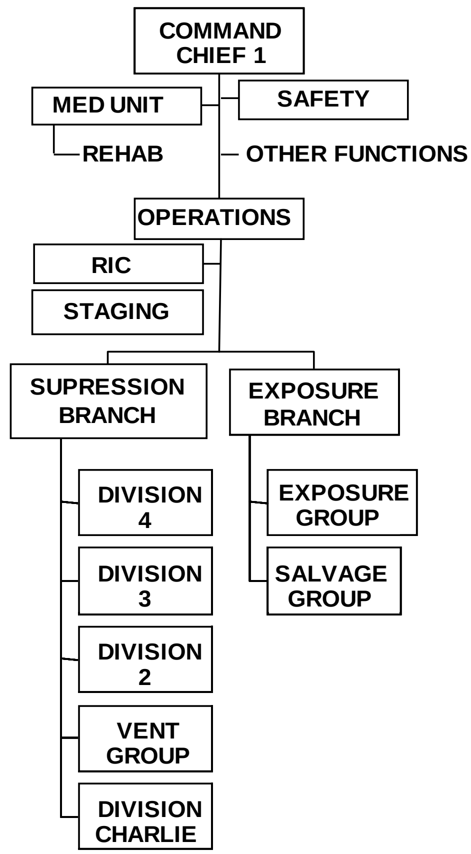
What has happened to the Operations Chief? The span-of-control now exceeds the optimal. This cannot be justified before an incident is brought under control.

Command could have experienced the same span-of-control problem if the Operations Section Chief had not been staffed.

Branches

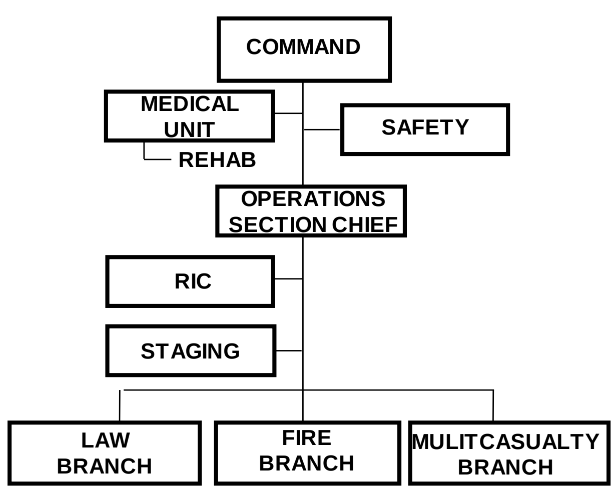
Functional Branch Structure

When the nature of the incident calls for a functional branch structure, e.g., a major aircraft crash within a jurisdiction, three departments within the jurisdiction (police, fire, and health service) may be organized into a functional branch structure operating under the direction of a single Operations Section Chief. In this example, the Operations Section Chief is from the fire department with branch directors from all three departments. Other alignments could be made depending upon the jurisdiction's plan and type of emergency. Note: Command in this situation could be either Single Command or Unified Command, depending on the jurisdiction.



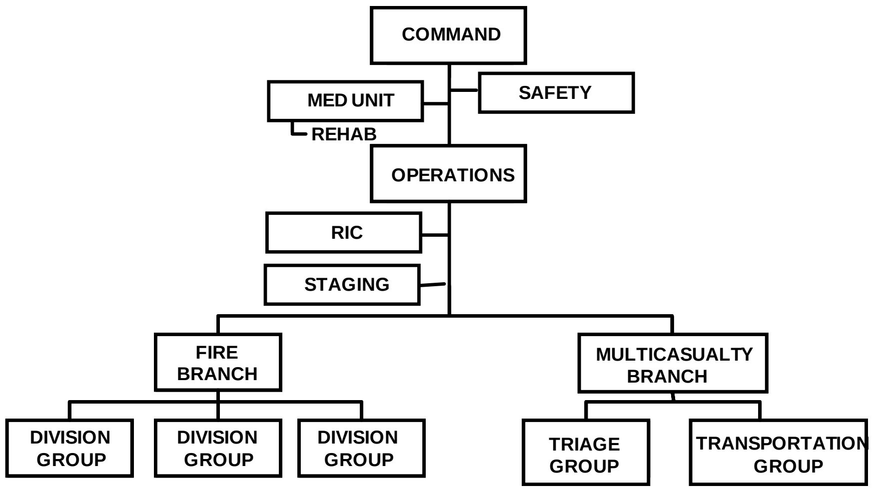
The organizational chart above shows the result of creating branches on Command's span-of-control. Did the Exposure Branch need to be created for span-of-control reasons?

Functional Branches



Multijurisdictional incidents: When the incident is multijurisdictional, resources are managed best under the agencies which have normal control over their local resources.

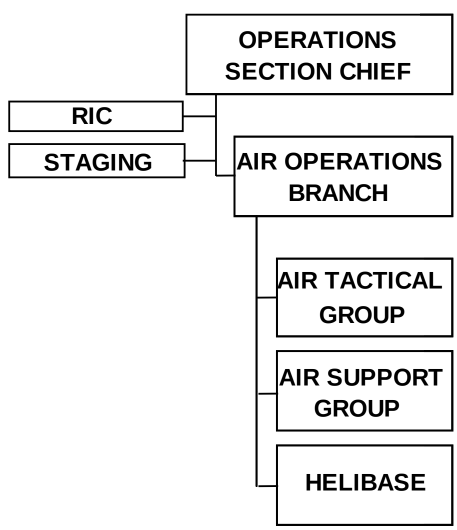
Branches should be used at incidents involving two or more distinctly different major management components (e.g., a large fire with a major evacuation; a large fire with a large number of patients). The IC may elect to assign branches to forward positions to manage and coordinate activities, as illustrated in Figure 2.



Multibranch

When the incident requires the use of aircraft, such as for the transportation of victims from a multicasualty incident, highrise rooftop rescue, swift water rescue, or wildland fire, the Operations Section Chief should establish the Air Operations organization. Its size, organization, and use will depend primarily on the nature of the incident and the availability of aircraft.

Air operations are complex operational elements. Air operations must be closely coordinated and fully understood by the IC and Operations Section Supervisors. For more information, see Figure 3 in the Student Manual (SM) Appendix.



Note: For more detailed information, review the Field Operations Guide located in the Appendix.

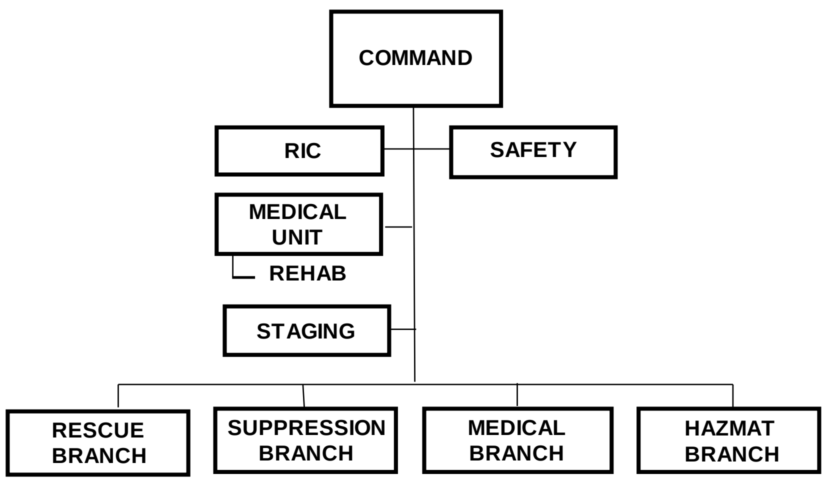
Incident Command System Functions Normally Staffed

Normally, the functions are staffed in the following order:

- Command;
- Divisions and Groups;
- Operations; and
- Branch.

Complex Incident Branch Organization

When an incident is already complex when first units arrive, and has a probability of having a large ICS organization, the initial IC should start at the branch level instead of the division and group level.



TWO-IN/TWO-OUT

Occupational Safety and Health Administration (OSHA) requires that a **minimum** of four firefighters be on location and in full turnouts, including self-contained breathing apparatus (SCBA) whenever firefighters are in the Immediately Dangerous to Life and Health (IDLH) area, meaning there are toxins or toxic products of combustion.

This requirement is waived when there is a known rescue situation. This means that there must be a **known** situation where the victim(s) is in the structure. A primary search for possible trapped victims does not fit this exclusion of rule.

The firefighters on the outside must be in full gear and SCBA and be ready to act to enter the structure should something go wrong. These personnel may be doing menial tasks on the outside, but must be ready to enter the structure at a moments notice.

RAPID INTERVENTION CREW

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program* requires having specifically designated rescue crews at the incident scene. This requirement is based on the realization that firefighters are exposed to the highest risk of injury or death while operating at the scene of an emergency and that one of the most effective mechanisms for reducing that risk is to have an RIC ready to come to the assistance of emergency personnel should the need arise.

One of our primary concerns should be to reduce the risks that our firefighters are exposed to during emergency operations. It is not realistic, however, to assume that all the risks can be avoided, controlled, or eliminated from the firefighter's environment. We realize that danger is part of our work environment, and the possibility that things can go wrong must always be considered. Recognizing this possibility, we must make some provisions to assist members who find themselves in trouble.

An important aspect of incident management is to identify the risk characteristics of the situation and to evaluate specific risk factors that apply to each activity. A situation involving a high level of risk requires a greater commitment to rapid intervention for the rescue of emergency personnel should something go wrong. An interior fire in a small, single-story building presents a certain level of risk to the firefighters who enter to search for occupants and to extinguish the fire. While a situation may appear to be routine, there are still things that could go wrong and place firefighters in imminent danger. A flashover could envelop them in flames, a structural collapse could trap them, or a faulty SCBA could cause a firefighter to run out of breathable air. In a small, single-story occupancy, the chances are fair that firefighters could extricate themselves from most situations if they are a short distance from an exit that leads directly to the exterior.

The same fire situation in a large building; a basement; an upper floor; in the hold of a ship; or in a highrise building presents a much greater danger. Simply because, in these areas, the ability of individuals to rescue themselves is reduced by the distance they would have to travel to reach a safe area and the difficulties they might encounter along the way.

The risk also may be increased by the nature of the task in which firefighters are involved. Rescuing an unconscious worker from a confined space that is filled with toxic and flammable vapor is much more dangerous to rescuers than removing an unconscious person from a wrecked automobile on a city street. Both situations involve a degree of risk to the rescuers, but the nature and degree of the risks are very different.

The composition and placement of RICs may be somewhat agency-specific, dictated by individual needs and resource availability. However, it is important that written procedures/guidelines be developed for the use of these crews, especially when they are performing exterior operations in support of interior crews. These written procedures also should include evacuation signals and guidelines for implementing evacuation and relocation of personnel from the area of danger. In addition, for agencies involved in auto/mutual-aid response, it is important to develop consistency among the participating agencies in the use of RICs.

A RIC should consist of a minimum of two members, fully equipped with appropriate clothing, SCBAs, portable radio, and necessary tools to be effective. Also, it should monitor the tactical radio channel to maintain a complete and accurate understanding of operations and changing conditions as well as location of tactical personnel. This information should be documented on a tactical worksheet by a member of the RIC. In the early stages of an incident, RIC personnel may perform other functions, e.g., secure utilities, flake-out hoselines, work in the Command Post (CP). However, they must remain prepared to redeploy to perform rapid intervention functions. As the incident expands in size or complexity, personnel should be assigned as a **dedicated** RIC. Placement of the RIC may depend on the incident; for example, in a highrise operation, the RIC should be located in Staging. In many other situations, a good location would be near the ICP or close to Operations. It should not be located in a position that would interfere with ICP operations. If the incident covers a large geographic area, more than one RIC may be required.

In a haz mat operation, the Entry Team Leader must ensure that there is a RIC of at least two personnel in the appropriate level of protection before the primary entry team accesses the hot zone. In a haz mat operation, this team is designated as the Backup Team. The personnel of the Backup Team need to have the same level of required technical competency as the Entry Team. This includes the appropriate level of protection required for the material(s) involved.

While there is some flexibility in procedural issues regarding rapid intervention, it is paramount that whenever personnel are operating in positions or performing functions that would subject them to immediate danger, such as equipment failure, or other unexpected occurrences, at least one properly-attired RIC must be available to provide assistance or rescue.

Rapid intervention procedures should not be confused with initial interior structural firefighting operations addressed in NFPA 1500. NFPA 1500 requires the presence of four personnel before beginning interior structural firefighting. Two members operate in the hazardous atmosphere, while the other two members are the rescue team outside the hazardous atmosphere. If there is an immediate life safety situation, rescues may be initiated, but members should carefully evaluate the level of risk that they would be exposed to by taking such actions. If it is determined that the situation warrants such action, incoming companies should be notified so that they will be prepared to provide necessary support and backup upon their arrival. When waiting to be deployed, members of the RIC may be assigned to other tasks, e.g., pump operator or initial IC, as long as these other activities do not interfere with their ability to respond as a RIC.

Example: A chief officer with two engines and one truck is operating at a structure fire. A portion of the second floor collapses. This information is transmitted to the IC. At this point, a likely scenario is as follows:

- The IC activates a signal and, by radio, orders all personnel out of the building.
- A Personnel Accountability Report (PAR) is taken, and it is found that one member is missing. That member was last seen working near the collapse area.
- The RIC Team is directed to re-enter the structure, quickly assess its stability, recover the missing firefighter, and remove the member from danger.

SUMMARY

We have examined a model ICS in its entire spectrum. Such a system is useful not only on large operations, but also can and should be applied to any incident regardless of size or type.

A close examination of various incidents should reveal that nearly all the functions and duties discussed thus far have been carried out. The key point to remember is that all functions are carried out at every incident. It is the size and/or type of incident that dictates the degree to which each function is addressed. The resources available in terms of personnel will dictate how many functional responsibilities can be delegated.

Another vital consideration is training. Simply delegating a function or responsibility does not guarantee success in carrying out the appropriate responsibilities.

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Activity 2.1

Application of Basic Incident Command System Functions

Purpose

To use components of the ICS to develop an organizational structure for an emergency incident.

Directions

1. In small groups, determine the appropriate ICS organization for the scenario assigned.

2. Analyze the situation and develop an ICS organization appropriate for the situation and the resources involved. Use whatever number of apparatus/personnel you need to handle these incidents.

3. Each group will prepare an ICS organizational chart on easel pad paper and will have a spokesperson present its work to the class with a brief explanation of why that particular organization was developed.

4. You may use only the following ICS functional positions:

    a. Command.

    b. Command Staff (Safety, Liaison, Public Information).

    c. Staging.

    d. Divisions/Groups.

    e. Resource units (single resources, Task Forces, Strike Teams, and crews).

Scenario 1

Two-story center corridor boarding house, 35' x 70', ordinary construction--fire on two floors, heavy smoke, trapped occupants. Two-story exposure on Side B (building left of the telephone pole on the slide). No exposures on Side C or Side D. Stair shaft to the second floor comes up just behind the room where the heavy fire is showing. A second stair shaft is at the rear of the building.

Scenario 2

A two-story, end-of-row modern townhouse with a garage fire.

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UNIT 3: DECISION MAKING REVIEW

OBJECTIVES

The students will:

1. *Understand the difference between classical and Naturalistic Decision Making.*

2. *Know how to determine whether classical or Naturalistic Decision Making is the appropriate decision making model to use at a particular incident.*

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INTRODUCTION

This unit explains the difference between classical and Naturalistic Decision Making. It uses the Command Sequence to teach the classical methodology. The expert way of making incident scene decisions is cue-based. Therefore, this unit presents incident information in the form of cues that should trigger conclusions or actions to take or avoid. Throughout the unit, you will recognize that Naturalistic Decision Making is the most effective for the incident scene.

Brief Initial Report

All departments should have a standard format for the brief initial report (BIR). The standard format helps ensure that critical information is not missed. A good BIR provides necessary and specific information about incident conditions and actions. It provides other responders with sufficient information to allow them to prepare themselves for specific conditions.

The other responders can begin to prethink tasks that this incident might require. For example, the tactics used by a truck company at a basement fire are significantly different from those used at a first-floor, second-floor, or attic fire. Therefore, the responding truck officer has some incident specifics he/she can focus on, such as the fire location, the types of activities, tools and equipment needed, and priorities. This officer is now in a better position to provide immediate action on arrival.

The minimum information required:

- Description of location. The unit number, and on which side the apparatus is parked; who you are, and where you are inside a building; facility or area description; what you are sitting in front of.

- A description of incident conditions. Where the smoke and flames are coming from; what is leaking and how much at a hazardous materials incident; or the number and type of vehicles and discernible injuries at an automobile accident.

- The assignment and location of the first-in company. This information gives the location of your people so others do not accidentally do tasks that cause them harm. It provides an insight into what you believe is the most pressing priority at this moment.

- Assume Command or Transfer Command. This institutes the Incident Command System (ICS) immediately.

- Call for additional resources, if needed. If you need resources, do not wait. Every minute you delay in calling is another minute's delay in arrival.

- Assign other responding units. No company or crew should be allowed to go to work at the incident without receiving a tactic or task to achieve.

The BIR used in this course has the following format:

Engine ____ arrived at (address), building description, Side ____ of building. Describe incident conditions, e.g., fire and smoke conditions and apparent location. Tell what tactical operation your crew is doing. Assume and identify Command. Call for additional resources, if needed. Assign other responding companies.

Progress Reports

A fire department's communications guidelines should include communications necessary to gather and analyze information to plan, issue orders, and supervise operations. For example, a tactical-level officer should communicate the following:

- assignment completed;
- additional resources required;
- unable to complete the assignment;
- special information;
- Personnel Accountability Report (PAR); and
- operational location.

It is important for the Incident Commander (IC) to understand what is happening at an incident scene. Once orders are given to Company Officers (COs), Group/Division Supervisors, or Branch Directors, feedback is critical to that understanding. The items listed above allow the IC to understand effectively to what point the various operations have progressed. Through these reports, the IC can track what has been done or completed, what additional resources will be needed for any given assignment, when tactics have to be changed or modified to overcome an impossible task, and what special factors--safety and otherwise--need to be involved in the assignments.

Progress reports are essential to incident management. They allow for effective decision making and assist in prioritizing the commitment of resources. They also allow for effective refinement and revision of the action plan. To be effective, progress reports need to be timely, complete, and concise.

Progress reports should detail briefly where and what actions have been completed and where and what actions are being undertaken. For example, a Vent Group Supervisor directed to do vertical and horizontal ventilation may provide a progress report as follows:

- Vertical ventilation will be completed in about 5 minutes.
- Horizontal ventilation of the fire floor is completed.
- Ventilation of the floor above is just beginning.

Progress reports will occur with greater frequency in the early stages of an incident--typically every 5 to 15 minutes--or as major parts of the job are completed. An IC or Operations Section Chief must request progress reports from subordinate personnel on a periodic basis, when these reports are not given by those personnel. Some departments have the dispatch center announce time on location every 15 minutes to assist the IC with time-tracking and to act as a mind-jogger for the progress reports. It is important to ensure that, if time-tracking is done, emergency communication procedures are not overridden by these reports.

In catastrophic events using large numbers of resources and a large ICS organization, it is critical that the progress of operations be conveyed to all General Staff functions on a timely basis. Branch Directors must query their subordinate Group and Division Supervisors frequently as to the state of their operations. This information must be transmitted to the Operations Section Chief and upwards to the IC.

Without the progress report information, the IC, as well as Operations and Planning, will find their information processing ability lessened. Often they will initiate or recommend actions that are unneeded as well as untimely for the situation.

OVERVIEW OF INCIDENT SCENE DECISION MAKING

Two primary methods are used by incident scene decision makers to reach conclusions, determine results, and institute actions: the classical method and the Naturalistic Decision Making method.

The Classical Method

The classical method is a time-consuming process where the decision maker:

- gathers information;
- analyzes the information;
- determines the problems that are present and selects and prioritizes them in order of importance;
- determines and prioritizes the possible solutions;
- selects tactics from one or more possible options; and
- issues directives to have the tactics implemented.

The use of this system, also called the Command Sequence, can develop into a habit. When this happens, the Command Officer will tend to use the technique under unfamiliar emergency conditions, thus structuring the decision making process and reducing stress. Using the Command Sequence also helps the Command Officer stay proactive.

Decision makers need the classical method when they are in the training mode. In the training mode, they will be taught to look for cues, draw conclusions, consider results, and take action for an incident type not previously learned, or learned incorrectly. Whether the cues, conclusions, results, and actions are learned must be tested in an application format, such as a simulation. This training must be from an expert in the incident type: for example, an urban or city fire officer learning wildland firefighting from a wildland expert.

The classical process is used for evaluating and planning when time is not a factor.

The decision makers need the classical method when they are evaluating and comparing the critical cues used, conclusions and results determined, and actions taken by other decision makers. This form of training typically involves case studies. Here the student uses a case study to examine the obvious and subtle cue differences. The examination provides optional conclusions, results, and action sets based on those differences. By using a case study and the classical method, students are able to evaluate whether or not the cues match the conclusions and actions of the decision maker at the actual scene. If they do not, then specific actions to avoid also may be learned.

In addition, the classical method can be used at an actual incident scene where there has been little or no previous experience or training with the specific incident type. There also may be little or no experience or training with the variables that are present at the incident. The decision maker must formulate a basic plan before directing tactical actions. A process that does not include an evaluation of the incident information, risk-benefit analysis, and appropriate strategies and tactics, is not a plan. It is a design for disaster.

Base the plan on incident information (critical cues), real problems, and appropriate broad solutions (strategies). Choose the best solutions (tactics) from several options.

The Naturalistic Method

The Naturalistic Decision Making method is a more rapid and intuitive process in which the decision maker:

- looks for certain critical cues (visual, verbal, touch, smell);
- relates those cues to previous similar situations (from experience or training);
- recalls the previous conclusion, results, and actions that most fit the new situation; and
- issues directives to have the tactics implemented.

It is obvious that basing decisions on the understanding gained from previous experience can produce results much faster than following a step-by-step classical process.

The more experience the fire officer has on similar types of incidents, the greater that person's ability will be to read the subtle differences at the incident, draw refined conclusions, and direct the most appropriate actions to provide a solution.

Use Naturalistic Decision Making when the decision maker has adequate experience or training of the incident type, or the variables within the incident type. The Naturalistic Decision Making method is almost an instant recall of previously learned conclusions, results, and actions. It includes the interrelationships of specific information with conclusions, results, and actions based on whether or not they worked before. Therefore, it provides a direct, lightning-fast transition from what you see, hear, feel, and smell to what you conclude and what you do.

Time-Pressure Nature of Decision Making

Because of the time-pressure nature of emergency-scene decision making, the choice between Naturalistic Decision Making and classical will not be conscious. The decision maker's brain will attempt the Naturalistic Decision Making method first. This is the way the brain operates, even though it is not apparent to the person.

The decision maker must recognize when he/she possesses insufficient information to use this method. Some cues for this recognition:

- It is obvious to the decision maker that there has been little or no experience or training on the specific incident type.

- The decision maker recognizes that the incident cues are very unfamiliar and do not immediately result in appropriate action decisions.

- The decision maker feels lost or overwhelmed, cannot think, or is in a panic. In these cases, the classical method is the appropriate response.

This is an emotional response to the inability of the brain to find an answer or solution. By recognizing these emotional response cues, the decision maker can recognize that it is time to convert to the classical method. If this conversion is not done, the decision maker often is left with what has been called "brain-lock," panic, or "wish the chief was here right now."

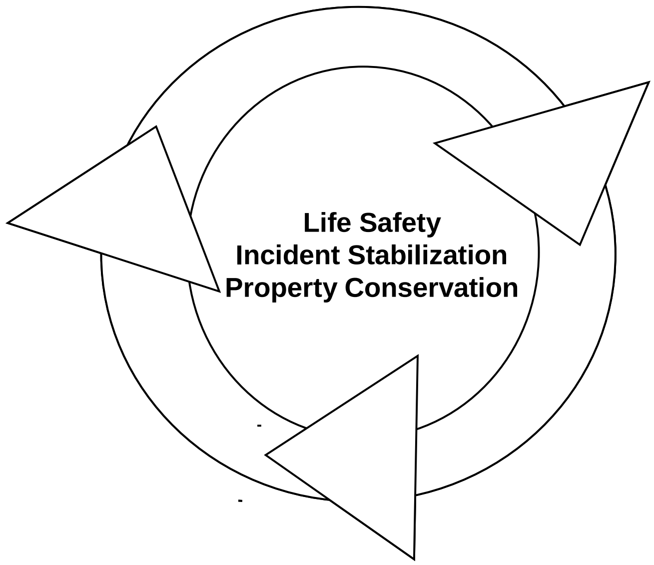
If Naturalistic Decision Making was used on the incident scene, the decision maker uses the classical method to evaluate actions to ensure that what is being done is achieving the desired result. This is continuing sizeup.

Remember that the classical method is primarily for situations where you have little or no experience with the incident type or are in the training mode.

THE CLASSICAL THOUGHT PROCESS--THE COMMAND SEQUENCE

The following discussion of the Command Sequence is an overview. If you need a course with an indepth explanation and reinforcement in the form of activities, take the 12-hour *Managing Company Tactical Operations: Decisionmaking* course offered by the National Fire Academy (NFA) and available through your State training agency.

The Command Sequence has three action steps, each with a specific result.

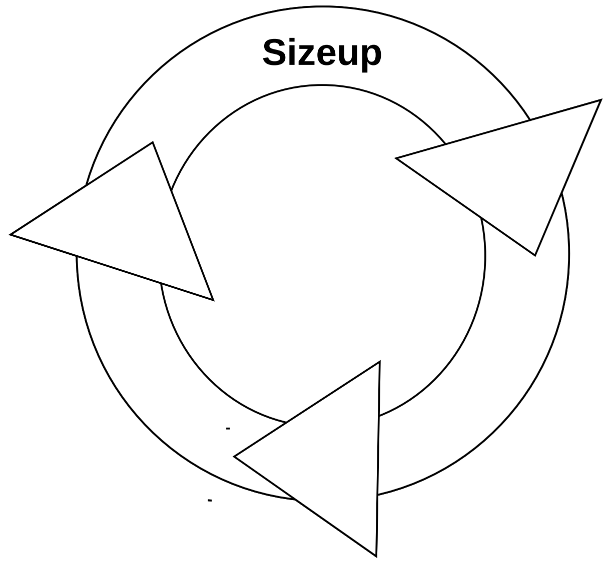


The Command Sequence emanates from the mission of the fire department. Incident priorities are the mission statements. The incident priorities are 1) life safety, 2) incident stabilization, and 3) property conservation. These describe why a fire department exists. Every action taken by the fire department must address one or more of these priorities.

The three action steps and specified results of the Command Sequence are

Action	**Result**
Sizeup	Problem Identification
Objectives, Strategy, and Tactics	Action Plan
Implementing the Action Plan	Tasks

Sizeup



Sizeup is the process of gathering and analyzing incident information that has an impact on decision making. We call this type of information critical cues. Sizeup leads to the identification of the problems at an incident.

Knowing where to look for these critical cues enhances the ability to identify the problems at the incident. The difficulty is gaining the knowledge and experience to know where to look and what to look for.

Sizeup Factors to Consider

Various authors use different elements to delineate the factors that affect decision making. One technique uses 13 points and has the acronym, **WALLACE WAS HOT**:

Water
Area
Life
Location/Extent
Apparatus/Personnel
Construction
Exposures

Weather
Auxiliary appliances*
Special hazards

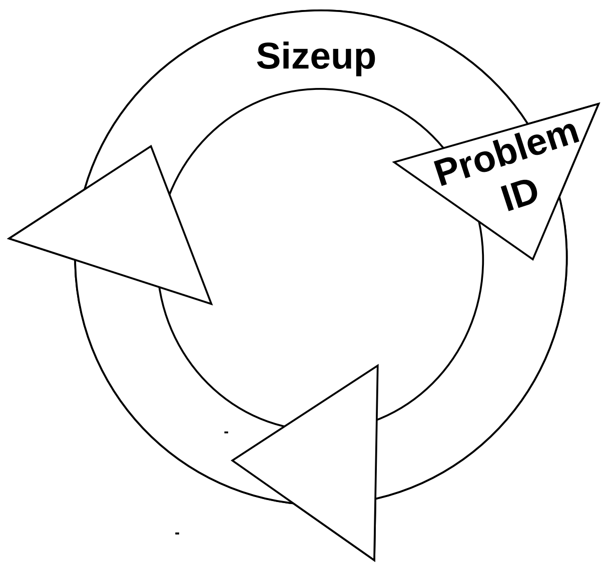
Height
Occupancy
Time

*Standpipes, sprinklers, heat detectors, etc.

These 13 points are specific enough to encompass emergency incident scene factors, yet broad enough to fit almost any type of incident. The acronym, once learned, will help you recall these topics. However, most people find that it is impossible to process this many items while en route to or standing in front of an incident scene. The most appropriate use of **WALLACE WAS HOT** is for training, especially training that involves learning the critical cues for handling a specific incident type, and in prefire planning (with the exception of location and extent, time, and weather).

You must commit these factors to memory. The brain will use this information as you attempt to gather critical cues. Having these factors in long-term memory allows the brain to access the data.

Problem Identification

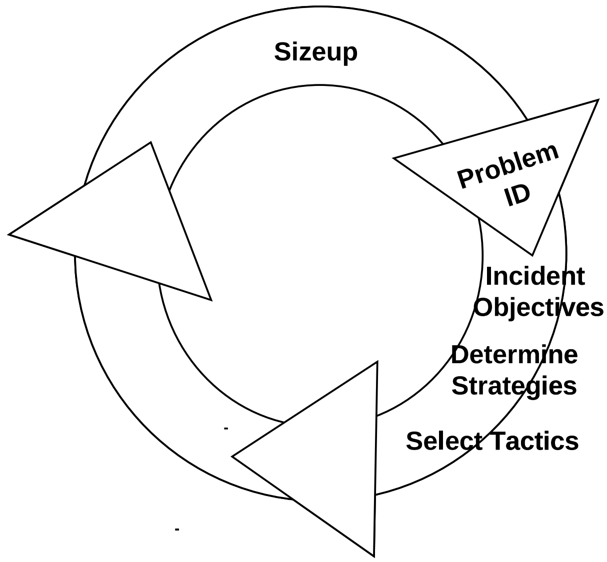


Problem identification is the goal of sizeup. Mental analysis and comparison of incident cues is the basis for problem identification.

Once the problems of an incident are identified, the correct solutions may be determined and applied. Now the planning process can begin.

Not all problems are visible to the naked eye. Use your experience to "see" those that are not visible.

Establish Objectives and Determine Strategy



Incident Objectives are statements of guidance and direction necessary for the selection of appropriate strategy(s) and the tactical direction of resources. Incident Objectives are based on realistic expectations of what can be accomplished when all allocated resources have been deployed effectively. Incident Objectives must be specific, measurable, action oriented, reasonable, and time sensitive (SMART).

Incident Objectives for a simple dwelling fire could be

1. Remove/Protect all occupants from fire, smoke, and toxic gases.

2. Keep fire from spreading and put it out.

3. Remove smoke and toxic gases from the structure.

4. Care for any injured civilians or firefighters.

Strategy is the overall plan that will be used to control the incident. Strategy delineates the broad goals, defines "**what**" must be done to provide a solution to the problems, and is the basis for action planning.

Strategy gives direction to get you from where you are to where you want to be. Strategy may have multiple components to gain control of an incident. Strategy evolves directly from the Incident Objectives, and is the beginning of the solution to those problems. Strategy will have several components to gain control of an incident.

Generally, Command Officers use Lloyd Layman's seven factors to provide a basis for the development of strategy for structure fires:

Rescue

Exposure

Confinement

Extinguishment

Overhaul

Ventilation

Salvage

Remember these factors by using the acronym **RECEO VS**. Typically, ventilation supports one or more of the other strategies.

A well-defined strategy gives incident personnel a clear description of the IC's plan and helps them accomplish it. The IC must determine strategy before he/she develops an action plan. Having a strategy indicates that critical cues have been gathered and assessed, and problems have been identified. The IC also has completed an evaluation of resource requirements and availability and has set priorities. Planning has begun.

Selecting Tactics

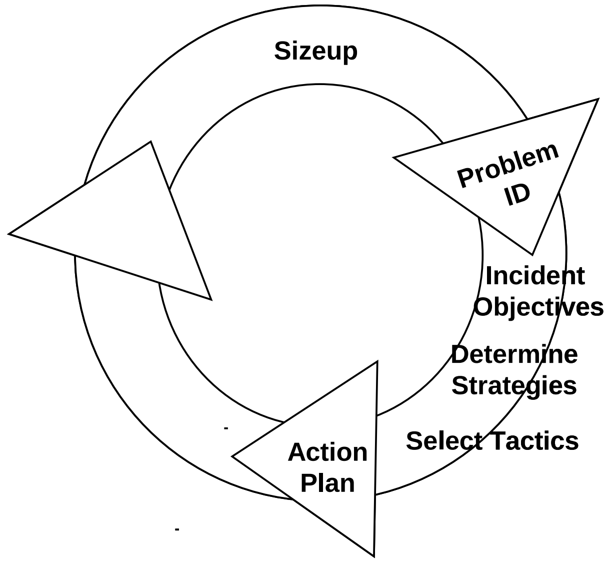
Tactics are the operations that must be completed successfully to accomplish the strategy. Examples of selected tactics:

- confine fire to room of origin (confinement strategy);
- conduct a primary search (rescue strategy);
- protect the stairway (rescue strategy);
- provide horizontal ventilation (rescue and confinement strategies); and
- check for extension (confinement strategy).

Tactics based on the strategies will guide the operational performance required of the companies or crews.

Tactics are the "how" of the solutions to the problems. The IC prioritizes the tactical order of activities. The order is dependent on the priorities of the strategies. Tactics are measurable and specific and can be completed within a designated time.

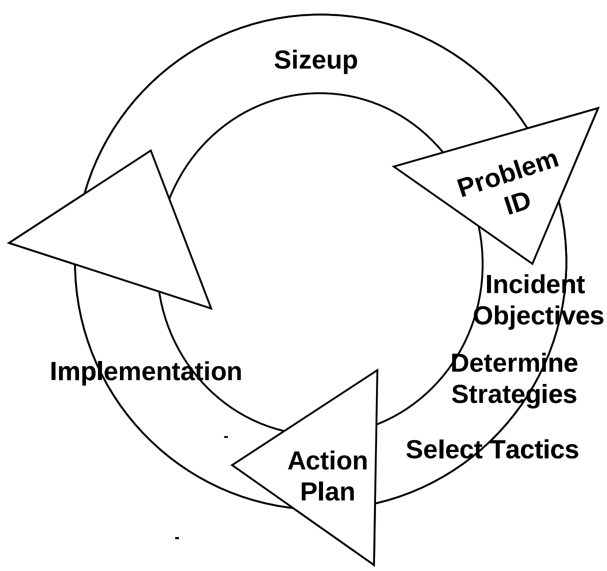
The Incident Action Plan



The determination of strategies and the selection of tactics is the second action step and the first part of the action plan. Strategy describes the "what" of incident solutions. Tactics define "how" the strategies will be achieved.

The action plan, often called an Incident Action Plan, or IAP, is the result of having done the strategies and tactics part of the Command Sequence. The IAP delineates the "who, where, and when" of the solution.

Implementation



Resources need to know their part of the plan. Directives are issued to the resources delineating their "tactical operation," and the "where," and "when."

IAPs are not necessarily completed before orders are given; however, the IC must be sure that the actions ordered are not "knee-jerk" reactions, but rather part of a good plan.

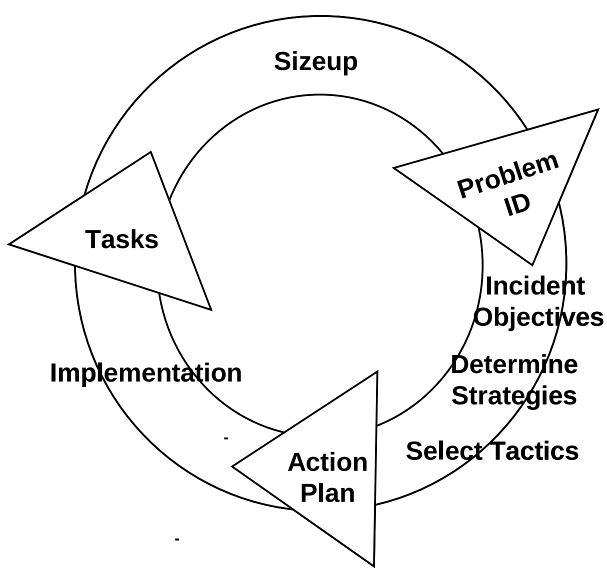
Directives define tactics that must be completed to achieve the IAP strategies.

The IAP also must define the ICS organizational structure for the operating forces. Adequate resources must be assigned for tactics to be successful. A Communication Plan defines the operational channels for the incident. For normal incidents, most departments use a pre-established channel or channel set, and the Communications Plan is a habit. However, when incidents evolve into major situations, the Communication Plan may need modification. A Medical Plan also must be part of the IAP, explaining how emergency medical care will be provided to care for injured response personnel.

Effectiveness of the IAP must be established. Additional information must be gathered and analyzed. Modification or updating may be done to improve the effectiveness of the IAP. Ongoing progress reports from subordinates allow the IC to modify the action IAP effectively. This is part of the continuing sizeup.

Tasks

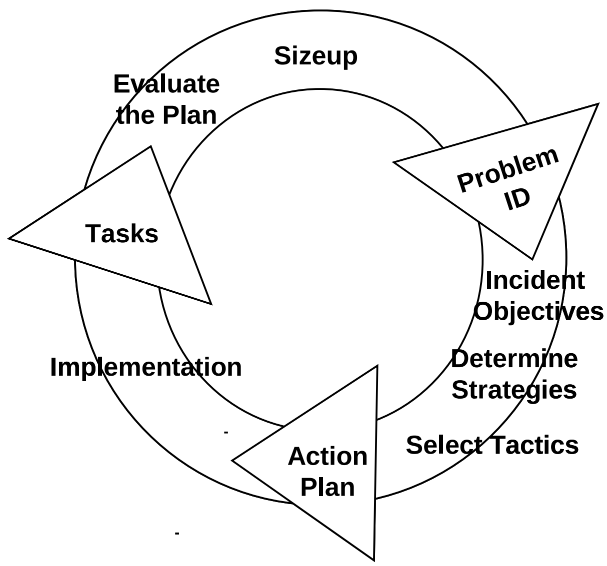
Performing the tasks required for tactical operations is the third outcome. Crews perform specially learned manual tasks that, when completed, achieve or help to achieve a tactic. Performance of tactical operations cycles back into the first action step: sizeup.



It is absolutely critical that the IC have a rational plan of initial action before starting tactical operations.

Going through the Command Sequence process helps to ensure that critical areas are not overlooked. The process makes you think before you act. It helps keep the IC in a proactive mode and gets him/her ahead of the time curve. The Command Sequence helps to ensure that critical cues are not overlooked. It can be used at any type of unfamiliar incident because it provides a logical thought process to follow.

The Command Sequence is a continuous process that starts with the first-in resource and doesn't end until the last resource leaves the scene. After the initial sizeup-to-tasks steps have been done by the IC, the process starts over again. However, it now starts with a re-evaluation of what the IC has already implemented to see if any of the incident dynamics have changed. Then, the IC is back to a second time through the Command Sequence starting with sizeup.



SUMMARY

Command presence is a vital part of the responsibilities of a Command Officer. The Command Officer must possess effective personal communications skills to be effective at an emergency incident. Unity of Command is a critical concept that, when applied to emergency incidents, helps to prevent confusion. An effective BIR is required to prepare other arriving officers for incident conditions. A Transfer-of-Command methodology is a requirement for incident scene continuity and safety. When the first-in officer is personally involved in a task, he/she should transfer Command.

There are two types of incident scene decision making--classical and Naturalistic Decision Making. Command Officers must understand when each is the preferred method.

UNIT 4: WALKTHROUGH SIMULATION 1: WAREHOUSE

OBJECTIVES

The students will:

1. *Know the mechanics of performing a simulation.*
2. *Perform a walkthrough simulation to gain familiarity with the mechanics of simulations.*
3. *Know the fire departments and resources that are available for the simulation incidents.*
4. *Perform the simulations for each unit of the course as scheduled.*

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MECHANICS OF THE SIMULATION

Classroom

You will be in the classroom for the first part of this unit, then you move to the Simulation Lab area for the remainder.

There is a homework assignment you must read for the units that have a front load instruction on the following day's schedule. You are then to complete the two scenario questions with problems in your Student Manual (SM) for each simulation front load using your classroom table groups to do the work by consensus.

Complete **only** the two scenarios with problems using your classroom table groups; the rest of the material will be covered in class.

The next day in the **classroom** you will answer the two scenario and problem questions for each simulation assigned. The instructor will ask a specific student to give a specific answer to ensure that all participated in the homework assignment. Then the Strategy Prompter activity will be completed.

The walk-around slides will be shown, and the Quick Access Prefire Plan (QAP) will be completed. You have a blank copy in your SM for each simulation.

You will be given the simulation assignments, and the class will go the Simulation Lab.

Simulation Lab

<u>Fire Station</u>

The fire station will be located in the break room in the simulation building.

<u>Dispatch</u>

There is a room in the Simulation Lab for the Dispatchers.

<u>Staging</u>

Will be located in the unused classroom.

Radio Operation

There are two channels:

- Channel 1--Dispatch--stay on this channel until on scene.
- Channel 2--Tactical--switch to this channel after Dispatch places you on scene.

Staging also will remain on Channel 1. This is normally the Engine 5 officer. The Staging Area company's crew of one officer and two firefighters will be available for assignment. The Driver Operator must remain at the Staging Area to manage resources.

- All students will be issued a radio.

Dispatcher Responsibilities

- There will be two Dispatchers assigned on most simulations, depending on the number of students in a class.
- Review the Dispatcher Instruction.
- Review the Dispatch Prompter.
- Review the "Run Card."
- Dispatch the alarms as directed.
- Place each unit on the scene.
- Monitor both channels.
- Answer either channel when called by Command.

Facilitator Responsibilities

- One facilitator will be assigned.
- **Ensure that engine and truck company officers locate their apparatus on the plot/floor plan**. Making sure that every engine and truck with accompanying hoselines, ladders, and vent holes are shown on the transparency is critical to the Incident Commander's (IC) and instructors' understanding of the progress being made.

- Ventilation holes in the roof are depicted by a square or rectangle with an **X** within. Windows that are vented are shown by an **X** on the wall. **It is important that ventilation hole locations be shown accurately on the structure.**

- Add and remove "fire" at the direction of the instructor.

- Clean the transparency with water after the simulation and return it to an instructor.

Phantom Companies

- There are too few students to play all the resource roles that may be required in a simulation.

- Those resources without students will be represented by index cards with the unit numbers inscribed.

- These cards will stay in Dispatch. At the appropriate time, a Dispatcher will move the card to Staging.

- Staging will move the card as directed by the IC or Operations.

- It is **critical** that these cards move through the system, if the IC and the instructors are going to be able to monitor progress of operations.

- Some students who have noncritical roles may be given additional roles to provide more action in the simulation.

Assignment to Simulator Rooms

- When students receive an assignment, the instructors will direct each one to a specific operating location for the simulation.

- The typical incident scene views may be (we can use only four):

  - The front of the structure.

  - The "fire" side of the structure.

  - The rear of the structure.

  - One side of the structure.

  - The roof.

  - An interior view.

Communications Plan

- Channel 1--Dispatch and Staging.
- Channel 2--Tactical.

Typical Simulation Sequence

1. View walkthrough slides and plot/floor plan.
2. Complete a QAP of the facility.
3. Receive assignments from the instructor.
4. Pick up assignment identification vests and radio. Engine 1 and Engine 5 should have an index card showing their company number.
5. 1st alarm units proceed to the fire station. Remainder of class may stay in classroom to observe and hear what is occurring in Command Post.
6. Dispatchers proceed to the Dispatch Center.
7. Facilitator report to the simulation rooms chosen by the instructor.
8. Before dispatching the alarm, the students playing **Engine 1, Battalion Chief (BC)-1, BC-1 Aide,** and **facilitator** will be allowed to view the fire situation. The **Engine 1** officer will be allowed to develop the "Strategy Prompter" with assistance from an instructor. BC-1 will view the process and then track resources as Engine 1 assigns them after the dispatch.
9. Engine 1 and facilitator will remain in the Incident Command Post (ICP) during Dispatch. BC-1 and the Aide will return to the fire station before dispatch.
10. Dispatchers dispatch the alarm on Channel 1, using the prompter and the run card.
11. Dispatch places Engine 1 on scene using Channel 1.
12. Engine 1 acknowledges and remains on Channel 1.
13. Engine 1 is on Side A. Engine 1 may go to any other side, as desired.
14. Engine 1 gives the Brief Initial Report (BIR), assumes Command, and calls for additional resources, then switches to Channel 2.
15. Engine 1 has the facilitator place their apparatus on the plot plan along with hose lines.

16. All other units on first alarm, except chief officers and Safety Officer, when placed on scene by Dispatch shall switch to Channel 2, do Level 1 Staging, and report "Command from (Unit #), staged (compass direction)."

17. Chief officer, when told they are on scene, switch to Channel 2 and go to the ICP.

18. Engine 1 begins assigning the first-alarm units.

19. BC-1 arrives and proceeds directly to the ICP without stopping at Staging. The BC 1 Aide is assigned to Resource/Situation Tracking and Staging and is on Channel 1. Transfer of Command is accomplished. E-1 Officer remains at the command and communicates on Channel 2 after command is transferred.

20. A Level 2 Staging Area is established. All units on the second and greater alarms will proceed to Level 2 Staging when placed "on scene" by Dispatch. Chiefs do not stop at Staging; they go directly to Command after Dispatch places them on scene.

21. BC-1 continues assigning units and chiefs until relieved by D/C-1. BC-1 will be assigned as needed by D/C-1.

22. The D/C-1 Aide will be assigned as needed by D/C-1.

23. It is important to play your role. Each assignment necessitates a certain amount of thought. Do not create problems for Command that are not directed by the instructors.

24. The instructor will evaluate your actions and stop the simulation as appropriate.

FIRE DEPARTMENT OVERVIEW

The Central City Fire Department (CCFD) consists of 10 fire stations proportionally distributed. Each station has varying capability, both in number and in type of apparatus.

Response Patterns

First-Alarm Dispatches

One engine unit from each of the four closest stations, a truck or water tender, BC, paramedic unit, and Safety Officer.

Engine 1 responds with four personnel, all other engines and trucks also have four personnel. Most chiefs have an aide. Two personnel on water tender and on EMS units.

A water tender is dispatched in lieu of a truck on all alarms when the instructors choose to use a nonhydrant situation. In either hydrant or nonhydrant situations, the trucks or tender not dispatched are available for special call by the IC.

Additional chief officers are dispatched by the response card.

On some simulations, the response card will change to meet the needs of the simulation, e.g., a haz mat unit on haz mat incidents, or outside agency representatives where needed; a second truck on first and second alarms at highrise incidents, etc.

Instructors will monitor the haz mat-type simulations: Industrial, Transportation, Bulk Propane Facility, and Hazardous Materials Facility. These simulations require a haz mat student on HM-9.

Additional Alarms

One unit from each of the next three closest stations, a truck or water tender, and a BC.

Specialized Apparatus

All other specialized apparatus (air unit, additional medical units, rescue units, etc.) must be special called.

Other Mutual Aid

Liberty County has a combination fire department and normally can release the following resources for mutual aid:

- five engines;
- three trucks;
- three paramedic units;
- two ambulances;
- one rescue; and
- one haz mat unit.

The State police have two medivac helicopters available.

State forestry can provide

- two water-dropping helicopters;
- two air tankers;
- two hand crews;
- one dozer strike team; and
- two engine company strike teams.

Other Agency Representatives

The use of these assignments will be both simulation- and instructor-driven:

- city health department;
- city police department;
- State police department;
- State forestry;
- State Department of the Environment;
- U.S. Coast Guard (USCG);
- Environmental Protection Agency (EPA); and
- other.

Dispatch Center is referred to as Dispatch.

Clear text is used--no codes.

We will use the "Engine 1 **from** Command" communications method during the simulations.

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CENTRAL CITY FIRE DEPARTMENT RESOURCES

Fire Department Resources

Station 1	Engine 1, Water Tender 1, Paramedic 1
Station 2	Engine 2, Truck 2, Ambulance 2, Engine 21
Station 3	Engine 3, Rescue 3, Engine 31
Station 4	Engine 4, Engine 41, Water Tender 4, Ambulance 4
Station 5	Engine 5, Engine 51, Truck 5, Paramedic 5
Station 6	Engine 6, Engine 61, Water Tender 6, Ambulance 6
Station 7	Engine 7, Engine 71, Truck 7, Rescue 7, Paramedic 7
Station 8	Engine 8, Engine 81, Ambulance 8, Air Unit 8
Station 9	Engine 9, Engine 91, Haz Mat 9
Station 10	Engine 10, Engine 101, Truck 10, Ambulance 10

List of all units:

Engines	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 21, 31, 41, 51, 61, 71, 81, 91, 101
Trucks	2, 5, 7, 10
Water Tender	1, 4, 6
Rescue	3, 7
Ambulances	PM 1, A 2, A 4, PM 5, A 6, PM 7, A 8, A 10, PM 2, PM 3, PM 4
Air Unit	8
Haz Mat Unit	9

All Engines

750 gallons of water and 1,500-gpm pumps.
28-ft. ladder and a 14-ft. roof ladder.
1,000 ft. of 5-in. hose.
3 250-ft. 1-3/4-in. preconnect handlines.
1 1,000-gpm master stream appliance with a 350- to 1,000-gpm nozzle.
1 600 gpm portable master steam device in a rear compartment.
Thermal imaging cameras.
Paramedic Unit--2 firefighter paramedics with transport capabilities.

All Trucks

100-ft. rear mount aerial apparatus. T 5 is a tower ladder.
Ground ladders.

Water Tenders

All water tender carry 3,000 gallons of water and a front-mount 1,000-gpm pump.

Ambulances

Ambulances are basic life support units (BLS) (2 EMTs).
Ambulances are paramedic units (ALS) (1 Paramedic/1 EMT).

Air Unit

Carries 80 30-min. self-contained breathing apparatus (SCBA) cylinders with the ability to fill 50 additional.

Haz Mat Unit

7-person team of Hazardous Materials Technician personnel.
Full encapsulation capability.

Will need to be supported by decontamination crew from engine companies.

Other Agencies

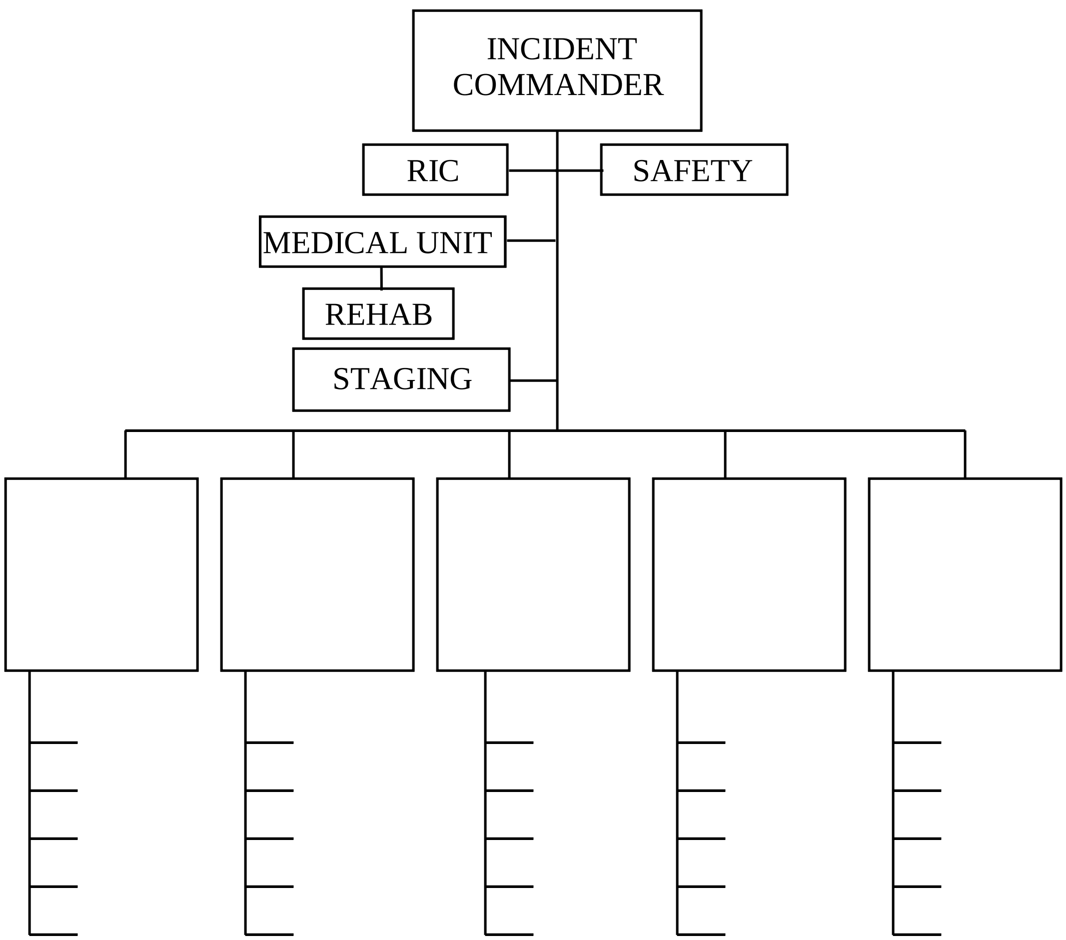
Health Department
State Department of the Environment
USCG
EPA
Emergency Management Agency
Local Police Department
State Police

Strategy Prompter

Overall Plan (Strategies):

Strategy Examples

Rescue
Exposures
Confinement
Extinguishment
Ventilation



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DISPATCHER INSTRUCTIONS

1. Depending on the number of students, one or two students are assigned as Dispatch.

2. Dispatchers should take three radios to the Dispatch room. Set them up on Channels 1 and 2.

3. Channel 1 is used for dispatching the alarms and placing the units on scene.

4. Channel 1 also will be used by Staging to communicate with the Incident Command Post (ICP).

5. Channel 2 will be the tactical channel.

6. Review the Response Card. An instructor will show you which are the last units staffed by a student. All other units will be represented by a set of index cards.

7. The Response Card also contains a time-delay arrival sequence for the arrival of units to the incident. An instructor will answer any questions you have on the sequencer.

8. For units represented by index cards, one of the Dispatchers must move the index cards to Staging when the arrival time on scene is indicated by the arrival sequence listed at the bottom of the Response Card.

9. After Engine 1 is placed on scene and gives the BIR, there probably will be a request for additional alarms and other units. **Before** dispatching the additional alarms, immediately place **all** other first alarm units on scene. The instructors will provide the arrival time delay from Level 1 Staging.

10. Answer Command on either channel.

11. Should units from other agencies be requested, like dump trucks from public works, the Dispatchers will write that unit name on an index card. There is a 20-minute delay before these outside units can arrive on scene. These index cards also must be moved to Staging at the correct time by a Dispatcher.

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FACILITATOR INSTRUCTIONS

You will do the following:

1. Ensure that each engine, truck, medic unit, or water tender draws their unit on the plot/floor plan laminated sheet.

2. Engine companies cannot place their handline(s) or master streams on the plot plan until 5 minutes after arriving at the operational location.

3. Truck companies must wait 10 minutes before showing their ventilation holes on the building roof. These are to be indicated by a square or rectangle with an **X** going from corner to corner. Horizontal ventilation is shown by an **X** on the building wall as the job is being done.

4. Should an engine company not be relieved before they have to leave to change self-contained breathing apparatus (SCBA) cylinders, their operating handlines must be removed from the transparency.

5. Keep both laminated sheets under your responsibility up-to-date with each other, as best you can.

6. **Remember that you are not to do the initial placement of apparatus, hoselines, and ventilation drawings. This is up to the company officers. You are to keep what they have drawn equal between rooms.**

7. Add or subtract the amount of fire, or any extension thereof, as directed by the instructors.

8. At the conclusion of the simulation, clean the laminated sheets with a spray bottle and towel, and dry them.

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STAGING AREA MANAGER INSTRUCTIONS

1. Situate yourself at the appropriate table in the Staging Area.

2. Review the Staging Check-in/Check-out sheet.

3. The Staging Area company's crew (usually E-5) is available for assignment. The Company Officer (student) will remain in Staging to manage this vital function. You should have two badges indicating your engine number.

4. As each company or resource comes to Staging, you will do the following:

   a. Fill in the Time Arrived and the Unit number.

   b. Keep Command continuously appraised of the number of units in Staging. You will simply give type of unit and how many, **no company numbers**. For example, "three engines, one truck, two medic units." Exception is when a "Par" is done and then give the unit designators.

   c. When Command calls you and tells you they want apparatus to be sent to specific location, you will tell Command what unit numbers are being sent from Staging to that location.

   d. You will write their Time-Out and Destination on the Check-in/Check-out sheet.

   e. Bring the Check-in/Check-out form to the Postincident Analysis.

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STAGING AREA MANAGER

CHECK-IN/CHECK-OUT FORM

Time-In	Unit #	Destination	Time-Out

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WALKTHROUGH SIMULATION PRIMER

SIMULATION 1--WAREHOUSE

Simulation Warehouse

A. Walk Around Slides:

Slide 4-1	Warehouse Simulation.
Slide 4-2	Sides A and D.
Slide 4-3	Sides B and C.
Slide 4-4	First floor.
Slide 4-5	Second and third floors.
Slide 4-6	Fourth through sixth floors.
Slide 4-7	First floor plan.
Slide 4-8	Second and third floor plan.
Slide 4-9	Fourth through sixth floor plan.
Slide 4-10	Roof plan.

Incident description:

A six-story, 120' x 120', heavy-timber warehouse. Floors 1, 2, and 3 have storage on them. Floors 4, 5, and 6 contain no storage. Both stair shafts exit at the roof level.

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Quick Access Prefire Plan

Building Address:
22nd and L Streets

Building Description:
120' x 120', six-story, heavy-timber construction

Roof Construction:
Beam and rafter, 2" wood decking, paper and tar

Floor Construction:
Beam and joist, 2" x 10", 2" wood decking

Occupancy Type:
Warehouse

Initial Resources Required:
4E, 1T, 1 Chief, 1 PM, 1 Safety Officer

Hazards to Personnel:
Large amounts of combustibles, Class A, and small amount of Class B

Location of Water Supply:
Hydrants--at A-D corner and 200' west of A-B corner--other hydrants at adjacent corners

Available Flow:
2,500 gpm each hydrant

	Estimated Fire Flow*			
Level of Involvement	*5%*	*10%*	*25%*	*100%*
Estimated Fire Flow	500	1,000	2,500	10,000

**Basic fire flow--First floor and five exposure floors (rounded).*

Fire Behavior Prediction:
Rapid horizontal fire spread on any floor. Vertical fire spread through floors is likely.

Predicted Strategies:
Rescue, Exposures, Confinement, Ventilation.

Problems Anticipated:
Rapid fire growth, long hose lays, dry standpipe.

[X] **Standpipe:** *Yes (Dry)*	[X] **Sprinklers:** *Partial--in office*	[ ] **Fire Detection:** *No*

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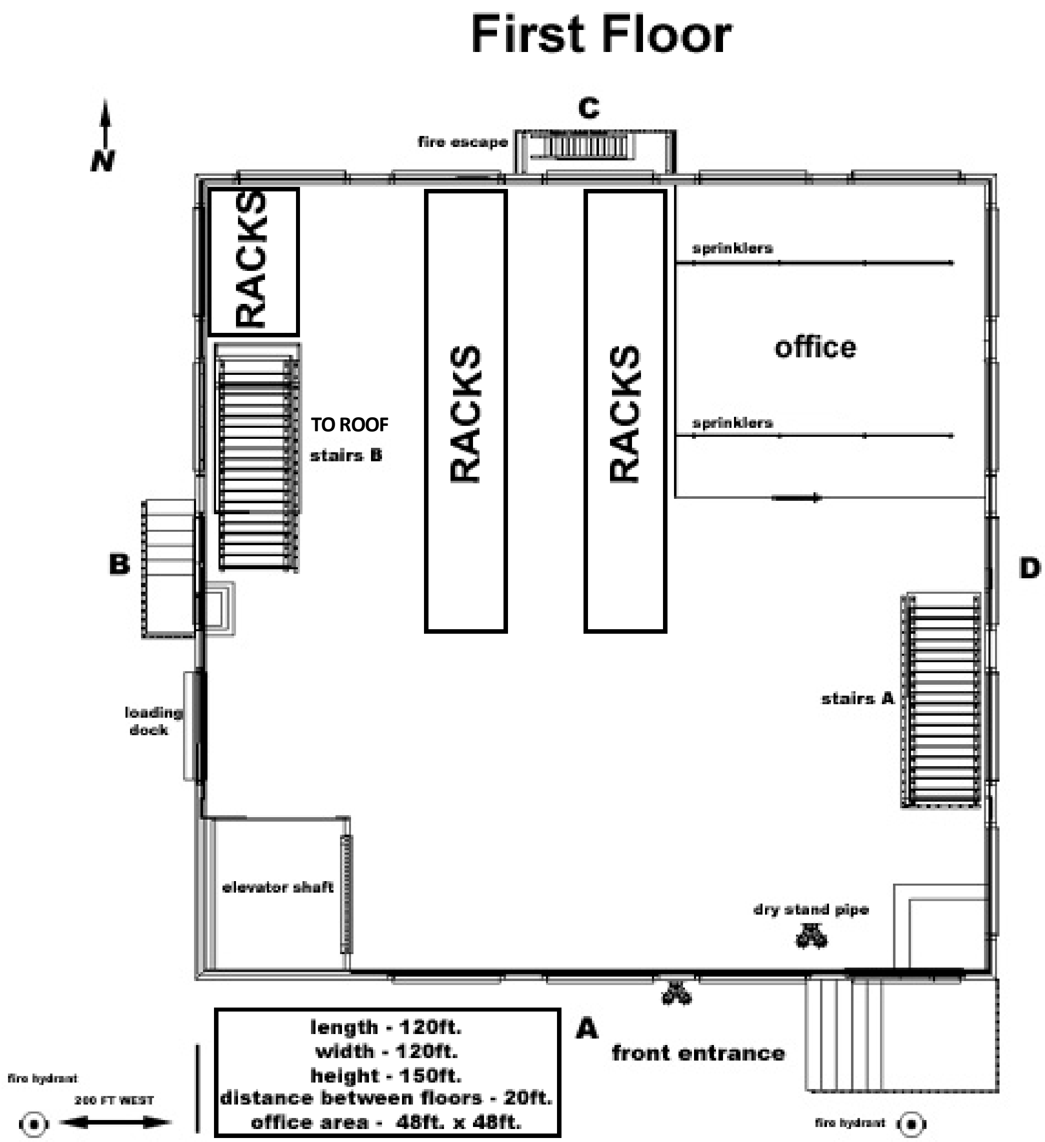
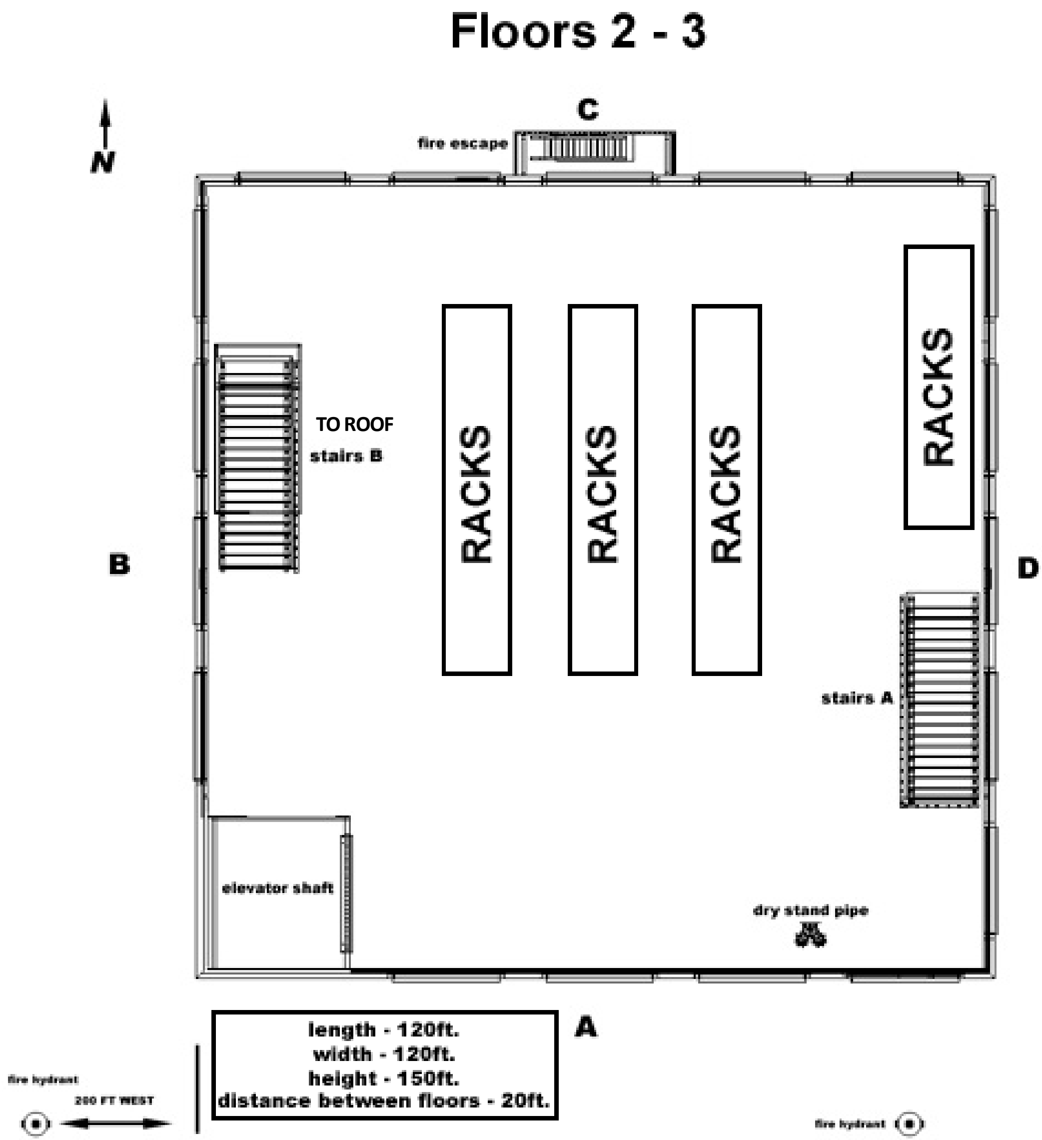
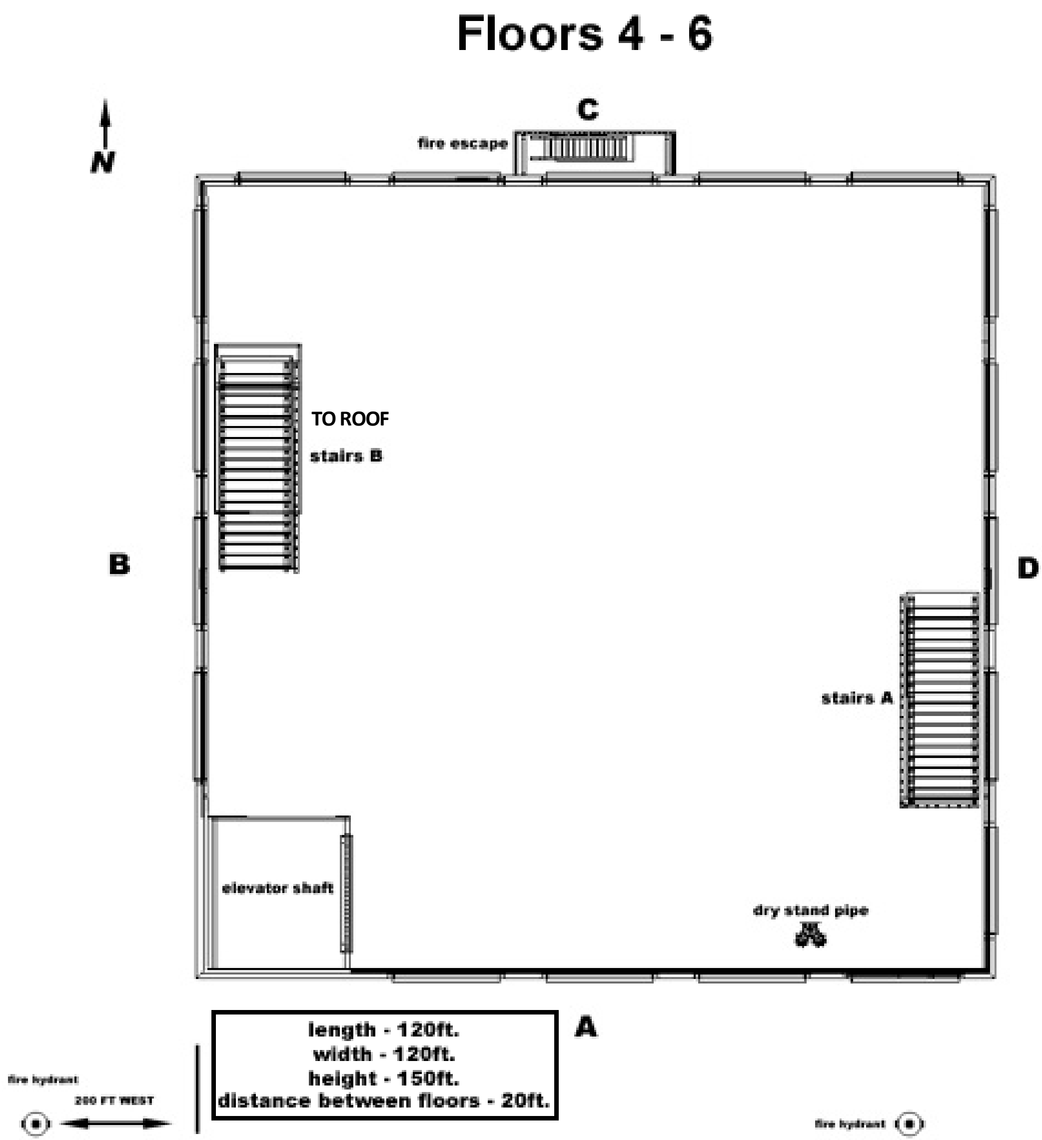
Plot/Floor Plan



Plot/Floor Plan (cont'd)



Plot/Floor Plan (cont'd)



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APPENDIX

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Rules of Engagement

General Definitions

Engine: 750 gallons, 1,000'-5", 1,000'-3", 250'-1 3/4" preconnects, 1,500 gpm pump, basic tools

Truck: 100'/rear mount aerial ladder, tools, rescue tools-no water or pump

Rescue (Heavy): Lots of tools, special operations rescue equipment, extrication

Ambulance: BLS: 2-EMT (Basic)

Paramedic: ALS: 2-firefighter/paramedics, transport capability

Tender: 3,000 gallons, 1,500 gpm pump, 3,000 gallon portable tank

BC or DC: Chief Officer/Command vehicle with aide/adjunct

Alarm: A standardized deployment of apparatus to an incident requiring a multi unit response. The initial alarm is a "first alarm" and then additional alarm requests follow a numerical sequence.

Phantom Companies: Index card with unit ID can be assigned but no one to play that role. E-1 will have a card for its crew and E-4 or E-5 (2nd alarm) will have a crew card for deployment. Cards shall come from dispatch to staging and staging will take to the appropriate area when assigned.

Staging: Will always be assigned on a 2nd alarm or greater. E-4 (or E-5) will assume and will maintain staging log. The crew (3 personnel) card will be available for assignment.

Rapid Intervention Crew (RIC): Will be established as quickly as possible by IC. An initial crew of 2 may be used, but needs to be a full crew with a supervisor as soon as resources are available.

Water Supply: Will be established by the first arriving engine utilizing additional resources. In non-hydrant areas this may be delegated to a "water supply group." All requested tender strike teams will report directly to the water supply group supervisor.

Medical Group/Branch or Medical Unit/Rehab: The IC will decide which of these functions will be staffed first. Medical Group/Branch is for victims and the Medical Unit/Rehab is for the responders. Typically the first arriving paramedic unit is used for this assignment. Additional Medical Units (PM or ambulances) report to staging.

Radio Communications

1. All units are dispatched on Channel 1. They will acknowledge that dispatch by Unit ID# and responding.

2. Units will respond on Channel 1 and dispatch will place them on scene on Channel 1.

3. E-1 will arrive on Channel 1 and give sizeup, requesting additional resources and assume command. E-1 will then switch to Channel 2.

4. Additional arriving 1st alarm units will be placed on the scene by dispatch and will then switch to Channel 2 and call command for assignment. Unit will repeat their instructions and the instructor will take them to their assignment.

5. First arriving engine on the 2nd alarm will establish staging (E-4 or E-5). That staging manager will call Command on Channel 1 and inform the IC that staging is established and remain on Channel 1. All other units will remain on Channel 1 and report to staging.

6. Once a unit from staging has been assigned that unit will switch to Channel 2, an instructor will move them to where needed.

7. All communications will follow the "Hey you, it's me" format. An example of this would be "Division 1 from Command…"

8. All communications/orders will be repeated back to sender.

9. **NO TEN CODES** or other encoded language or signals.

10. Chief's aides may move resources that are staged by direct communications with the staging manager if acting on the IC's orders.

11. BC-1 and D/C-1 will report to the CP as directed by the instructor. All other chief officers will report to the CP.

12. Do not need to contact IC for the first air bottle change. Supervisors need to contact IC for relief crew (2 bottle rule); takes five minutes to change the first bottle.

13. When a Personnel Accountability Report (PAR) is made each division/group supervisor will report those units under their supervision. When branches or operations are established this procedure will be modified accordingly.

Additional Points

- All 2nd alarm units and greater will **always** report to staging for check in.
- Supervisors assigned to a division/group will read their tactical reports from the card or instructions provided by the instructor. There is no "ad lib" or inventing situations.
- At the completion of each simulation the facilitators will clean the related charts unless instructed otherwise. All personnel shall turn radios off, return radios to chargers, ID cards to table, and messages to instructor, then report to classroom for PIA.
- Instructor will move students from an assigned position to another position as needed. The original assignment (where they were) will be tracked by that supervisor for accountability.
- The IC chart shall be updated by the chief's aide as PARs are conducted. The individual crews are being accounted for where they are being used. The supervisor for that division/group will keep track of them and report them when PAR is done. If operations are established, the Operations section will retain the original chart. Written documentation of crews and activities will be kept by division/group supervisors, branch directors, and section chiefs.

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SIMULATION 2: GARDEN APARTMENTS

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management tasks at fires involving garden apartments.*

2. *Perform the management functions required of the Command Officer at fires in garden apartments.*

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INTRODUCTION

A **garden apartment** is a **two- to four-story** residential structure. Usually, there is only **one exterior entrance** with a common set of stairs to the upper floors. The norm is four apartments per floor.

A number of construction types are used in garden apartments, including wood frame with vinyl or aluminum siding or a brick veneer; ordinary (masonry, wood-joist) construction; and the seldom-used noncombustible using steel bar-joists.

The cues found in garden apartments also are applicable, in varying degrees, to:

- center-corridor apartment buildings;
- rooming houses;
- motels;
- townhouses; and
- condominiums.

OCCUPANCY-SPECIFIC CUES

Wall Construction

The **bearing** walls in garden apartments are constructed of one of two basic construction materials.

Masonry--Concrete block with stucco, vinyl or aluminum siding, or brick veneer.

Wood frame with vinyl or aluminum siding or brick veneer.

There are usually four apartments per floor. We'll call this package of 12 apartments a **section.** Often **two or more sections** adjoin one another. New codes usually require **firewalls** or **fire division walls** where they join.

The **partition** walls are usually 1/2-inch drywall (gypsum board) on wood or metal studs placed from 16 to 24 inches apart. Remember, you can **go through a flimsy wall** very quickly to get on the opposite side of a fire area.

Roof Assemblies

<u>Flat</u>

- **Beam** and **rafter** with sheathing. This is normal for flat roof construction.

- **Steel bar-joist.** Found in newer complexes where noncombustible construction is used.

- **Parallel-chord wood truss** or **plywood I-beams.** Found in modern construction.

Pitched

- **Ridgepole** and **rafter** is used where a usable attic space is desired, but also is an indicator of older construction.

- **Wood truss** is the modern roof assembly base. Wood truss can be nailed at the joints. Toe-nailing the joints was the original method of truss assembly. In order to reduce labor costs, to speed truss construction, and to build a stronger truss, the manufacturers started using **gusset plates.** A gusset plate is simply a piece of **plywood or sheet metal** that is laid over the truss joints. Nails then are driven through the gusset plate into the truss members.

  The latest technique for truss assembly is the use of the **gang-nailer**. This is a sheet of **thick sheet metal** that has been punched. The punching produces a **large number of 1/4" or 3/8" points** protruding from one side. The gang-nailer is laid on the truss joint and the points are pressed into the truss members to hold them together.

When there are **no** firewalls or division walls there is normally a **common attic** or **cockloft** over the **entire** structure, which typically includes **two or more sections**.

Even when there are **firewalls,** there is a **common attic** over the **top four** apartments in a **section**.

Access

It may be **difficult or impossible** to drive fire apparatus to the sides or rear, or to even get close from the front. Resident parking may block parking lot entrances or preclude the movement of fire apparatus through the parking lot.

Front Entry

Usually a **single** front access door serves the common open stairwell of each section. **Each** apartment has a **single** entrance door from the common stair and vestibule area. The door is usually **steel or steel clad**; however, many are wooden. The **stairs** often are made of metal and are **self-standing.** However, they also may be made of wood. There may be **balconies** served by sliding glass doors in the front on the second and higher floors.

Rear Entry

Windows are plentiful. **Sliding glass doors** may or may not be present at the ground level. Most garden apartments have the **first-floor** level partly **underground.** Many times the land is contoured and there is a **patio area** served by sliding glass doors in the **rear** first floor units. There may be **balconies** served by sliding glass doors **in the rear** on the second and higher floors.

Floor Assemblies

The **older** garden apartments have **beam and rafter** with plywood sheathing. Apartments built of noncombustible construction typically have **steel bar-joists** with poured concrete floors. **Parallel chord wood-truss** or **wood I-beam** with plywood sheathing is found in modern construction.

Storage Rooms

A **ground-level** apartment space may be used as a **storage area** for one or more sections of apartments. These storage areas provide a **small cubicle** for each apartment owner. Normally they are constructed of plywood and may have chicken wire roofs. It is possible to find anything in these cubicles, from **flammable liquids** to **motorcycles** to **pesticides** and **gunpowder**.

Common Problems to Identify

Always assume that **every** apartment is **occupied 24 hours** a day. We must be aware that there may be **unattended** children left in any apartment. Some garden apartment complexes cater to the **elderly** and these need to be identified.

Roof or Floor Assembly Construction Type

Whether or not a specific complex has **wood-truss roof** and/or **floor** assemblies **must** be identified ahead of time during a **prefire plan.** There is **no time** on arrival at a fire incident for a Command Officer to determine the exact type of roof or floor construction.

Truss roof assemblies tend to be more stable in these structures than in structures without partition walls. Partition walls are not considered **"bearing"** members, but they **do support the bottom truss chord** and reduce collapse potential.

This affects the Command Officer's risk-benefit evaluation for roof and interior tactical operations.

Fire Involvement Considerations

Has the fire **extended** to the roof assembly area? What are the **signs** of probable roof assembly involvement?

- Major fire involvement in one top-floor apartment.
- Fire involvement in two or more top-floor apartments.
- Hot, rising smoke from attic vents.
- Fire has vented through the roof.

Is the fire **likely to spread** to the roof assembly in the near future? What are the **signs** that the fire likely will spread to the roof or ceiling assembly?

- A well-involved single occupancy on the top floor.

Structural Deterioration and Collapse

These structures are **not prone** to early collapse. However, should fire gain a good **foothold** in a combustible floor or roof assembly, the likelihood of failure or collapse is increased proportionally. **Older** buildings may have structural **deficiencies** before the fire.

CUE-BASED PREDICTIONS

Given the cues just presented, and adding a fire situation, we can make **predictions**:

- The **life hazard could be severe** and a thorough primary search must be done. This occupancy requires a **specific assignment** for search and rescue.
- **Smoke conditions** in the stairwell and corridor may be heavy and prevent occupants from exiting.
- Fire travel in **attic spaces** could involve an entire section.
- Fire in a **storage area** may spread rapidly to the floor above and may involve unsuspected materials.

INCIDENT MANAGEMENT CUES

Coordinated Operations

Rescue and primary search must be **coordinated** with **ventilation**. Life safety is the highest priority, and early ventilation efforts should support rescue. Rescue and primary search teams must take handlines with them, or have appropriately placed lines staffed by other crews.

Confinement efforts, specifically the reduction of "**mushrooming**," need **vertical** ventilation support in attic areas.

Incident Command System Organization Cues

Each function (e.g., ventilation and rescue) needs to be supervised. Each geographic area where personnel are operating needs supervision. At working incidents you may need a Safety Officer and a Public Information Officer (PIO).

STRATEGY AND TACTICS

Any Fire Situation--Primary Search and Rescue

- **Immediately** begin a primary search of the occupancy or occupancies involved in fire, if it is possible enter the area.

- **Next,** primary search the **rest** of the apartments on the **same floor** where the fire started. Start from the fire apartment and work out and away from the fire area.

- **Third,** primary search the **floors above**, starting with the apartment over the fire and working outward.

- Be sure to **check the rear** of the building **immediately** after arrival. The **life safety** problem may be **greater** there than in the front. This can be very true when there are rear balconies.

Fires Not Involving the Roof Assembly

- An **aggressive interior attack** on the fire with **horizontal ventilation.** Positive-pressure ventilation may be appropriate here.

- Assign personnel to **check for extension**:

  - Other apartments on the **same** floor.

  - Apartments on floors **above** (or attic space, if that is above) and below, in that order.

Fire in a Storage Area

- **Rapidly ventilate** the storage area by **removing** window panes. Positive-pressure ventilation may be effective.

- **Aggressively attack fire** with at least two handlines (one backup line).

- **Check for extension** in the apartments next to and above the involved area.

Fire in an Attic Space Over a Single Section Separated From Other Occupancies by Firewalls or Division Walls

- If roof construction type is unknown, **assume lightweight.**

- When the risk is acceptable the following tactics are recommended:

  - **Interior fire attack**--several handlines to the top floor; pull ceiling and attack the fire.

  - Vertical and horizontal **ventilation**.

  - Check interior exposures for **extension**.

  - Check **exposed attic** areas in **adjoining** sections for extension.

- When the risk is unacceptable to attack the attic fire from the floor below, the following tactics are recommended.

  - Vertical ventilation only if it can be done safely away from the intensity of the fire.

  - **Do not** put a ladder pipe or other exterior stream into any ventilation hole.

  - Exterior fire attack--heavy streams from front and rear. Use aerial devices to apply streams to upper floors and attic space.

  - Check interior exposures and attic areas on the far side of the firewalls for extension.

Well-Involved Fire in a Roof Assembly That Serves More Than One Occupancy (Common Attic or Common Cockloft)

- **Roof** construction **must** be **known before** an interior attack or vertical ventilation is initiated.

- If construction type is unknown, **assume lightweight**.

- **Risk/Benefit** must be assessed before personnel are placed on or under a roof or floor assembly of truss construction that is well-involved in fire.

- Recommended tactics:

  - **Vertically ventilate** as close to the fire as safety permits. When possible, the vent hole should be on the side with the **shortest roof span.** Start by trying to **draw the fire** toward the least amount of building.

  - **Do not** put a ladder pipe into any ventilation hole.

  - **Fire attack** with handlines from beneath must be aggressive. Confinement of the fire to prevent spread to the longest portion of the structure is a high priority.

- **Check** interior exposures for **extension**.

  Pull ceilings to check exposed roof areas for extension and to provide a path for water to reach the fire.

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Simulation 2

Homework Assignment

Garden Apartment Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on garden apartments as part of the precourse assignment. You are to provide written answers on the worksheet and bring the worksheets to class to use during the presentation. At the conclusion of the presentation, the instructor will collect the worksheets and retain them.

2. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems or solutions that were not discussed.

Scenario 1

A three-story garden apartment section has a single front entrance, no rear entrances, and no front or rear balconies. A fire is located in a second-floor apartment living room.

What problems are created, and what tactical and Incident Command System (ICS) solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ______________________________________

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Scenario 2

A three-story garden apartment section has a common attic over the top four apartments. A fire is located in a third-floor apartment bedroom.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ______________________________

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Tactical Solution: ______________________________

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ICS Solution: ______________________________

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What cues led you to this solution? ______________________________

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Problem: ______________________________

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Tactical Solution: ______________________________

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ICS Solution: ______________________________

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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In Class
Activity 2.1

Incident Command System Organization

Purpose

You will complete a Strategy Prompter for a garden apartment scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the worksheet for the activity.

3. The class will be shown a slide of a garden apartment building. Everyone will review the scenario description and the plot/floor plan.

4. Your group will write its overall goals (strategies) on the Strategy Prompter and convert those goals into an ICS organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident.

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 4 minutes per group. Be brief and to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, identify which Division or Group is performing that task.

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In Class
Activity 2.1 (cont'd)

Scenario Description

Construction

Wood-frame.
Floor--2" x 10" joists, plywood sheathing.
Roof--pitched lightweight wood-truss, plywood sheathing, composition shingles.

Fire Location

Second-floor apartment bedroom facing the C-D sides.
Bedroom fully involved, approximately 25 percent of the apartment.

Time and Day

0630 hours, Wednesday.

Resources (1st alarm)

4 engines
1 truck
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

4 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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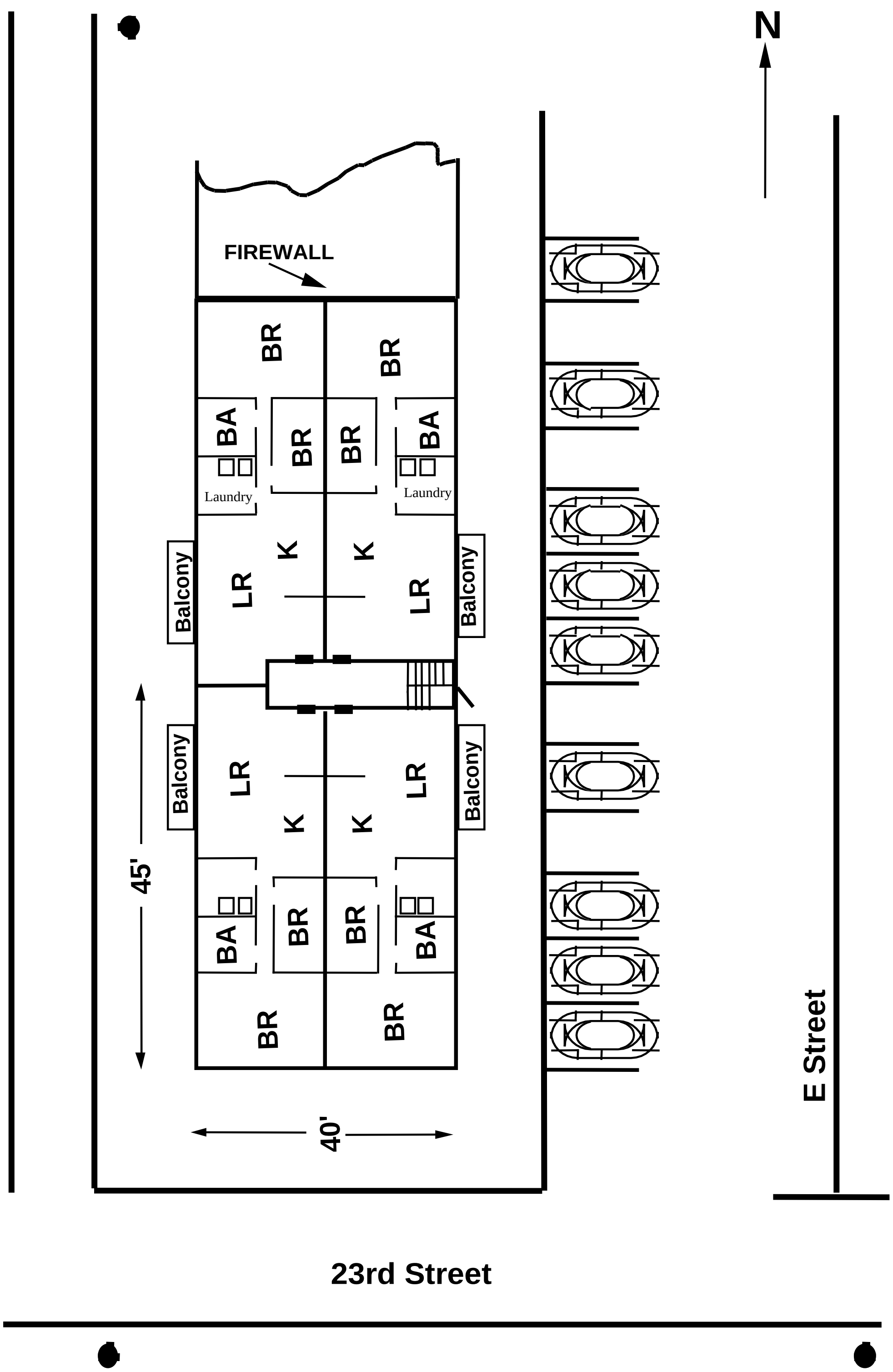
In Class
Activity 2.1 (cont'd)

Typical Plot/Floor Plan



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Simulation 2

GARDEN APARTMENT SIMULATION

Incident Description

The Elaine Garden apartments is a three-story building located at the corner of E and 23rd Streets in Central City. The apartment unit is 180 feet in length by 40 feet in width and is of wood-frame construction with a common attic. The roof consists of built-up, 2-inch by 8-inch beams and rafters with plywood sheathing. The ground floor is a concrete slab. The second and third floors are constructed of 2-inch by 8-inch beam and joist, with plywood sheathing. The apartment unit is divided into two sections. Each section measures 90 feet in length by 40 feet in width. A firewall separates each section. The section that contains the fire is toward the B end of the unit. This particular section consists of 11 apartments and a storage area. The first floor, or ground floor, is divided into three apartments and one storage area. The storage area is located on the A-B side of the section. Each apartment and storage room measures 45 feet in length by 20 feet in width. The apartments are divided into a living room, a kitchen, a bathroom, a laundry room, and two bedrooms. The second and third floors of this section contain four apartments each. Each section has one exterior entrance with a common set of stairs that leads to the upper floors.

The walkaround slides show

Sides A and B
Roof
Sides B and C
Ground floor--interior
Ground floor plan
Typical floor plan

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Simulation 2: Sample
Quick Access Prefire Plan

Building Address:
23rd and E Streets

Building Description:
90' x 40', 3-story, wood frame, common attic, each apartment is 45' x 20'

Roof Construction:
2" x 8", ridgepole and rafter, plywood sheathing, composition shingles

Floor Construction:
Ground level--concrete slab, 2nd & 3rd floors--2" x 8", beam and joist, plywood sheathing

Occupancy Type:
Garden Apartment

Initial Resources Required:
4E, 1T, 1 Chief, 1 PM, 1 Safety Officer

Hazards to Personnel:
Small amounts of pesticides, flammable, and combustible liquids in storage area

Location of Water Supply:
Hydrants on every corner

Available Flow:
1,500 gpm

	Estimated Fire Flow*			
Level of Involvement	*25%*	*50%*	*75%*	*100%*
Estimated Fire Flow	150	300	450	600

**Fire flow based on one apartment with three exposures; apartments are 900 square feet each (rounded).*

Fire Behavior Prediction:
Rapid spread through the apartment of origin. If attic becomes involved, the fire will travel horizontally.

Predicted Strategies:
Rescue, Ventilation, Exposure Protection, Confinement.

Problems Anticipated:
Tenant parking at night makes access difficult. Rescue from rear.

☐ Standpipe:	☐ Sprinklers:	☒ Fire Detection:
No	*No*	*Yes (Smoke)*

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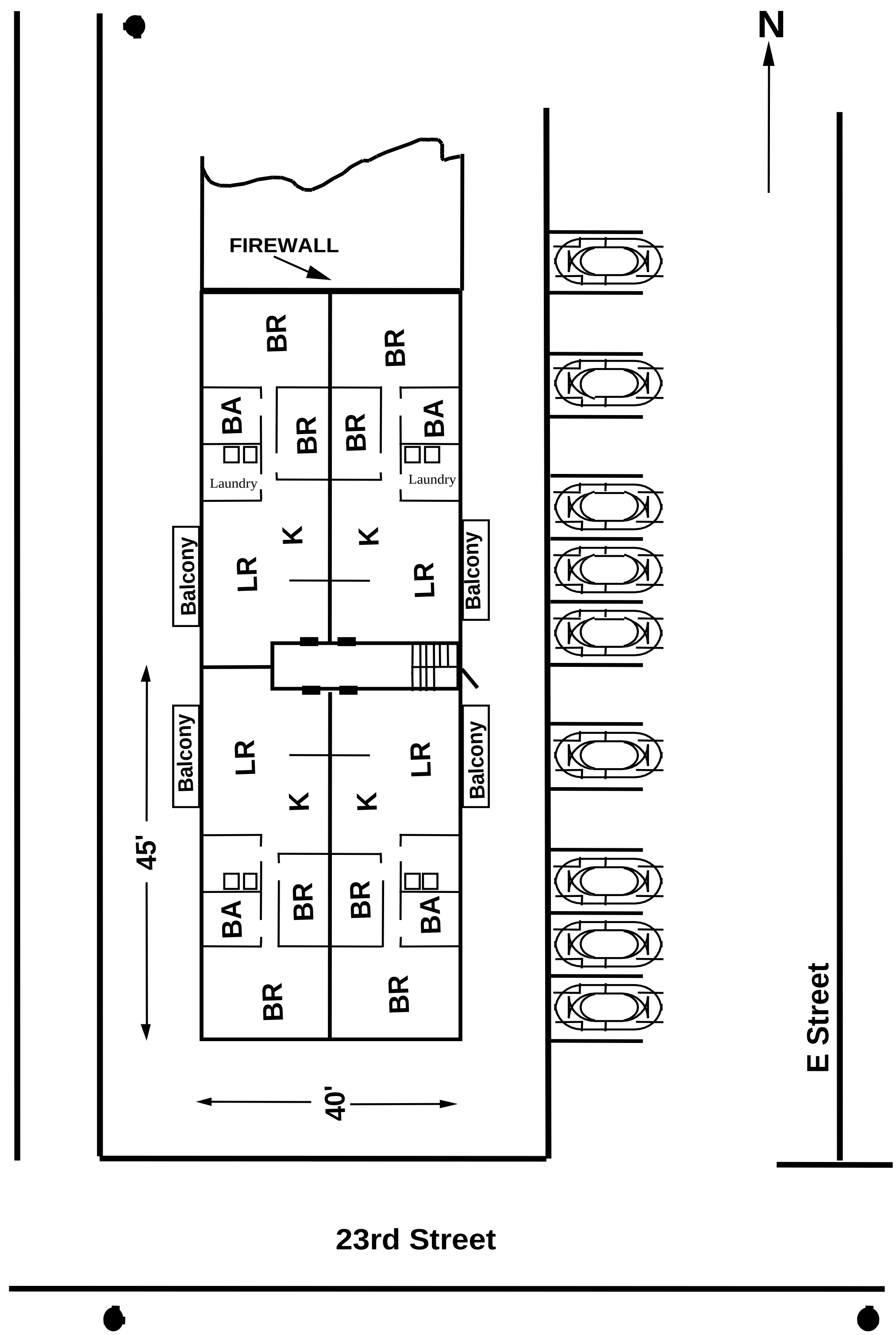
Simulation 2

Typical Plot/Floor Plan



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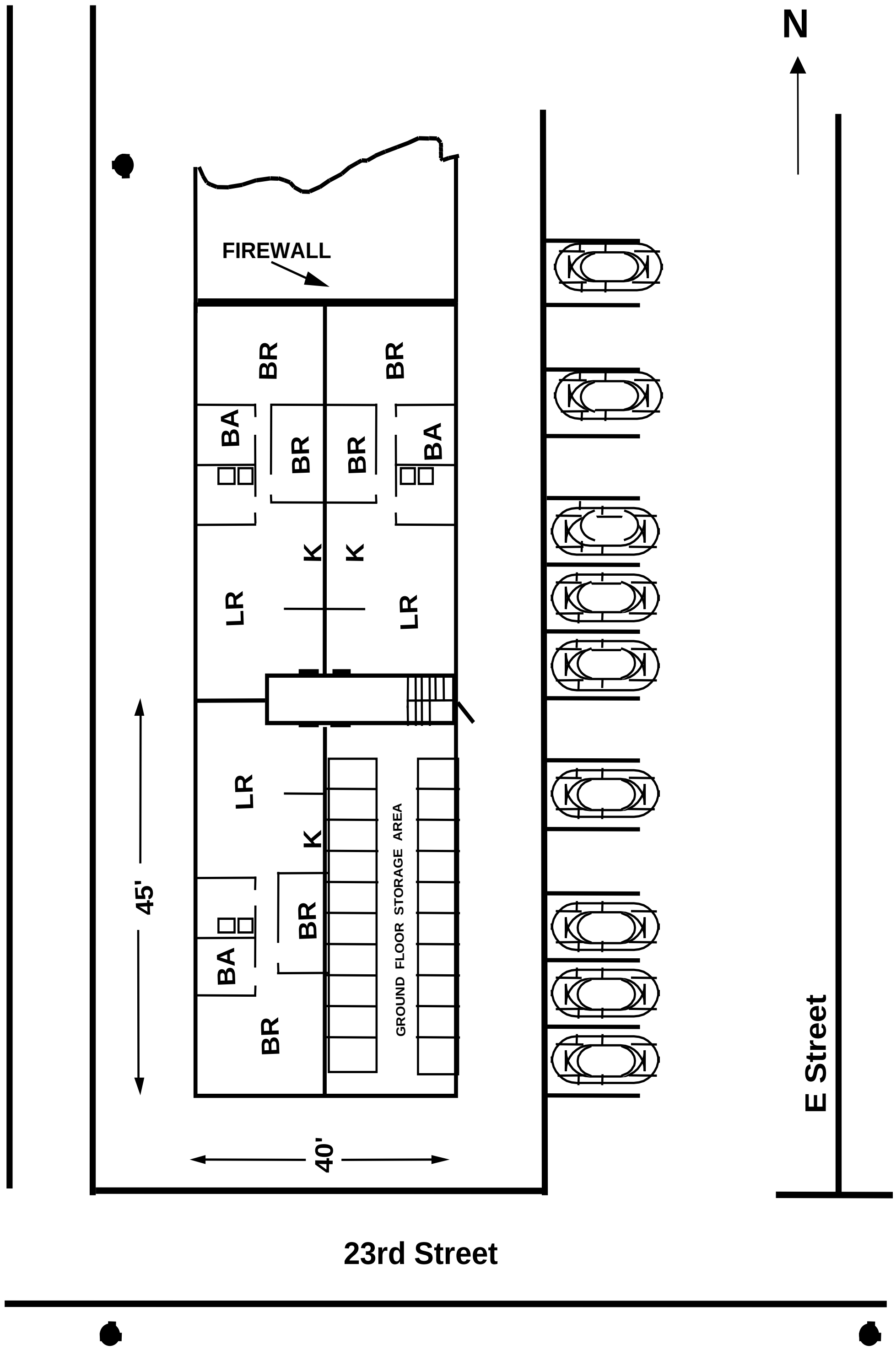
Simulation 2: Plot/Floor Plan (cont'd)

Ground Floor



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SIMULATION 3:
STRIP SHOPPING CENTERS

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management tasks at fires involving strip shopping centers.*

2. *Perform the management functions required at fires in strip shopping centers.*

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INTRODUCTION

A **strip shopping center** is a one- or two-story structure that contains two or more business or mercantile occupancies on the ground floor.

The construction type for these shopping centers may take a number of forms. Most are one-story, and they usually are built on a concrete slab with no basement. However, there are a number of two-story strip shopping centers, and strip shopping centers with basements in many areas of the country. Most are of ordinary construction with masonry walls and wood roof assemblies. Many of the more modern strip shopping centers are of noncombustible construction with masonry walls and steel bar-joist roof assemblies covered with metal decking. The top layer is a built-up roof of tar or tar and stone.

OCCUPANCY-SPECIFIC CUES

Wall Construction

The walls normally are masonry; the most common is concrete block. However, you may encounter poured concrete tilt-up construction where the finished wall sections are set in place and anchored to the floor, to each other at the corners, and to the roof assembly.

Wood-frame wall construction also may be found, but in relatively small numbers. Here the walls are built of nominal wood sizes, e.g., 2" x 4," similar to most private dwellings.

Using a skeletal steel frame to hold the roof assembly with nonbearing exterior walls is another construction method. Here the construction type could either be noncombustible or ordinary, depending on the roof construction type.

In more modern construction, firewalls or fire division walls may separate the single or multiple occupancies. When this method is used, the attic space covers an individual occupancy, which reduces the probability and rapidity of fire spread. It does not necessarily reduce the likelihood of collapse over a single involved occupancy. Collapse is more dependent on roof construction.

Presently, most strip malls do not have firewalls or fire division walls. This construction method ensures a common attic or cockloft over all the occupancies. Fire spread, once it reaches the common attic, is often very rapid and is destructive to the roof assembly bearing members.

Roof Assemblies

Several roof assembly methods produce a **flat roof:**

Wood beam and rafter with sheathing. Beams are laid horizontally from the bearing walls, and may be supported at several places between the bearing walls by lolly columns. The beams are the main supports of the roof assembly. The beams will carry the roof rafters. The roof rafters, 2" x 6" to 2" x 12" or greater solid lumber, are laid across the beams on 16-inch to 4-foot centers, depending on the rafter size. The rafters are covered with sheathing (1" x 6" lumber, plywood, or particle board), then a built-up rain covering. This construction method generally is found in older buildings. **This type of roof assembly has a very high resistance to collapse.** It normally just burns through at the involved fire area with very little resultant weakening to the entire structure. Of course, in major fire situations, where the entire attic space is well-involved, significant failure can result. If the risk of sending people under the roof assembly is high, then it is also high to place people on it.

Steel bar-joist. The steel bar-joists are suspended between the bearing walls. There may be a column and beam system acting as a bearing member between bearing walls when the space being spanned is excessive for the bar-joist size. The bar-joists may be covered with wood sheathing and a rain covering as above, or it may have Q-decking. Q-decking is a sheathing made of corrugated sheet metal over which a rain covering is applied. The steel bar-joist construction method is used in both modern and older buildings.

Parallel-chord wood truss and plywood I-beam. These types of trusses are found in modern construction. Born from the prefab and precut housing industry as a use for scrap lumber, the parallel-chord wood truss is a replacement for the solid-wood rafter and the steel bar-joist in many applications. The plywood I-beam also has replaced the solid-wood rafter. The I-beams are covered with sheathing (plywood or particle board) and then with a built-up rain covering. Under fire conditions both of these replacements have remarkably short failure times. It is not unusual for both the parallel-chord wood truss and the plywood I-beam to fail in less than 5 minutes of major fire involvement. A discussion of gusset-plate types follows in the pitched wood-truss section.

Several roof assembly methods produce a **pitched roof**:

Ridgepole and rafter. The ridgepole and rafter method produces a usable space in the attic area. The covered area is open and unobstructed. A center pole is located at the ridge, or peak of the roof. Rafters are laid from the ridgepole to the top of the exterior bearing wall and nailed in place. The rafters are covered with sheathing (1" x 6" lumber was typical in older construction and plywood or particle board in more modern construction). The sheathing is covered with felt paper and shingles or tiles.

Pitched--Wood truss. Pitched trusses may be nailed at the juncture points of the webs and chords and other points where two separate pieces of lumber need to be held together. Originally, wood pieces were simply toe-nailed together. Next, plywood was used as a gusset-plate material through which the nails were driven. This method provided added strength and faster assembly. Sheet metal gusset-plates also are used. The most recent method is the gang-nailer. These are pieces of heavy sheet metal that have 1/4" or 3/8" punched points protruding. There are a number of these points in every square inch of the gusset-plate. The gang-nailers are placed over the wood pieces that need to be locked together. The gang-nailers are then pressed into the wood. All of these truss assemblies have high failure rates under fire conditions. The gang-nailer may fail within 5 minutes of major fire involvement.

Rear Entry

Rear windows are limited or nonexistent in strip shopping centers. If there are windows, they normally are barred, have heavy screening, and are small.

Rear doors include steel, steel clad, or solid wood. Normally, all are locked securely, even when the business is open. Rear entry is extremely time consuming when forcible entry must be accomplished. Most fire departments choose front entry even when it goes against the "burned to the unburned" philosophy.

Warning: When people are known to be trapped between the fire and the rear of the occupancy, a judgment must be made as to which entry, front or rear, offers the best chance for rescue.

Two-Story Building Floor Assemblies

The beam and wood joist with sheathing, similar to that described for a flat roof, is found often in older construction. Steel bar-joist may be used and have a concrete deck applied as the second floor surface. Parallel chord wood-truss or plywood I-beams are found in modern construction. These are covered with a plywood or particle board sheathing and then carpet or tile.

COMMON PROBLEMS TO IDENTIFY

Roof or Ceiling Assembly Construction Type

The roof construction of a one-story strip shopping center **must** be identified ahead of time on a prefire plan. The same applies to a two-story strip center; additionally, the second floor assembly needs to be identified. The risk-benefit analysis of whether to place personnel over or under an assembly cannot be made without knowledge of the type of construction materials used. **After** arrival at the fire scene is a poor time to gather roof and floor construction information. If roof construction is unknown, **assume that it is lightweight, and subject to early collapse once fire has gotten a foothold on the assembly.** You should take the time to determine the roof and floor construction materials in an adjacent occupancy and pull some ceiling.

Fire Involvement Considerations

Has the fire extended to the roof assembly area? Has the fire extended to the first-floor ceiling assembly of a two-story? What are the signs of probable roof/ceiling assembly involvement?

- major fire involvement in one occupancy;
- fire involvement in two or more occupancies;
- hot, rising smoke from attic vents; and
- fire venting through the roof.

Is the fire likely to spread to the roof assembly soon? The signs that the fire will likely spread to the roof or ceiling assembly:

- one or more well-involved single occupancies; and
- a fire that is not being controlled in a timely manner due to insufficient fire flow into the area of involvement.

Structural Deterioration and Collapse

In any structure, collapse potential is related directly to roof construction type. Any type of truss construction can be expected to collapse early once it has become well involved in fire. Collapse can come as soon as 5 minutes after involvement. In multistory structures, collapse potential is related to both floor and roof assembly construction. Older buildings may have structural deficiencies before the fire. Loads on the roof, such as heating, ventilation, and air-conditioning (HVAC) systems, may accelerate collapse.

CUE-BASED PREDICTIONS

Given the cues that were just discussed, we can add a fire situation and make predictions based on the cues.

The life hazard is likely to be minor on the ground floor where the mercantile occupancies are located. Statistics do not indicate a fire death problem at strip shopping centers. This does not preclude the need for a primary search.

The life hazard in residential occupancies that may be above some strip shopping centers is very high. You can expect heat, smoke, and toxic gases to be on the second floor with a well-involved first floor occupancy.

Fire often occurs after closing time and gains considerable headway. This allows time for extension to floors and attic spaces above. Fire travel in these floor and attic spaces can spread the fire to other occupancies.

Access to the rear of the structure may be very time consuming due to security devices. A delayed access will mean that the fire will increase in intensity and size.

INCIDENT MANAGEMENT CUES

Primary Search and Ventilation

The faster vertical and horizontal ventilation is completed, the faster crews can complete the primary search and be reassigned to firefighting duties.

Confinement and Vertical Ventilation

Vertical ventilation is critical for interior crews to stop the lateral spread of fire in a common attic area. Vertical ventilation stops the downward and horizontal movement of smoke and heat into the operating area and adjacent stores. Crews can see further and work faster when visibility is above zero.

STRATEGY AND TACTICS

Occupancy-Specific Strategies

Based on the occupancy, there are few cues that indicate rescue. Rescue needs generally will be minimal on the first floor, but greater on the second floor if it is residential.

Fire control cues are building construction, floor construction, and roof construction. A common attic space strongly indicates the need for extension control.

The location and extent of the fire will indicate the resource intensity of the various tactics that must be performed.

Ventilation cues include smoke in the fire occupancy and adjacent occupancies. Smoke coming from roof vents may indicate involvement of the attic space. Immediate vertical ventilation will be required. Horizontal ventilation also must occur early in order to permit operating forces to work effectively in the exposed areas.

Tactical Examples

Fires Not Involving the Roof Assembly--One-Story

1. An aggressive interior attack on the fire with horizontal ventilation.

2. Followed closely by assigning personnel to check for extension.

3. One-story buildings, check ceiling space and exposures.

Fires Not Involving the Roof Assembly--Two-Story

1. Two-story buildings with a fire on first floor:

   - check the adjoining occupancies;
   - first floor;
   - ceiling space; and
   - occupancy directly above the fire.

2. Two-story buildings with a fire on second floor:

   - check exposures;
   - attic space; and
   - occupancy below the fire.

Fire in a Roof or Ceiling Assembly Over One Single Occupancy Separated From Other Occupancies by Firewalls or Division Walls

1. Roof or ceiling construction must be known before an interior attack or vertical ventilation is initiated.

2. If construction type is unknown, **assume lightweight.** Then check adjoining occupancy for the information by pulling some ceiling.

3. Risk/Benefit must be assessed before personnel are placed on or under a roof or floor assembly of truss construction.

   Recommended tactics when the risk is acceptable:

   - Vertically ventilate the roof over the fire area.
   - Horizontal ventilation front and rear.
   - **Do not** put a ladder pipe or other exterior stream into any ventilation hole.
   - Interior fire attack--apply large quantities of water on the fire.
   - Operate from an area between the fire and an exit. Pull ceiling from the doorway and begin extinguishment. **Do not** advance into the room with fire over your head; also, don't allow it to be behind you.
   - Check interior exposures and attic areas for extension.

Well-Involved Fire in a Roof or Ceiling Assembly That Serves More Than One Occupancy

1. Roof or ceiling construction must be known before an interior attack or vertical ventilation is initiated.

2. If construction type is unknown, **assume lightweight.** Then check adjoining occupancy for the information by pulling some ceiling.

3. Risk/Benefit must be assessed before personnel are placed on or under a roof or floor assembly of truss construction.

Recommended tactics when risk is acceptable:

- Vertical ventilation over involved occupancy.
- Horizontal ventilation front and rear.
- **Do not** put a ladder pipe into any ventilation hole.
- Check interior exposures for extension.
- Start at least two occupancies away on each side to make sure you are ahead of the fire.
- Pull ceilings to check exposed roof or floor areas for extension and provide a path for water to reach the fire.
- Control horizontal extension by applying large quantities of water to keep the fire from extending.

Recommended tactics when the risk is unacceptable:

- Exterior fire attack--large caliber streams.
- Horizontal ventilation.
- Check interior exposures for extension.
- Check exposed attic areas for extension.

Fire Flow Tactical Considerations

Because of the needed fire flow requirements required in advanced fire situations, Incident Commanders (ICs) must be prepared to order master streams as soon as possible after arrival.

The first engine company **must** position itself in a location where a master stream appliance can be applied by the pump operator or engineer after handline(s) are charged.

While most engines have a deck-mounted master stream device, many departments have located a two-inlet, 600 gpm, master stream appliance on the rear step, or inside a rear compartment. This allows the pump operator to set up and flow an effective appliance onto the main body of fire handily and alone. **Of course**, the fire must be reachable from the front of the building.

Protect the Long Side of the Building First

Save the greatest amount of property. It is important to recognize that sufficient hoselines must be placed in the "long" side exposure to ensure that the fire does not get by you before hoselines are placed on the "short" side.

One 1-3/4-inch hoseline can cover approximately 30 to 35 feet of wall effectively. Partitioned offices or storage areas may require more hoselines.

Also, you will need personnel to pull ceilings so hose streams can reach the attic space and stop extension.

Simulation 3

Homework Assignment

Strip Shopping Center Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on strip shopping centers the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the same groups established for classroom activities. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation. At the conclusion of the presentation, the instructor will collect the worksheets for the students and retain them. Only do the two scenarios and the related problems; the rest of the unit will be done in the classroom.

2. After reading the SM, your group will determine a number of the problems facing the IC, based on the limited incident information given. For each problem, you must provide both a tactical solution and an Incident Command System (ICS) solution.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems or solutions that were not discussed.

Scenario 1

A strip shopping center with an unknown roof assembly type is showing cues that indicate the fire is involving the roof assembly.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ______________________________

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Problem: ______________________________

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Tactical Solution: ______________________________

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ICS Solution: ______________________________

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What cues led you to this solution? ______________________________

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Problem: ______________________________

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Tactical Solution: ______________________________

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ICS Solution: ______________________________

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What cues led you to this solution? ____

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Scenario 2

A strip shopping center with a known common cockloft of beam-and-rafter roof construction is showing fire involvement in two occupancies and hot, rising smoke from attic vents.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ______________________________

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ______________________________

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In Class
Activity 3.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a strip shopping center scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the worksheet for the activity.

3. The class will be shown a slide of a strip shopping center. Everyone will review the scenario description and the plot/floor plan.

4. Your group will write its overall goals (strategies) on the Strategy Prompter and convert those strategies into an ICS organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident.

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 10 minutes total. Be brief, but to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, identify which Division or Group is performing that task.

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In Class
Activity 3.1 (cont'd)

Scenario Description

Construction

One-story, ordinary construction.
Floor--concrete slab.
Roof--flat, parallel-chord wood truss, plywood sheathing, builtup roof (tar and stone).

Fire Location

End of building, hardware store.
50-percent involvement of the front of the store.

Time and Day

0530 hours, Wednesday.

Resources (1st alarm)

4 engines
1 truck
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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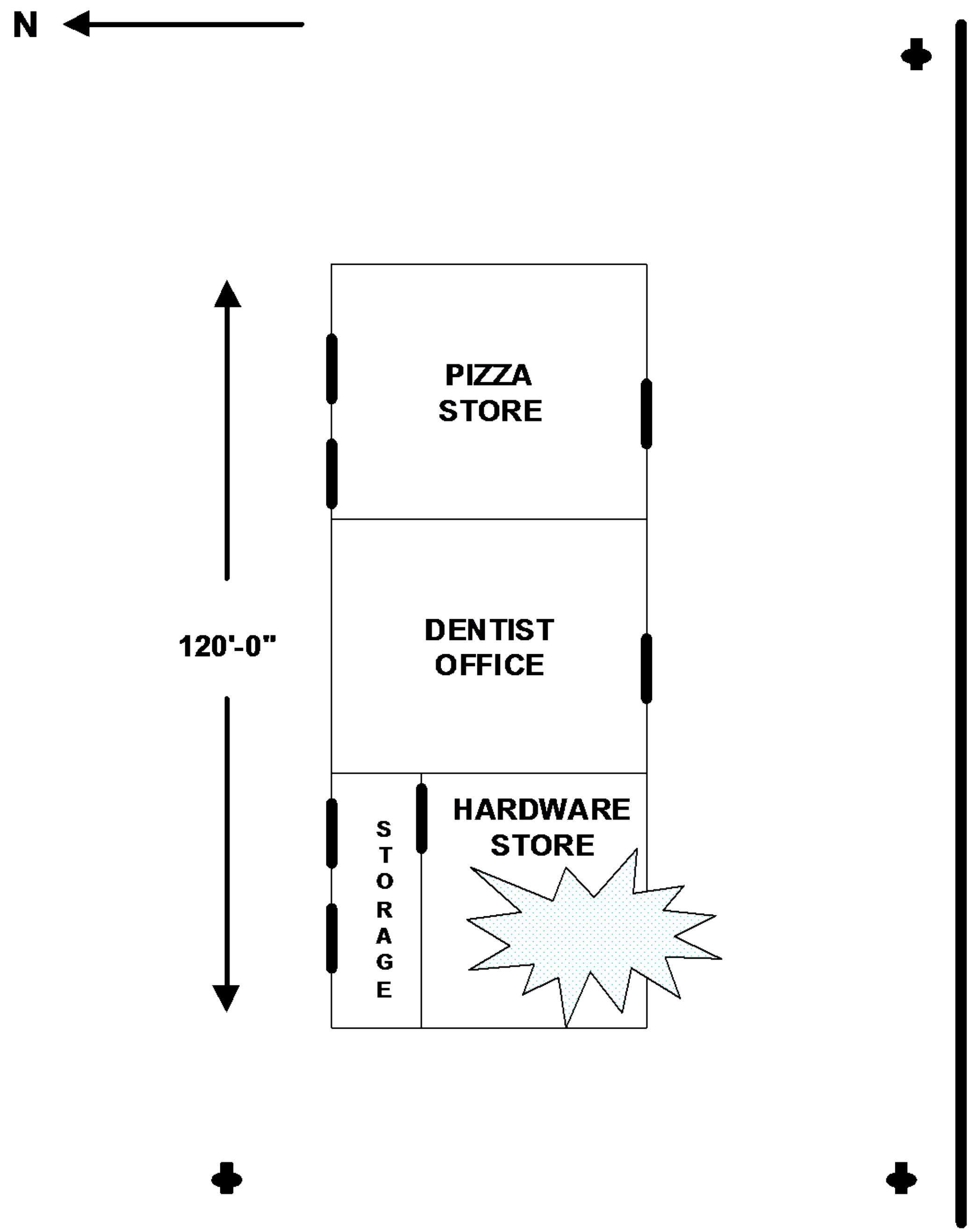
In Class
Activity 3.1 (cont'd)

Plot/Floor Plan



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Simulation 3

STRIP SHOPPING CENTER SIMULATION

Incident Description

The shopping center is a single-story, multioccupancy structure located at 921 C Street in Central City. It is ordinary construction, with a common attic and a steel bar-joist roof with plywood decking. The shopping center is divided into three compartment areas by firewalls. The first fire area, that runs from the liquor store on Side D of the shopping center to the firewall on Side D of the restaurant, measures 260 feet in length by 100 feet in width. The second fire area, that runs from the firewall on Side D of the restaurant to the firewall on Side D of the thrift store, measures 190 feet in length by 100 feet in width. The last fire area, that runs from the firewall on Side D of the thrift store to Side B of the shopping center, measures 100 feet in length by 125 feet in width.

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Simulation 3

Quick Access Prefire Plan

Building Address:
921 C Street

Building Description:
260' x 100', one-story, ordinary construction, common cockloft (this is the largest fire area in the complex)

Roof Construction:
Steel bar-joist, plywood sheathing, composition covering

Floor Construction:
Concrete slab

Occupancy Type:
Mixed mercantile

Initial Resources Required:
4E, 1T, 1 Chief, 1 PM, 1 Safety Officer

Hazards to Personnel:
Early roof collapse

Location of Water Supply:
Hydrants on every corner

Available Flow:
5,000 gpm

	Estimated Fire Flow*			
Level of Involvement	*5%*	*10%*	*25%*	*100%*
Estimated Fire Flow	*500*	*1,000*	*2,500*	*10,000*

**Based on 260' x 100' largest fire area and one exposure (10,833 rounded to 10,000).*

Fire Behavior Prediction:
Possible extension into cockloft with further extension to other occupancies.

Predicted Strategies:
Ventilation, Exposure Protection, Confinement.

Problems Anticipated:
Traffic congestion during business hours, difficult access through doors on Side C.

❑ **Standpipe:**
None

❑ **Sprinklers:**
None

❑ **Fire Detection**:
None

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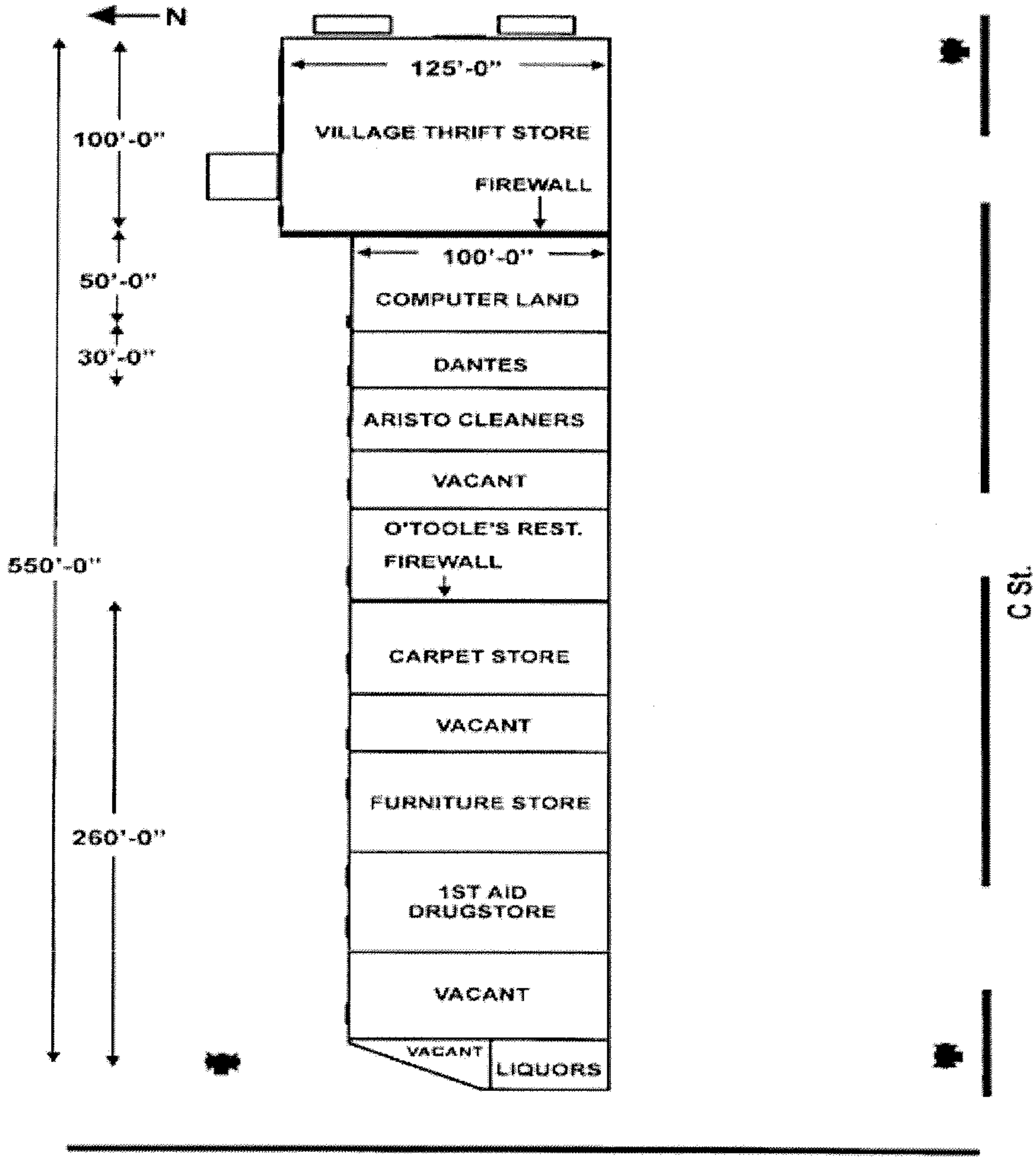
Simulation 3

Plot/Floor Plan



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SIMULATION 4: LUMBERYARD

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management functions at lumberyard fires.*
2. *Apply the knowledge, skills, and abilities discussed to manage a simulated lumberyard fire.*

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INTRODUCTION

A **lumberyard** usually is defined as a facility or location where commercial lumber products are stored in large quantities for sale to the building construction trades and to the general public.

Large retail stores that merchandise miscellaneous building supplies do not universally fit this description. However, they frequently store large amounts of lumber products that can create fires that can be extremely difficult to control. In addition, they often store large quantities of other products, such as flammable liquids, miscellaneous combustibles, and toxic materials that can compound the problem when fires occur.

OCCUPANCY-SPECIFIC CUES

Construction and Content Factors

Structures in lumberyards can be a factor in fire growth and spread if the fire starts in, or spreads to, them. In most cases, however, lumber is stored outside, and structures on the premises are small, usually consisting of offices or sales areas.

Structures in lumberyard facilities are usually of ordinary or wood-frame construction and will contribute to the fire load. Stability under fire conditions may be questionable in structures used for storage of lumber or wood products, and collapse under severe fire conditions may be rapid.

Metal, noncombustible buildings are used frequently in lumberyard facilities for semiprotected storage. Although these structures may appear sturdy, they can collapse very quickly when subjected to the heat produced by burning lumber or wood products.

In addition to office structures in lumberyard facilities, finished lumber products such as moldings, paneling, and plywood may be stored inside regular structures. The value of these contents must be considered during fire situations. Business records, finished lumber products, hardware items, and tools and machinery are, in most cases, much more valuable than the raw lumber that may be burning.

Built-in fire protection for outside lumber storage usually is not provided. Only occasionally are alarm systems found in structures on the premises. For this reason, the reporting of fires in lumberyards frequently is delayed, resulting in large fires by the time the fire department reaches the scene.

COMMON PROBLEMS TO IDENTIFY

Access to lumberyard facilities may be difficult, especially to reach the area where the fire is located. It may not be possible to approach to the fire area with apparatus, resulting in long stretches of hoseline to reach the fire. Be careful in the placement of fire apparatus in lumberyard facilities because of possible fire spread or collapse of stacked lumber piles. Access points into and around the facility should be preplanned.

Water supply for fires in lumberyards usually is not considered a problem because hydrants are almost always available in the areas where they are located. However, you must consider the total fire flow required for a large fire in the facility. The water supply from area hydrants may not be sufficient to support the heavy streams required for the fire potential.

Rapid fire spread is common in lumberyard fires if they are not reported quickly and suppressed in their early stages. It must be remembered that lumberyard fires can grow rapidly, requiring major changes in strategy and increased resource commitments.

The **type and amount of material** burning and the manner in which it is stored will be factors in fire growth and the ability to extinguish it. For example, tightly stacked large-dimension lumber will not burn as rapidly as loosely stacked, smaller-sized lumber.

The amount of **heat radiation and convection** produced by the burning material must be considered. Large, free-burning fires will have a greater potential for exposing adjacent structures and will require additional hoselines for exposure protection. These types of fires also will make it more difficult to approach the fire area to apply water in the most effective manner.

Stream penetration into stacked lumber is important and is made more difficult if the lumber is tightly stacked or if heat radiation limits the approach to the fire area. Because of these factors, straight-tip streams may be required along with hoselines equipped with spray nozzles for protection. In some cases, elevated streams may be necessary to place the water on the burning material.

Flying brands can be generated in large quantities from free-burning lumber and can be carried great distances by winds and the thermal columns created by the heat from the fire. This can create spot fires quite distant from the original fire area. Consider, downwind patrols to minimize the potential for additional fires being started.

Fires in lumberyard facilities have the **potential for becoming long-term incidents**. The size of the fire, the amount of material burned, and mopup operations can require extended onscene commitment of resources. Also, **fatigue of personnel** can be a factor due to the amount of work required and the possibly hostile operating environment. For this reason, **rehab needs should be considered** along with the use of relief personnel.

Large, long-duration fires in lumberyards usually will require **extensive resource commitments**. When the potential exists for this type of fire, consider resource needs early. Requesting additional alarms or mutual aid must be done in a timely manner. Also consider specialized resources that may be needed, such as elevated stream apparatus or lighting equipment for nighttime operations.

Interagency support also should be evaluated early and requested as needed. Law enforcement personnel to deal with traffic problems in the area and utility service companies to terminate or control affected utilities probably will be required. Also consider establishing **emergency medical services** (EMS) capability at the scene to treat any injured firefighters.

Overhaul of lumberyard fires can be extensive and difficult. The large amounts of tightly stacked, burned, and charred materials present, and the difficulty in reaching deep-seated fires for final extinguishment make overhaul time-consuming and labor-intensive. The instability of stacked lumber also may be a problem. **Wetting agents** such as "light water" can speed this process up considerably. In some cases, heavy equipment is required to move material for the overhaul. A consideration for solving these problems is not to conduct an overhaul of the burned material, but to post a fire watch until it is certain that the fire is completely out.

CUE-BASED PREDICTIONS

When the fire is of significant proportions, use the defensive mode from the arrival of the first apparatus. Protect exposures and establish a high-volume water supply.

Intense radiant heat may prevent firefighters and apparatus from approaching the fire area to place effective streams on the burning area.

Long supply lines often require significant numbers of pumping apparatus to deliver water to the scene.

Lumberyard fires can turn into conflagrations quickly if large streams are not used or if sufficient resources are not called early. Flying brands are a problem downwind.

Master streams and large handlines are required to knock down the fire.

INCIDENT MANAGEMENT CUES

Fires in lumberyard facilities often require multiple tactical operations. Fire attack, exposure protection, and ventilation are just a few of the activities that must be coordinated during the incident. Failure to coordinate tactical operations can result not only in very ineffective fire control, but also can cause serious injury to firefighting personnel.

Command Officers must ensure that tactical operations are performed in a timely manner and do not conflict with each other. Problems such as opposing hoselines and premature or delayed ventilation can develop if tactical operations are not controlled and coordinated.

STRATEGY AND TACTICS

The basic strategy for controlling fires in lumberyard facilities will vary, to some extent, depending on whether the fire is located in outside lumber storage or inside a structure. For that reason, basic strategies will be discussed separately.

Outside Storage Fires

Fires in outside lumber storage can grow quickly and spread rapidly depending on the type of materials involved and the method of storage. They can create spectacular fires that generate enormous amounts of heat and spread flying brands over large areas.

The basic strategy for controlling an exterior lumber storage fire depends on the size of the fire, access to the fire, and proximity of any exposures. If the fire is not large, small hoselines (1-3/4 inches) can be used for a direct attack on the fire, with additional small lines placed to protect any exposed lumber storage or adjacent structures.

In the case of larger fires in outside lumber storage, large handlines (2-1/2 inches) should be deployed to provide the reach, fire flow, and penetration required to extinguish the fire. In some situations, the size of the fire may dictate the use of master streams from fixed appliances. If the fire involves high-stacked lumber storage, consider using elevated streams. When employing large handlines or master streams, think of the ability of the available water supply to support the operation.

If conditions permit attack, the fire from a direction that will not move it toward any uninvolved material or toward adjacent structures. If structures are threatened by heat radiation or convection from the fire, place initial hoselines or appliances in positions to protect them. Flanking a hot, fast-moving fire will allow some fire control along with a measure of safety for firefighters.

Safety must be a prime consideration when selecting strategies or tactics to combat fires in lumber storage. This is especially true in larger fires. The heat radiation produced and the possibility of collapse of stacked lumber are particular concerns.

Fires Inside Structures

Fires that occur inside structures of lumberyard facilities present different problems from those that involve only outside storage.

If the fire occurs in the facility during normal business hours, life safety of employees and customers must be a primary consideration.

The amount of lumber or other combustibles inside a structure at a lumberyard facility is not normally as great as that of outside lumber storage. However, the type of material, e.g., moldings, paneling, plywood, and other products, often can produce intense fires that are extremely difficult to control. Additionally, the structure itself may contribute to the fire load.

As with any interior fire, the best approach usually will be a quick, aggressive attack on the seat of the fire. Temper this with concern for conditions within the building, the amount of fire, and the risks involved in entering the building.

Ventilation of the structure also should be considered as a means of providing a safe operating environment within the building and limiting the direction and amount of fire spread.

Also consider internal exposures, especially the extension of fire to other combustibles, combustible liquids, or products considered to be hazardous materials.

Salvage becomes a strategic consideration at fires involving structures in lumberyard facilities. Protection of building materials, hardware items, and tools from water and smoke damage can do much to limit the overall amount of fire loss.

Safety considerations are important when fighting fires involving structures at lumberyard facilities. Structural stability must be evaluated before firefighters enter the structure, and be monitored constantly if the fire is not extinguished quickly.

Changes In Strategic Mode

Fires in lumberyard facilities, whether involving outside or inside storage, can develop rapidly and change quickly. Because of this, Command Officers should have alternate strategies in place to deal with changing conditions.

Initial placement of apparatus can be critical if the fire does grow, and a switch must be made from an offensive attack with handlines to a defensive operation with heavy streams.

When a switch in operational mode is made, it is critical that all involved in the incident be made aware of the change and modify their operational status accordingly. Obtain acknowledgment from officers directing tactical operations to prevent injuries or noncompatible activities.

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Simulation 4

Homework Assignment

Lumberyard Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on lumberyards the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the same groups established for classroom activities. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation.

2. After reading the SM, your group will answer the questions pertaining to different situations or problems at lumberyard fires.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems that were not discussed.

Scenario 1

A lumberyard is experiencing a major fire in a number of lumber stacks in the outside storage. The fire is severely exposing other lumber stacks and one wood-frame storage building.

What problems are created, and what tactical and Incident Command System (ICS) solutions must be applied?

Problem: ____

____

____

Tactical Solution: ____

____

____

ICS Solution: ____

____

____

What cues led you to this solution? ______________________________________

Problem: ____

Tactical Solution: ____

ICS Solution: ____

What cues led you to this solution? ______________________________________

Problem: ____

Tactical Solution: ____

ICS Solution: ____

What cues led you to this solution? ____________________

Scenario 2

A lumberyard with a major involvement of one storage shed (45' x 100') and several lumber stacks is seen on arrival. Given the inability to trap steam in a 100-percent-involved structure, will the National Fire Academy (NFA) Fire Flow Formula apply in this situation? If not, what flow will you attempt to apply to this fire?

Delineate the types of fire streams (handline, master stream) required and the types of nozzles to be used.

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In Class
Activity 4.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a lumberyard scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the activity worksheet.

3. The class will be shown a slide of a home improvement center. Everyone will review the scenario description and the plot/floor plan.

4. Your group will write its overall goals (strategies) on the Strategy Prompter and convert those goals into an ICS organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident.

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 15 minutes total. Be brief, but to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, you must identify which Division or Group is performing that task.

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In Class
Activity 4.1 (cont'd)

Scenario Description

Construction

Ordinary construction (masonry wood-joist).
Walls--concrete block.
Steel columns and beams support the roof assembly.
Roof--parallel-chord wood-truss, plywood sheathing, with paper, tar, stone covering.

Fire Location

Heavy fire in the outside storage area along the entire rear of the building.

Time and Day

1630 hours, Wednesday.

Water Supply

3,000 gpm total system flow.

Resources (1st alarm)

4 engines
1 truck
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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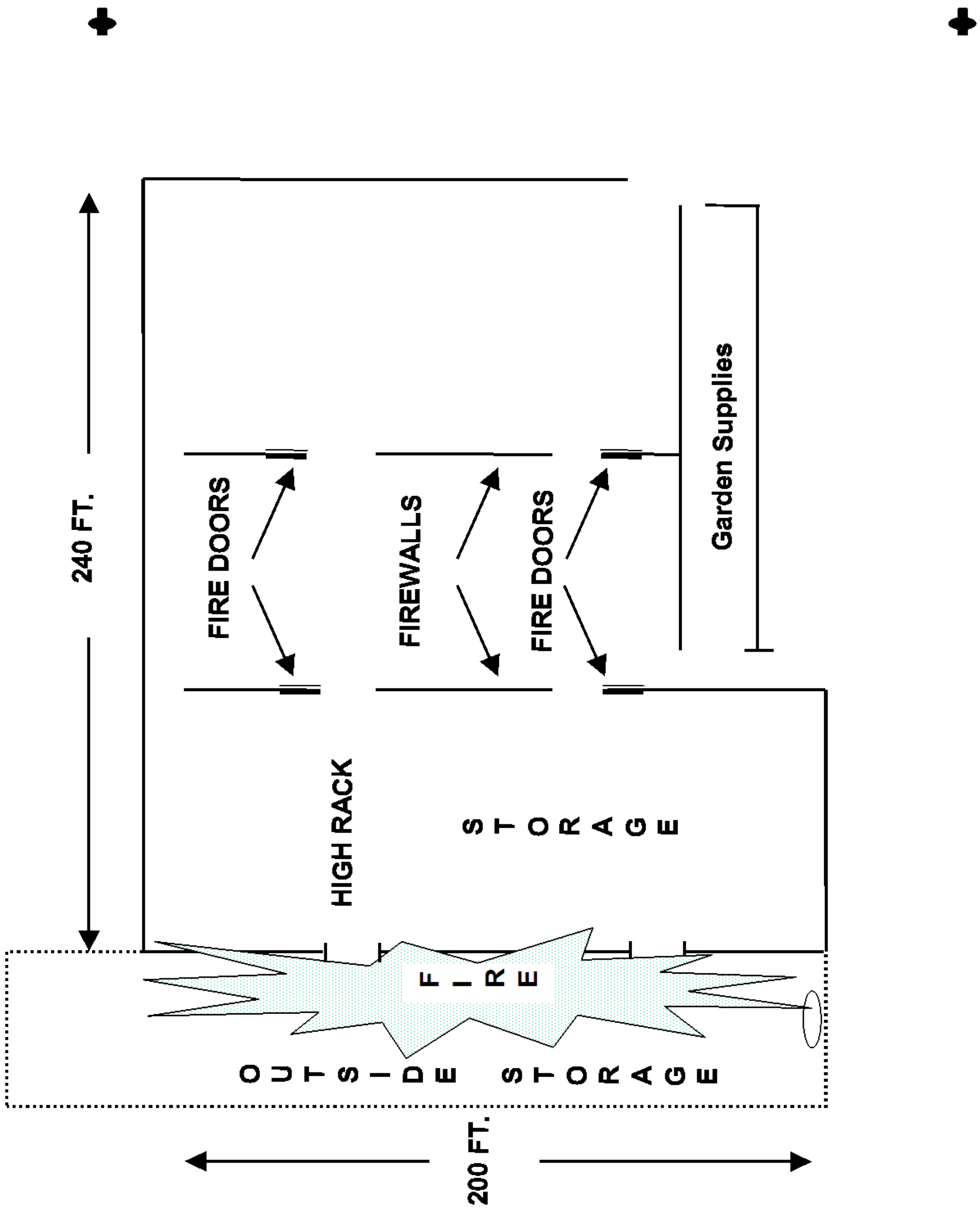
In Class
Activity 4.1 (cont'd)

Plot/Floor Plan

Front Side



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Simulation 4

LUMBERYARD SIMULATION

Incident Description

A typical lumberyard with covered lumber sheds, a sales office, and stacks of lumber. The sheds are wood-frame construction with corrugated metal sides and roofs.

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Simulation 4
Quick Access Prefire Plan

Building Address:
22nd and L Streets

Building Description:
Lumberyard and building supply--Outside lumber storage and covered storage of lumber and finished wood products--corrugated metal sides

Roof Construction:
Wood joist--metal covering

Floor Construction:
Concrete

Occupancy Type:
Lumberyard

Initial Resources Required:
4E, 1T, 1 BC, 1 PM, 1 Safety Officer

Hazards to Personnel:
Large amounts of combustibles--paint and other flammables--possible structural collapse--propane tank on premises

Location of Water Supply:
Hydrants 200' east and west, 1,000' north

Available Flow:
1,500 gpm each hydrant

	Estimated Fire Flow*			
Level of Involvement	*10%*	*25%*	*50%*	*100%*
Estimated Fire Flow	500	1,250	2,500	5,000

**Basic fire flow--5,000 gpm (2,700 for structures--2,300 for outside storage).*

Fire Behavior Prediction:
Potential large fire in outside storage area--rapid fire growth.
Potential large fire in covered storage structures and sales/office areas.

Predicted Strategies:
Exposures, Confinement.

Problems Anticipated:
Rapid fire growth--heat radiation and convection--flying brands--spread to exposures--possible involvement of flammables and hazardous materials.

❑ **Standpipe:** *No*

❑ **Sprinklers:** *No*

❑ **Fire Detection:** *No*

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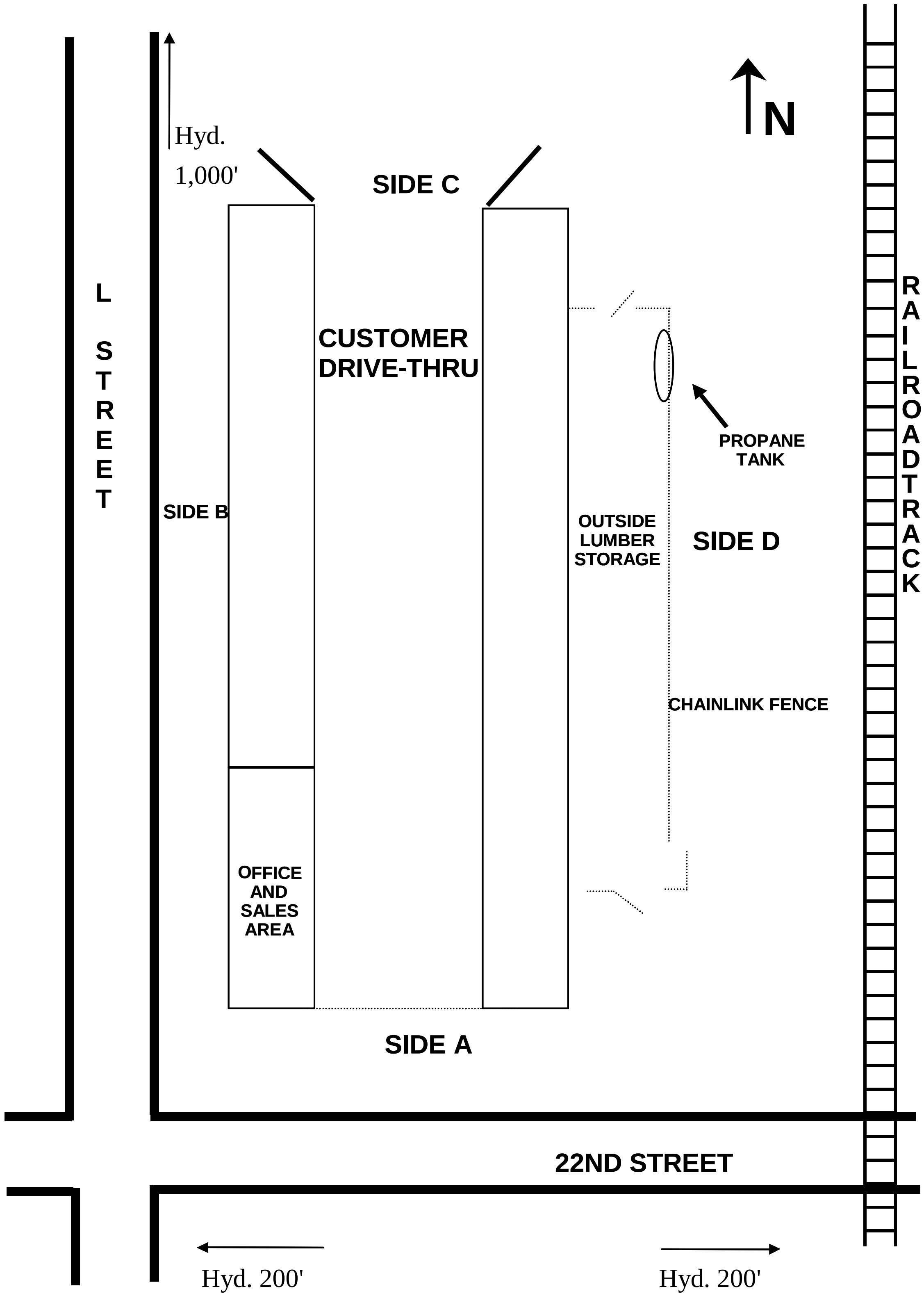
Simulation 4

Plot/Floor Plan



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SIMULATION 5: VACANT COMMERCIAL

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management functions at fires involving vacant commercial structures.*

2. *Apply the knowledge, skills, and abilities discussed to manage a simulated fire situation involving a vacant commercial structure.*

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INTRODUCTION

A **vacant commercial structure** usually is defined as a commercial building or enterprise that was used for manufacturing, warehousing, or sales and currently is vacant.

Buildings that fit this classification may be of **various design and construction types**, and either **single story or multiple story**. These buildings can range in size from **small to very large**.

These types of buildings can be vacant for many reasons. Often the business that occupied the structure has failed, or the structure is scheduled for demolition because of age or condition, or to allow construction of another building.

OCCUPANCY-SPECIFIC CUES

Special Construction Factors

The **type of construction** found in vacant commercial structures will vary greatly. The range of construction types will run the gamut from **noncombustible** to **fire resistive** to **ordinary** and, in some cases, even **wood frame** depending on the design and age of the building and its originally intended use.

Mixed construction types are common in vacant commercial buildings, especially older buildings that have been expanded, remodeled, or modified for specific types of occupancies or uses.

Vacant commercial structures, often by their very nature, contain **construction deficiencies** which must be considered when fighting fires in them. Expansion or modification of the structure, as mentioned above, may create conditions that will affect fire spread and the general stability of the building.

Vacant commercial buildings that pose the most serious problems under fire conditions are typically of old-style construction, have minimal fire resistiveness, lack built-in fire protection, and have the potential for rapid fire spread and early collapse.

Wall construction in vacant commercial structures also can be of many different types. Masonry walls, which may be concrete block or brick, and which may be reinforced, are quite often found in these types of structures. Many of these buildings that were constructed of "tilt-up" design will have poured concrete walls. Metal walls or combination metal-masonry walls also are typical of vacant commercial structures. In some cases, especially in multistory buildings, the walls may be steel frame curtain walls.

When wood-frame walls are found in vacant commercial structures, they are usually of platform construction, which limits the unrestricted vertical travel of fire within the walls.

In some cases, firewalls or division walls may divide single occupancies or may separate multiple occupancies within a single structure.

Always consider the **potential for wall collapse** when dealing with vacant commercial structures. The failure of other structural members during a fire can trigger a wall collapse. Quite often the failure of the roof assembly is the cause for wall failure. Monitor the potential for wall failure throughout the fire, based on fire conditions.

Roofs on vacant commercial structures will vary, depending on the age of the building, the design, and the construction type. **Flat roofs** that consist of wood joists, wood rafters, and wood sheathing are typical of older buildings. Many newer (and some older) buildings feature **steel bar-joist** roofs that can fail very quickly under severe fire conditions. **Parallel-chord** truss roofs are typical of modern construction design, and can be found on many newer buildings that have been vacated. **Panelized** roofs, which are used on many "tilt-up" buildings, use girder-and-beam construction with minimal support of the plywood roof decking. These roofs are extremely dangerous to walk on during fires.

The **two general types of roof designs** found on vacant commercial structures are pitched roofs and arched roofs. **Pitched roofs** can be of two different designs. Ridgepole and rafter roofs are common on older, smaller buildings, as are wood-truss pitched roofs. The wood-truss roofs may be nailed (typical in older construction) or gusset plate (typical of more modern truss construction). **Arched roofs** are typical of large-area buildings and may be of "bridged truss" or "summerbell" design. Bridged truss roofs are supported by rafters and are considered to be relatively safe under fire conditions. **Summerbell roofs**, in contrast, have no main structural members for support and have a **reputation for collapse under fire conditions**.

Fire Loading and Fire Spread

Fire loading **will vary greatly** in vacant commercial structures, based on general building conditions. Buildings of this type that have been cleaned out and properly secured usually have minimal fire loading. Some buildings have what is considered to be medium fire loading because some debris and combustible fixtures or furnishings remain in the building. Maximum fire loading is present when the building contains large amounts of combustible materials.

Delayed alarms are a common condition associated with major fires in vacant commercial structures. It is obvious that, when the building is not occupied and the fire is not reported promptly, special problems are created for responding firefighters. Among these is the fact that there is no reliable indication as to how long the fire has been burning. This creates the potential for **possible damage to structural members** within the building and the **possibility of flashover or backdraft** under certain conditions.

Fire may spread rapidly in vacant commercial structures for a variety of reasons. Large amounts of combustibles within the building, and the fact that the building may be wide open can create very fast-moving fires. Unrestricted paths for fire travel, caused by regular openings or building deficiencies, also will cause the fire to spread very rapidly.

The **incidence of incendiary fires** in vacant commercial properties is quite high. Many times fires of this type will have multiple areas of origin, which cause rapid fire development and spread. This high potential for incendiarism requires caution during initial entry and fire attack operations.

Floors in vacant commercial structures may be wood joist with wood decking, which is typical in older buildings, or concrete, which is commonly found in newer buildings. Many multistoried buildings may have concrete first floors with wood joist floors above. Trussed joist floors also are common on some newer buildings. The **possibility of floor voids** in vacated buildings requires extra caution during interior operations.

Loss of floor girders or floor joists may trigger wall collapse in some types of construction. This is especially true in older buildings, such as heavy timber, and those with unreinforced masonry walls.

COMMON PROBLEMS TO IDENTIFY

Roof, wall, and floor construction can be critical during a fire situation. Identify these during preplanning. Time and conditions usually will not permit detailed determination of these elements on arrival at the incident scene. If the construction of key elements of the building cannot be determined, then assume the worst and act accordingly.

Fire involvement on arrival must be a primary sizeup consideration. Determine the location of the fire in the building and the amount of fire as quickly as possible. Also check extension of the fire from the original area of involvement. Signs of potential fire spread are the volume of fire in the building, the horizontal and vertical travel paths for the fire to spread, and the location of the fire in terms of the direction from which it can be attacked. A determination must be made as to whether the fire is likely to affect any primary structural components, such as the roof, walls, or floors.

Immediately check for extension of the fire through the ceiling and into the attic area. A sign of probable roof or attic involvement is major fire involvement of the interior of the building or fire venting through the roof. Hot smoke rising forcefully from attic vents, or heat discoloration of the roof covering also are indicators that the fire may be burning in the ceiling or attic area

Consider structural deficiencies in terms of overall safety and the method of fire attack. General decay of the structure or modifications to the structure will play a major role in fire development and spread. This is true also if the building is partially demolished, and any fire protection features built into the building have been removed or rendered ineffective.

Structural deterioration of vacant commercial buildings may be rapid due to the amount of fire present on arrival and the uncontrolled spread of fire before it can be contained. The construction type of the building as well as its general condition also will affect possible failure of structural components.

In these types of buildings, roofs generally will be the first structural element to fail. The type of roof construction is key: trussed roofs are the most susceptible to early failure. Anticipate roof collapse if the fire has been burning for a prolonged period, or if a large volume of fire has extended to the roof or attic area.

Wall collapse can be tied closely to the type of roof construction. The loss of the roof usually is preliminary to wall failure, as the collapse of the roof usually will affect the horizontal and vertical stability of the walls. In some cases, roof and wall failure may occur at the same time.

Wall collapse may be gradual or sudden, depending on construction type. Often the shift in walls from normal vertical position is noticeable as the fire progresses, and this condition should be monitored.

The **direction of wall collapse**, either inward or outward, **cannot always be anticipated**. The loss of roof or floor structural members may push walls out or pull them in. As a general rule, walls in heavy timber or ordinary (masonry and wood) construction will fall outward. The rule of thumb is that walls will fall outward to a distance of one-and-one-half times their height. This should be considered as a minimum safety consideration, as the height of the wall and the impact with the ground may propel portions of the wall a greater distance. One-and-one-half times the wall height is considered a safe distance for firefighters.

The collapse of floors may occur from fire burning on that floor or on the floor below. This is especially true of truss-type floors.

If the collapse of a roof, wall, or floor is indicated or anticipated, remove firefighters from inside the building, from the roof of the building, and from within a safety zone on the outside perimeter of the building. Remember, if it is not safe to be in or on top of, it is not safe to be around.

Exposures

Exposures in vacant commercial structures **must be a primary consideration** in developing an initial strategy and determining tactical objectives. In fires of this type, exposures will fall into two basic categories: connected exposures and nonconnected exposures. The type of exposure generally will affect the overall strategy.

Connected exposures may be difficult to protect due to their **proximity to the fire area**. Normally they will require protective lines being placed inside the exposure, but fire conditions and fire behavior may make interior protection difficult and extremely dangerous. This is especially true if there is minimal protection between the fire occupancy and the exposure. Lack of division walls, nonrated fire doors, and common attics are examples of elements that make connected exposures difficult to protect.

Nonconnected exposures usually are **much easier to protect**. The space between the fire building and the exposure serves as a buffer in terms of radiated heat and provides space to position protective hose streams. Normally, protecting these types of exposures does not require interior operations; frequently it can be accomplished with master streams placed at key points on the exterior of the exposure.

Access points into vacant commercial structures are important. The ability to reach the fire area will be critical in terms of time required and the direction from which the fire is attacked. Because the location of access points can play an important role in fighting the fire, they should be identified on preplans.

In the case of well-secured vacant commercial structures, entry into the building may be difficult. This will require support assistance for fire attack teams. If entry is delayed because access points are well secured, the fire may grow considerably and become more difficult to control.

If possible, the access point(s) selected should allow attack on the fire from a direction that will not drive it into areas of the structure that are not involved. If this is not possible, then additional lines should be placed in the structure to provide interior exposure protection in terms of holding the fire to its original location.

CUE-BASED PREDICTIONS

When the fire is of significant proportions, use the defensive mode from the arrival of the first apparatus. Protect exposures and establish a high-volume water supply.

View the structural integrity of vacant commercials pessimistically when they are involved in fire. Wall, roof, and floor collapse can occur suddenly due to fire spread to bearing members through deteriorated assemblies. Arson should be suspected. Master streams and large handlines often are required to knock down the fire.

INCIDENT MANAGEMENT CUES

Fires in vacant commercial structures often require **multiple tactical operations**. Interior attack, exposure protection, and ventilation are just a few of the activities that must be coordinated during the incident. **Failure to coordinate tactical operations** can result in very ineffective fire control operations but, more importantly, can be the cause of serious injury to fire personnel.

Command Officers at all levels must ensure that tactical operations are performed in a timely manner and do not conflict with each other. Opposing hoselines, mixing offensive and defensive tactics, and premature or delayed ventilation are just a few examples of activities that can cause problems if tactical operations are not controlled and coordinated.

STRATEGY AND TACTICS

A **good sizeup** is required before any tactical decisions are made to fight a fire in a vacant commercial structure. Some critical factors that should be considered during the sizeup are

- construction type;
- possible structural deficiencies;
- potential structural failures;
- location of fire in the building;
- amount of fire;
- predicted fire behavior; and
- resource needs.

Acting before thinking and planning at the scene of a vacant commercial fire can cause some serious problems in terms of firefighter safety and control effectiveness. A few moments spent making a proper sizeup can prevent many of these problems.

Strategy and tactics in these situations must be based on a **risk/benefit analysis**. The first questions that must be answered are, "Are there any life safety considerations?" and "Is this building worth saving?"

The **commercial value of the building should be a consideration** when deciding what type of attack mode will be used. What will be left of value after the fire in the building is extinguished? If the determination is that most of the structure will be damaged or destroyed to the point where the building will no longer be usable, the strategy and tactics should be based on minimizing any safety concerns for firefighters. If the building is scheduled for demolition, which is the case with many vacant commercial structures, the risks involved in trying to save the building far outweigh the benefit to be gained, and this should be the governing factor in deciding which action to take.

Exposures should be a primary concern when developing strategy and assigning tactical objectives. When there are multiple exposure problems, they should be placed in priority order and handled according to their priority.

Occupied exposures and exposures connected to the fire building are of the most immediate concern and should be dealt with first. Exposures that are not connected or not occupied pose less of a threat and should rate lower on the priority scale.

Decide the **type of fire attack that will be used** based on fire conditions and available resources. The attack mode may be either offensive or defensive and may change according to fire conditions and resource availability.

An **offensive attack** in these types of situations can be considered an attempt to extinguish the fire and save the building. Current conditions indicate that it is safe to put people inside the building to extinguish the fire, or on top of the building to perform ventilation operations. If an offensive attack is contemplated, the risks associated with such an operation must be acceptable. If the risks are not acceptable, employ a defensive attack.

When an offensive attack is used, scene conditions such as fire location, fire size, and structural stability must be monitored constantly. Remember that fire conditions can change rapidly and may require rapid changes in strategy and tactics.

Use **large-diameter hoseline** when mounting an offensive attack for anything other than a small fire. When compared to smaller hoselines that may be sufficient for other types of structure fires, large-diameter hoselines provide an increased margin of safety. They also provide greater reach and more extinguishing capability, which is sometimes required in fires in vacant commercial structures.

When interior attack teams are used to fight fires in vacant commercial structures, assign **backup teams with charged hoselines** to provide protection for them. Officers in charge of supervising interior operations must monitor the location and status of personnel inside the building constantly and notify them of any changes that may affect their safety.

A **defensive attack** on a fire in a vacant commercial structure may take many forms. It may be an attempt to extinguish the fire in the building without actually placing personnel and hoselines into the structure. It may consist of placing hose streams from handlines or heavy stream appliances in key positions to protect exposures. **Be careful when mixing the use of hand-held lines and heavy stream equipment** during defensive operations. Firefighters often attempt to use handlines close to walls and doors in the structure. This act places firefighters in great danger should a wall collapse.

Consider **initial placement of apparatus on arrival** at the incident scene if using defensive operations with master stream appliances. Attempting to reposition apparatus for defensive operations when a change in attack mode is required can be extremely difficult. A little thought about where apparatus is located initially can make this process much easier.

In many cases, the initial strategy may be a defensive operation attempting to hold the fire in check or to protect exposures pending the arrival of additional resources. When the required resources arrive onscene, a switch to an offensive mode can be made.

The **switch from an offensive attack to a defensive attack** may be required because of changes in fire conditions. When this occurs, it is critical that everyone at the scene gets the message that the attack mode is changing and acts accordingly.

Also, it is critical to use a **common signal** that is understood by everyone at the scene when conditions indicate that it is no longer safe to be inside or on top of the building.

This alarm signal can take many different forms, but when sounded it should alert everyone to leave the building and the immediate perimeter area immediately.

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Simulation 5

Homework Assignment

Vacant Commercial Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on vacant commercials the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the same groups that were established for classroom activities. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation.

2. After reading the SM, your group will answer the questions pertaining to different situations or problems at vacant commercial fires.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems that were not discussed.

Scenario 1

A three-story, 80' x 80', vacant commercial of ordinary construction, circa 1935, has a 20- to 25-percent involvement on the second floor. The building has been vandalized, and all the copper tubing and electrical wiring have been removed from the walls and floors. The stairs are deteriorated or missing, and most of the windows are broken. What orders would you give pertaining to the safety of firefighting operations?

Scenario 2

A 75' x 100', four-story, vacant commercial of ordinary construction is involved in fire. Initial conditions indicated that the second floor was involved. Initial operations were ventilation and interior fire attack. Two alarms are operating at the scene. After approximately 15 minutes of fire attack, the fire has extended to the third floor, and now that floor is well involved. The firefighting forces on the second floor have made partial headway in stopping the spread of fire on the second floor. The third-alarm companies have arrived at Staging and are ready for assignment. As the Incident Commander (IC), what, if any, decisions would you make at this time?

In Class
Activity 5.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a vacant commercial scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the worksheet for the activity.

3. Your group will write its overall goals (strategies) on the Strategy Prompter and convert those strategies into an Incident Command System (ICS) organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident.

4. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 15 minutes total. Be brief, but to the point.

5. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group, and ventilation is required, you must identify which Division or Group is performing that task.

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In Class
Activity 5.1 (cont'd)

Scenario Description

Construction

60' x 100', one-story.
Ordinary construction (masonry wood-joist).
Walls--concrete block and brick.
Steel columns and beams support the roof assembly.
Roof--flat beam and rafter, 1" x 6" sheathing, with paper, tar, stone covering.

Fire Location

A 50-percent or more involvement on the interior from the rear towards the front.

Time and Day

0600 hours, Sunday.

Water Supply

4,500 gpm total system flow.

Resources (1st alarm)

4 engines
1 truck
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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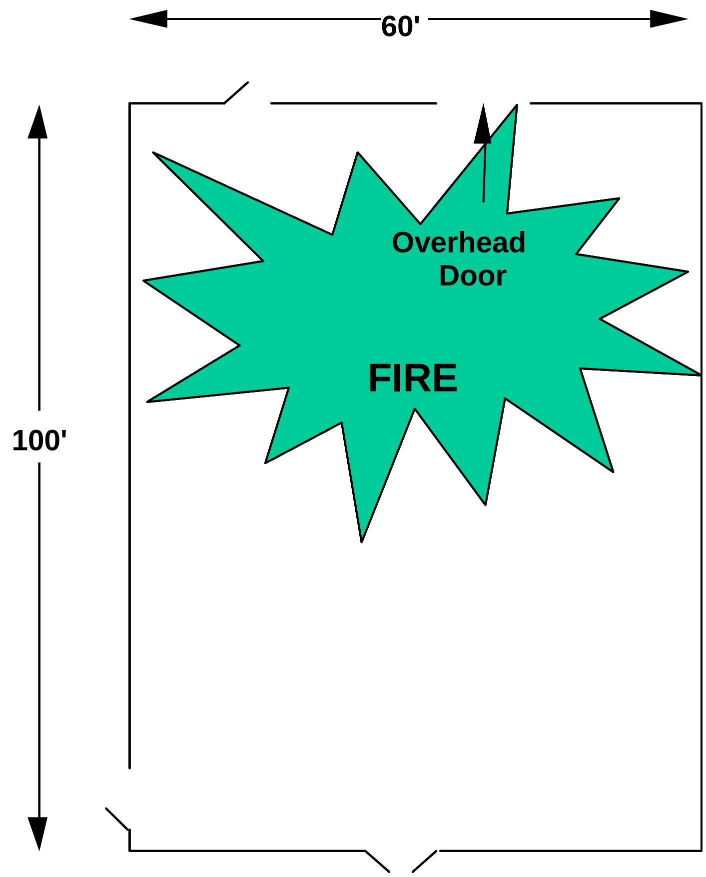
In Class
Activity 5.1 (cont'd)

Plot/Floor Plan



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Simulation 5

VACANT COMMERCIAL SIMULATION

Incident Description

A two-story vacant commercial building, 80' x 100'. There is an exposure on Side B. There are two open stairs in the vacant building. The stair shafts go to the roof.

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Simulation 5

Quick Access Prefire Plan

Building Address:
525 S. 6th Street

Building Description:
80' x 100', vacant 2-story, ordinary construction

Roof Construction:
Wood joist--wood sheathing with tar covering

Floor Construction:
First floor concrete--second floor wood joist/wood decking

Occupancy Type:
Vacant

Initial Resources Required:
4E, 1T, 1 BC, 1 PM, 1 Safety Officer

Hazards to Personnel:
Potential for rapid fire spread and large fire--possible structural collapse

Location of Water Supply:
2 hydrants within 300' and 2 within 600'

Available Flow:
1,500 gpm each hydrant

	Estimated Fire Flow*			
Level of Involvement	*10%*	*25%*	*50%*	*100%*
Estimated Fire Flow	400	1,000	2,000	4,000

**Basic fire flow--2,700 gpm for one floor plus 1,300 for exposure floor and Exposure B.*

Fire Behavior Prediction:
Potential large fire--rapid spread to second floor and possibly to exposures.

Predicted Strategies:
Exposures, Confinement, Ventilation.

Problems Anticipated:
Rapid fire growth--heat radiation and convection--flying brands--spread to exposures.

❑ **Standpipe:** *No*

❑ **Sprinklers:** *No*

❑ **Fire Detection:** *No*

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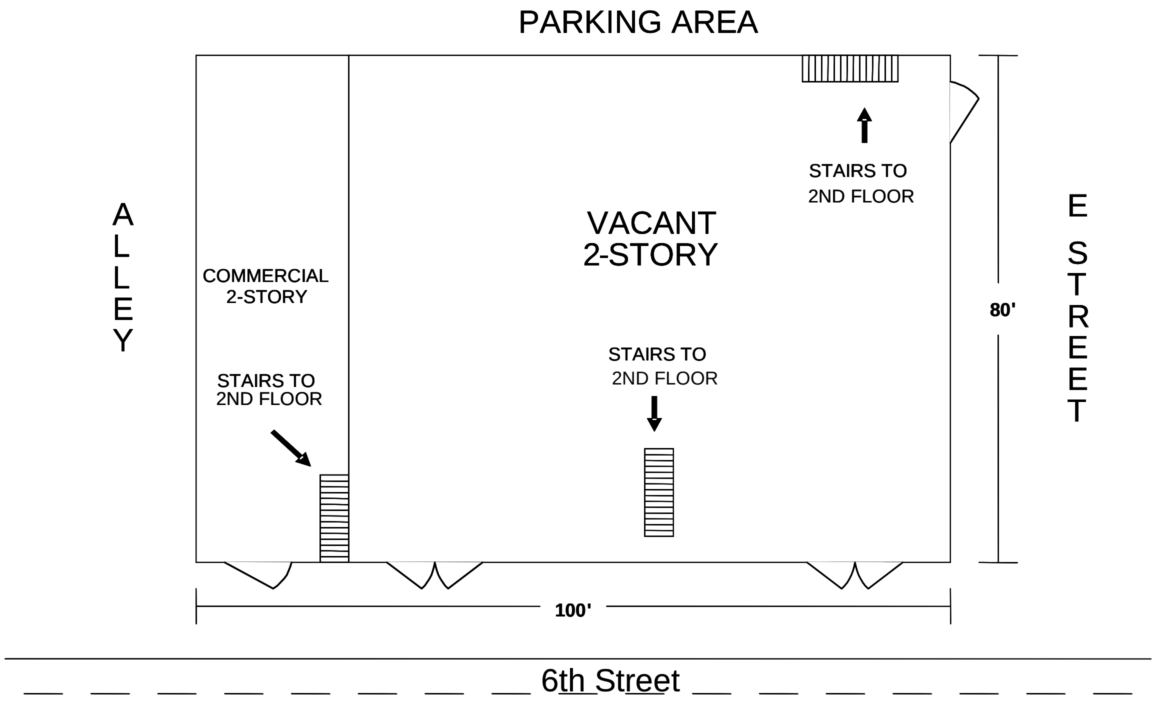
Simulation 5

Plot/Floor Plan



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Simulation 5

Plot/Floor Plan (cont'd)

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SIMULATION 6: HAZARDOUS MATERIALS FACILITIES

OBJECTIVES

The students will:

1. *Develop their knowledge, skills, and abilities relating to hazardous materials (haz mat) facilities.*
2. *Apply the knowledge, skills, and abilities while performing a haz mat facility simulation.*

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INTRODUCTION

For the purposes of this course, a hazardous materials (haz mat) facility is defined as a facility that stores, distributes, or manufactures products using haz mat.

OCCUPANCY-SPECIFIC CUES

Construction Factors

The construction of the facilities will vary to some degree with age, geographical location, type of product, and the building codes that were in force at the time of construction. For example, facilities in older cities may have structures that were built around the turn of the 19th century. These structures may be wood frame, while heavy-timber buildings can be found, as well as ordinary (masonry wood-joist) construction. In other areas, skeletal steel (metal-clad buildings) and tilt-up concrete construction may be found.

It is important to remember that these are just some common associations, and that there is no correlation between the product/process and the exterior construction.

The configuration of the interiors will vary greatly, depending on the needs of the particular operation. Where fire prevention efforts and enforcement are weak, incompatible haz mats often will be commingled, posing a serious interaction problem in the event of a fire or chemical release. Offices, storage rooms, mechanical rooms, loading docks, and product storage are common in these facilities.

Some of the structures at the facilities may be wood or metal storage sheds and they may be open on one or more sides.

Resource Considerations

Water supply is always a major consideration in the areas where these buildings are found. The fire loading and potential for fire spread in this type of occupancy are considerable. Preplanning can help Command Officers determine available water supply, estimated fire flow requirements, and alternate strategies such as equipping first-responding engines with large-diameter hose.

Of course, built-in fire protection systems and the proper support of these systems by the fire department may contribute significantly to suppression efforts. However, in many cases, sprinkler systems are not installed, either because they weren't required at the time of construction, or because water is not the appropriate extinguishing agent. In cases where water cannot be used (water-reactive products, etc.), the Incident Commander (IC) must consider alternative agents.

Companies storing or using haz mats should have an internal emergency procedure/plan which would include evacuation and accounting for employees, among other things. However, the fire department cannot depend on such procedures being in place and must plan its resources accordingly. Evacuation in this type of incident may pose a problem due to the hazardous vapors that may develop during an incident. In addition, buildings that are adjacent and downwind must be evacuated due to toxic smoke/vapors.

Consider outside agencies when projecting resource needs. What is their level of training and expertise? How will they be integrated into the overall strategy and Incident Command System (ICS) organization? Do we have the ability to communicate with other agencies? Some agencies to be considered are mutual-aid fire departments, police, industrial emergency response teams, environmental protection agencies, health departments, and technical specialists.

Some private chemical corporations have joined forces in certain areas of the country to provide each other with technical assistance, as well as personnel, apparatus, and equipment during times of emergencies. In fact, they have mutual-aid pacts similar to many fire service communities.

Structural Deterioration and Collapse Potential

Due to the general nature of these occupancies, there are exposed roof assembly members. This often allows fire to impinge on roof structures, increasing the potential for collapse. Lightweight roofs are another concern. Lightweight truss construction tends to collapse after only 5 to 9 minutes of direct fire impingement.

Ordinary construction presents the most potential for wall collapse, especially concrete block construction. However, concrete tilt-up buildings can come apart at the corners where the walls are joined, allowing the walls to collapse outward. It is important that ICs recognize the collapse potential and dangers presented by the different types of construction. Many haz mats are likely to undergo a boiling liquid, expanding vapor explosion (BLEVE), causing excessive pressure on bearing walls. The time to develop the necessary skills and knowledge is **before** the incident occurs.

Hazardous Materials Operations and Organization

These facilities often contain haz mats in quantity. These materials may range from low to extreme severity for health, fire, and reactivity. This fact usually calls for the dispatch of a haz mat response team to incidents involving haz mat facilities.

The haz mat team operates directly for the IC or the Operations Section Chief (when established). Haz mat is either a Group or a Branch, depending on the severity and risk of the situation.

Haz mat may have the following subunits:

- Entry Team;
- Backup Team;

- Decontamination;
- Perimeter;
- Assistant Safety Officer--Haz Mat (ASO-HM); and
- Technical Specialist--Haz Mat Research.

The ASO-HM reports directly to the scene Safety Officer, but works with and advises the Haz Mat Group Supervisor/Branch Director.

CUE-BASED PREDICTIONS

Well-trained ICs are aware of and make use of incident-specific cues to assist them in developing appropriate strategies for incident mitigation. Earlier we discussed the cues of various construction types. Additionally, the type of chemicals stored will give cues relating to fire load, presence of haz mats, method of attack, and required resources.

During the hours of operation (in some cases, 24 hours a day), rescue and evacuation are critical. This problem is compounded because, in this type of occupancy, employees often work in small groups in many locations (offices, shipping, transport, manufacturing, etc.). This makes it difficult to notify and locate everyone. Generally speaking, most employees are adults and mobile, able to self-evacuate. However, physically challenged individuals and non-English-speaking personnel are employed in many industries. Consider putting this information on preplans and dispatch cards.

For all the reasons already discussed, it is imperative that the incident be located and confined early. This may require multiple large handlines (if materials are not water-reactive), placing an even greater demand on personnel.

Ventilation for smoke and toxic gases may not be an option, depending on the materials involved and construction type of the building involved. Often this type of industry (especially newer construction) will have built-in systems called "scrubbers" that can be used to ventilate toxic vapors.

Almost always there will be environmental impact and cleanup considerations. ICs must be cognizant that protecting the environment is part of the responsibilities of the position. The IC should ensure that runoff materials are contained to the smallest area possible, and that all storm drains and sewers are diked appropriately. It is critical to keep runoff materials out of streams and rivers and other waterways.

INCIDENT MANAGEMENT CUES

It is imperative that the IC meet with a facility representative to determine what materials are involved and the dangers of those materials. Also, determine what other materials are endangered by the present situation.

Consider a major evacuation of the facility and outlying areas, as well as who is going to do the evacuation (police, fire, or a combination).

There may be a need for a mass or multiple casualty response.

It may not be possible to use water as the extinguishing agent, and procurement of the correct agent may take some time. Water also can be used to absorb soluble gases.

Normal firefighting operations may be hampered because of the toxic or explosive nature of the materials.

STRATEGY AND TACTICS

If we are going to prevent serious life and property losses at incidents involving haz mat facilities, preincident planning is a must. The resource demands of these incidents will not allow us to wait until the incident occurs to begin planning.

Due to the potential for rapid escalation, consider increasing the first-alarm assignment to these incidents that present special problems, especially the assignment of a haz mat unit to the first alarm.

Another consideration is for the fire department to work with the facility to develop onsite emergency response teams comprised of trained employees familiar with the processes and equipment. They could assist with evacuation and provide fire department personnel with technical advice and support.

Fire department responders MUST establish a place near the scene to meet with a facility manager. The manager can tell you what is involved in the facility, what the dangers are , and what possible actions you can take to mitigate the situation. If haz mats are involved, **no** actions should be taken until a Hazardous Materials Response Team evaluates the situation and determines the level of protection required for entry personnel.

All the following is based on the assumption that the IC has met with a facility manager on arrival.

Commit first-alarm companies to those actions that will have the greatest impact on the overall outcome. These assignments could vary with the nature of the business and the specific problem (i.e., fire, spill, smoke, etc.). During hours of operation, start evacuation and accounting for employees immediately. This should be coupled with aggressive material control and segregation of the exposed haz mats.

It is important to confine the situation early, if possible. Otherwise, your actions will become defensive quickly. This requires enough personnel to check all the possible avenues of extension, in addition to personnel operating handlines.

Evacuation of surrounding areas may be the greatest concern. This may be a very labor- and resource-intensive operation.

Handlines used to suppress the fire should be adequate to overwhelm the fire. Considering the potential in this type of fire, you can't afford to take a chance with "just enough."

This type of operation can be very labor intensive and has a significant potential for both firefighter and civilian injuries.

The IC must consider properly equipped and staffed rehab areas and medical areas.

The containment of runoff also must be a priority. The IC must incorporate a Containment Group into the ICS organization. This group will need logistical support in the form of diking materials, booms, absorbents, and outside response agency support, such as the Coast Guard, Environmental Protection Agency (EPA), State Health Department, State Department of the Environment, fish and game, private contractors, etc.

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Simulation 6

Homework Assignment

Hazardous Materials Facilities Questions

Directions

1. Read the entire SM portion on haz mat facilities the evening before the simulation is scheduled. This worksheet of questions pertains to the reading material. You will work in the same groups established for classroom activities. There are two scenarios for this unit. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation.

2. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems that were not discussed.

Scenario 1

A fire is reported at a haz mat facility. The fire is in an enclosed one-story storage shed of ordinary construction. The facility manager tells the IC that the materials involved are bags of ammonium nitrate fertilizer. Since the bags are not in an enclosure that can be pressurized, he/she believes that an attack with handlines is appropriate. The IC agrees. See International Chemical Safety Data Card that follows.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____________________

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Problem: ____________________

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Tactical Solution: ____________________

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ICS Solution: ____________________

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What cues led you to this solution? ____________________

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Problem: ____________________

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Tactical Solution: ____________________

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ICS Solution: ____________________

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What cues led you to this solution? ____________________

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International Chemical Safety Cards			
AMMONIUM NITRATE			**ICSC: 0216**
AMMONIUM NITRATE Nitric acid, ammonium salt NH_4NO_3 Molecular mass: 80.1 CAS # 6484-52-2 RTECS # BR9050000 ICSC # 0216 UN # 1942			
TYPES OF HAZARD/ EXPOSURE	**ACUTE HAZARDS/ SYMPTOMS**	**PREVENTION**	**FIRST AID/ FIREFIGHTING**
FIRE	Not combustible but enhances combustion of other substances. Explosive. Gives off irritating or toxic fumes (or gases) in a fire.	NO contact with combustible or reducing agents.	Water in large amounts. NO other extinguishing agents. In case of fire in the surroundings: use flooding amounts of water in the early stages.
EXPLOSION	Risk of fire and explosion under confinement and high temperatures.		In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position. Evacuate danger area.
EXPOSURE		PREVENT DISPERSION OF DUST!	
INHALATION	Cough. Headache. Sore throat (see Ingestion).	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
SKIN	Redness.	Protective gloves.	First rinse with plenty of water, then remove contaminated clothes and rinse again. Refer for medical attention.
EYES	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
INGESTION	Abdominal pain. Blue lips or fingernails. Blue skin. Convulsions. Diarrhea. Dizziness. Vomiting. Weakness (further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

<table>
<tr><th>SPILLAGE DISPOSAL</th><th>STORAGE</th><th>PACKAGING & LABELING</th></tr>
<tr><td>Sweep spilled substance into noncombustible containers. Wash away remainder with plenty of water.</td><td>Provision to contain effluent from fire extinguishing. Separated from combustible and reducing substances. Dry.</td><td>UN Hazard Class: 5.1
UN Packing Group: III</td></tr>
<tr><td>IMPORTANT DATA</td><td>PHYSICAL STATE; APPEARANCE:
ODORLESS, HYGROSCOPIC, COLORLESS TO WHITE SOLID IN VARIOUS FORMS.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Heating may cause violent combustion or explosion. The substance decomposes on heating or on burning, producing toxic fumes (nitrogen oxides). The substance is a strong oxidant, and reacts with combustible and reducing materials.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV not established.</td><td>ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol.

INHALATION RISK:
Evaporation at 20 °C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes, the skin, and the respiratory tract. The substance may cause effects on the blood, resulting in formation of methahemoglobin.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</td></tr>
<tr><td>PHYSICAL PROPERTIES</td><td>Decomposes below boiling point at c.a. 210 °C
Melting point: 170 °C</td><td>Relative density (water = 1): 1.7
Solubility in water, g/100 ml at 20 °C: 192</td></tr>
<tr><td>ENVIRONMENTAL DATA</td><td colspan="2">This substance may be hazardous to the environment; special attention should be given to water.</td></tr>
<tr><th colspan="3">NOTES</th></tr>
<tr><td colspan="3">Becomes shock-sensitive when mixed with organic materials. Rinse contaminated clothes (fire hazard) with plenty of water.

Transport Emergency Card: TEC (R)-51G09
NFPA Code: H-2; F-0; R-3;</td></tr>
</table>

Scenario 2

A tank car containing anhydrous ammonia was unloading at a hazardous materials facility. A discharge hoseline has separated at a coupling. A cloud of ammonia gas has formed and is heading off site into a residential neighborhood. Anhydrous ammonia is a nonflammable compressed gas because of the high ignition temperature. See International Chemical Safety Data Card that follows.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ______________________________

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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International Chemical Safety Cards	
AMMONIA (ANHYDROUS)	**ICSC: 0414**

AMMONIA (ANHYDROUS)
(cylinder)
NH_3
Molecular mass: 17.03

CAS # 7664-41-7
RTECS # BO0875000
ICSC # 0414
UN # 1005
EC # 007-001-00-5

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIREFIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Gas/Air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting.	In case of fire: keep cylinder cool by spraying with water.
EXPOSURE		AVOID ALL CONTACT!	
INHALATION	Burning sensation. Cough. Labored breathing. Shortness of breath. Sore throat. Symptoms may be delayed (see Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration if indicated. Refer for medical attention.
SKIN	Redness. Skin burns. Pain. Blisters. ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.
EYES	Redness. Pain. Severe deep burns.	Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELING
I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLORLESS, COMPRESSED LIQUEFIED GAS, WITH PUNGENT ODOR. **PHYSICAL DANGERS:** The gas is lighter than air. **CHEMICAL DANGERS:** Shock-sensitive compounds are formed with mercury, silver, and gold oxides. The substance is a strong base, it reacts violently with acid, and is corrosive. Reacts violently with strong oxidants and halogens. Attacks copper, aluminum, zinc, and their alloys. Dissolves in water evolving heat. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: 25 ppm; 17 mg/m^3 (as TWA); 35 ppm; 24 mg/m^3 (as STEL) (ACGIH 1997). MAK: 20 ppm; 14 mg/m^3; (1993) OSHA PEL: TWA 50 ppm (35 mg/m^3) NIOSH REL: TWA 25 ppm (18 mg/m^3) ST 35 ppm (27 mg/m^3) NIOSH IDLH: 300 ppm	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation. **INHALATION RISK:** A harmful concentration of this gas in the air will be reached very quickly on loss of containment. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is corrosive to the eyes, the skin, and the respiratory tract. Inhalation of high concentrations may cause lung edema (see Notes). Rapid evaporation of the liquid may cause frostbite. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: -33 °C Melting point: -78 °C Relative density (water = 1): 0.7 at -33 °C Solubility in water, g/100 ml at 20 °C: 54	Vapor pressure, kPa at 26 °C: 1013 Relative vapor density (air = 1): 0.59 Autoignition temperature: 1,203 °F Explosive limits, vol% in air: 15-28
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms.	

NOTES

The symptoms of lung edema often do not become manifest until a few hours have passed, and they are aggravated by physical effort. Rest and medical observation, therefore, is essential. Immediate administration of an appropriate spray, by a doctor or a person authorized by him/her, should be considered. Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

Transport Emergency Card: TEC (R)-1
NFPA Code: H3; F1; R0;

In Class
Activity 6.1

Incident Command System Organization

Purpose:

To complete a Strategy Prompter for a haz mat facility scenario.

Directions

1. You will work in your groups.

2. You will be shown a slide of a haz mat facility. Refer to the incident description, plot/floor plan showing the fire location, and Strategy Prompter. The Strategy Prompter will be used as the worksheet for the activity.

3. Write your strategies, and convert those strategies into an ICS organization chart. Fill in up to five of the blank boxes with Division/Group/Branch nomenclature appropriate for the incident.

4. You have 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time should be limited to no more than 15 minutes, total.

5. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, you identify which Division or Group is performing that task.

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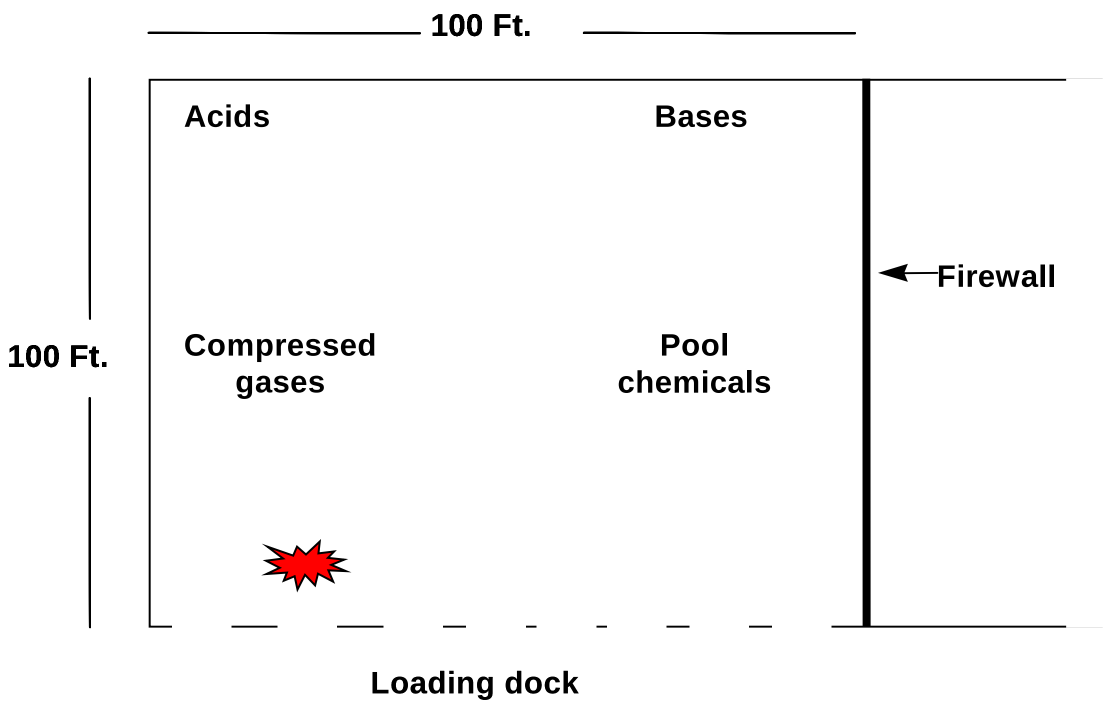
In Class
Activity 6.1 (cont'd)

Plot/Floor Plan



Incident Description

Building description: 100' x 100', 1-story, ordinary construction, manufacturing plant.
Fire involves pool chemicals.
There are seven employees plus the plant manager working today.
Plant manager advises that he does not know where his employees are located.

Fire Alarm Assignment:
4 Engines
1 Truck
1 Medic Unit
1 Hazardous Materials Unit
1 Battalion Chief
ISO

Second Alarm Assignment:
3 Engines
1 Truck
1 Battalion Chief
1 District Chief
1 PM Unit

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Simulation 6

HAZARDOUS MATERIALS FACILITY SIMULATION

Incident Description

The Zap Corporation is a major manufacturer of home improvement products. These products include caulking, sealing, patching and stripping materials. The corporation has four manufacturing facilities located regionally throughout the country. The Central City Plant is the largest of four manufacturing plants. It produces adhesive sealant, silicone sealant and wood filler –"plastic wood". All aspects of manufacturing including packaging and distribution take place at the plant. Central City also serves as the corporate headquarters of ZAP which is located at a separate site. As a result the plant is also involved in the corporate Research & Development (R&D) process.

The ZAP plant is actually a complex of three buildings that have been constructed as the company has grown. The original plant was constructed in 1972 and in 1975 a second structure was added and a final building then followed in 1980. The total plant contains 63,300 square feet of space which is divided between administrative offices, distribution /packaging area and a manufacturing area. The entire plant is classified as Type-II non-combustible construction with a steel frame and metal bar/joist roof system. The walls are constructed of steel and there is a brick veneer applied around the administrative/office area. The roof is a metal deck assembly covered by a tar composite material. In 1990 a "rubberized" membrane roof was applied to the manufacturing building to mitigate some problems with leakage. There are numerous skylights located throughout the roof of the entire complex. These are not part of any fire/ventilation system.

On the outside of the manufacturing area there are four vertical tanks of 30,000 gallons, each which contain hazardous materials. In addition, there are a series of five horizontal 20,000-gallon tanks, which contain hazardous materials. These are all raw materials utilized in the manufacturing process and supplied by a rail siding at the site. Typically there are 3-4 pressurized rail tank cars on site to maintain the constant supply needs. The complex is not sprinklered, but there is a standpipe system in the distribution and manufacturing areas. There is also an internal fire alarm system that is monitored at a central security post 24/7. This system includes both heat detectors and manual pull stations. The facility's MSDS information is also stored at that location. As a result of an insurance "risk assessment" performed last year, the plant is in the process of implementing an "incipient" fire brigade which will consist of plant personnel who are also volunteer firefighters in their communities and the on-duty security force of three personnel. While their training is complete they have not as of yet implemented the brigade.

The plant sits in a largely industrial area of the city. It is located at 2200 25th Street in Central City. It has interstate access adjacent to it and it is about 4 miles from a large containerized port facility. A stream which empties into the Roaring River borders the south end of the property. There is direct rail access to the site with a private rail siding maintained by ZAP to allow for bulk receiving of raw materials.

The nearest fire station is approximately one mile from the plant and it is a career station of the Central City Fire Department. It operates a 4-person engine company and a two-person ALS/transport unit. The plant utilizes the municipal water system, which consists of four hydrants on site each with a tested flow rate of 1500 gpm or 6000 gpm available on site. There is a standpipe connection on the Alpha/Bravo (A/B) corner of the complex. The plant complex is broken down as follows:

1. **Administration Building:** 150'x 90'= 13,500 sq. feet
2. **Distribution/Packaging Building:** 120' x 140'=16,800 sq. feet
3. **Manufacturing Building:** 220' x 150'= 33,000 sq. feet

TOTAL SQUARE FOOTAGE: =63,300

The plant is in operation 24 hours/day with three eight hour shifts in operation. There is a change of shifts at 0700, 1500 and 2300 and there are 300 total line employees with 125 on day shift, 100 on evenings and 75 on nights. During the day there are approximately 50 administrative and support personnel. In addition, the regional distribution center covering a 15 state area is in operation from this location, which produces a significant amount of truck traffic into and out of the plant.

EXPOSURES:

Exposures in close proximity include:

Side-D: Railroad siding with 3-4 rail tank cars carrying raw materials (chemicals) and truck loading dock area.

Side-C: Four vertical (30,000 gallon) and five horizontal (20.000 gallon) chemical storage tanks for raw materials utilized in manufacturing processes.

Simulation 6

Quick Access Prefire Plan

Building Address:
2200 25th Street near KK Street

Building Description:
480' x 380', 1-story, Type-II non-combustible construction, steel frame manufacturing plant

Roof Construction:
Steel columns, steel bar joist systems, with a built up tar and gravel roof

Floor Construction:
Concrete slab

Occupancy Type:
Home improvement product production

Initial Resources Required:
4 engines, 1 truck, 1 PM, 1 haz mat, 1 BC, Safety Officer

Hazards to Personnel: *Hazardous chemicals, large open areas-mazelike, potential for structural collapse, Roof failure*

Location of Water Supply:
Hydrants at every corner

Available Flow:
4,500 gpm system flow

	Estimated Fire Flow*			
Level of Involvement	*5%*	*10%*	*25%*	*100%*
Estimated Fire Flow	550	1,100	2,700	11,000

Fire Behavior Prediction: *Rapid horizontal spread fueled by chemicals and large open floor areas.*

Predicted Strategies: *Rescue, Exposures (interior), Confinement, Ventilation.*

Problems Anticipated: *Significant area to locate fire, Haz-Mat interactions, evacuation*

[X] **Standpipe**:
Only in manufacturing area

[ ] **Sprinklers**:
No

[X] **Fire Detection**:
Heat detectors, pull stations

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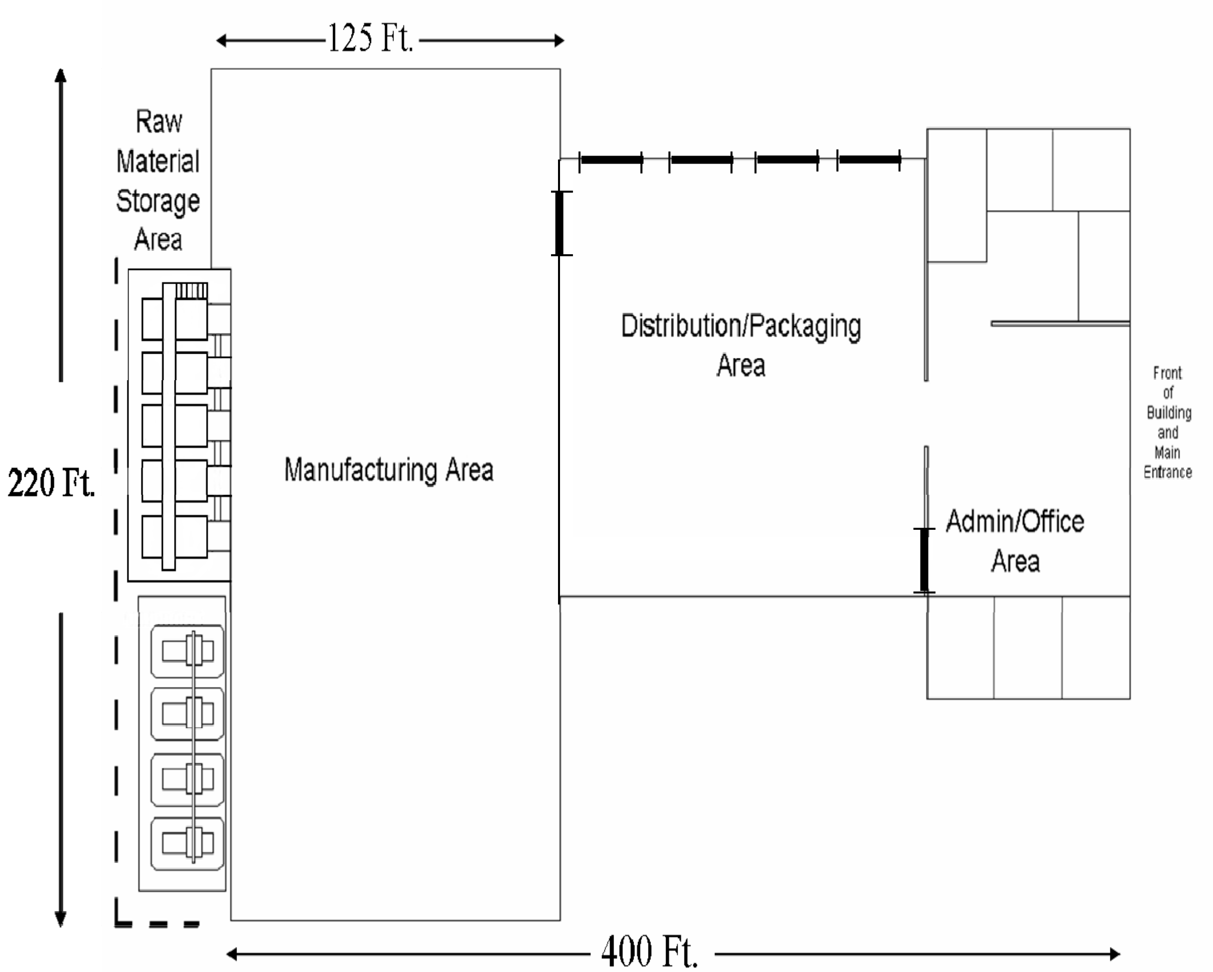
Simulation 6

Hazardous Materials Facility

Plot/Floor



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Simulation 6
Acetone
Safety Data Sheet

Section 1 – Emergency Contact Identification

For CHEMTREC assistance, call: 800-424-9300 [International]
For International CHEMTREC assistance call: 703-527-3887 [International]

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-64-1	**Acetone**	**99**	**200-662-2**

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: - 4-0 degrees F.
Danger! Extremely flammable liquid and vapor. Vapor may cause flash fire. Causes eye irritation. Breathing vapors may cause drowsiness and dizziness. Causes respiratory tract irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Prolonged or repeated contact may dry the skin and cause irritation.

Target Organs: Central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. Vapors cause eye irritation.

Skin: May be absorbed through the skin. Repeated or prolonged exposure may cause drying and cracking of the skin.

Ingestion: May cause irritation of the digestive tract. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause motor incoordination and speech abnormalities.

Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation may cause effects similar to those of acute inhalation. Matsushita et al. exposed human volunteers 6 hours per day for 6 days at 500 ppm acetone and found hematologic changes including significantly increased leukocyte and eosinophil counts and decreased neutrophil phagocytic activity.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.

Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.

Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire exposed containers cool. Extremely flammable liquid and vapor. Vapor may cause flash fire. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: Use dry chemical, carbon dioxide, or appropriate foam. Water may be ineffective because it will not cool material below its flash point.

Flash Point: -4-0 degrees F
Autoignition Temperature: 465 degrees C (869.00 degrees F)
Explosion Limits: Lower: 2.5% – Upper: 12.8%
NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use personal protective equipment as indicated in Section 8. Spills/Leaks: Absorb spill with inert material (e.g., vermiculite, sand or earth), then place in a suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Wear appropriate protective clothing to minimize contact with skin. Remove all sources of ignition. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces. Use only non-sparking tools and equipment.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin and clothing. Empty containers retain product residue (liquid and/or vapor) and can be dangerous. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor.

Storage: Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammable area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Ventilation fans and other electrical service must be non-sparking and have an explosion-proof design.

Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear butyl rubber gloves, apron, and/or clothing.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A NIOSH/MSHA approved or European Standard EN 149 air purifying respirator with an organic vapor cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: sweetish odor
pH: 7
Vapor Pressure: 231 mm Hg @ 25 degrees C
Vapor Density: 2.0 (Air=1)
Evaporation Rate: 5.6 (n-Butyl acetate=1)
Viscosity: 0.32 cps @ 20 degrees C
Boiling Point: 56.5 degrees C
Freezing/Melting Point: -94 degrees C
Decomposition Temperature: Not available.
Solubility: Soluble.
Specific Gravity/Density: 0.78
Molecular Formula: C_3H_6O
Molecular Weight: 58.08

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to Avoid: High temperatures, ignition sources, confined spaces.

Incompatibilities with Other Materials: Strong oxidizing agents, strong reducing agents, strong bases, nitric acid, hexachloromelamine, sulfur dichloride, potassium tert-butoxide.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

SIMULATION 7: COMMERCIAL BUILDING

OBJECTIVES

The students will:

1. *Develop their knowledge, skills, and abilities relating to a commercial building during a fire.*
2. *Apply the knowledge, skills, and abilities while performing a commercial building simulation.*

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INTRODUCTION

All members of the fire service must recognize the importance of building construction in their preplanning and sizeup. Buildings have various means of resistance to collapse, based on their construction type, age, and built-in fire protection. The fire officer who cannot discern the type of construction and does not know the inherent collapse and fire spread dangers of each type is inadequately prepared to lead his/her personnel into building fire situations.

BUILDING CONSTRUCTION TYPES

Fire-Resistive Construction

Fire-resistive buildings have the greatest resistance to collapse. These buildings have bearing members of reinforced concrete construction or steel that are adequately protected from the heat of a fire for a given length of time. No bearing members of steel are left unprotected.

Heavy-Timber (Mill) Construction

These buildings are considered the second-best at resisting collapse. While they have masonry bearing walls and wooden floor and roof assemblies, the size of the wooden members is massive compared to the nominal-size lumber of wood-frame construction. The size of the wooden bearing members allows for a significant amount of burn time before the threat of a collapse. Wood is porous and contains an amount of water and air that acts as an insulator to the rest of the member as the outer skin is burning.

Because these buildings are very large, maybe a half square block or more, and possibly six stories tall, they can become an inferno that no fire department has the ability to extinguish. At that point, the building may be subject to massive collapse.

Ordinary (Masonry, Wood-Joist) Construction

These types of buildings are considered the third most resistant to collapse. However, one must consider the era in which they were built. The original ordinary constructed buildings had masonry walls with typical-sized lumber, such as 2- by 4-foot or 2- by 6-foot, etc., and wooden floor and roof assemblies. They typically had either ridgepole and rafter pitched roof assemblies, or beam-and-rafter flat roof assemblies. The wooden members were actually the advertised dimensions. These older buildings can be found in the downtown areas of many cities throughout the Nation.

These buildings do resist collapse but, due to age, many of the wall assemblies are failing (pulling away from the floors). This has been overcome by placing "spreaders" (a threaded steel rod) into the walls, hooking them to a wooden floor member, and pulling the wall back into place. The "stars" or other metal plates at irregular places on the walls show that this has been done.

The **new** ordinary constructed building is different. These buildings use masonry walls, but have wooden trusses supporting the floor and roof assemblies. These wooden trusses have inherent features that make them fail rapidly under fire conditions once the fire or major heat reaches the truss assembly. These new ordinary constructed buildings must be treated as lightweight truss assemblies, and fire officers should anticipate early collapse when fire is significant. Wooden trusses have been known to collapse in as little as 5 minutes after flame/heat impingement.

Wood-Frame Construction

With this type of construction you also must take into consideration the era of the actual construction, whether or not they are lightweight, and also the length that is being spanned by both floor and roof assemblies.

Balloon-Frame Construction

In these buildings, the foundation was set and then long wall studs were placed. A ledger-board often was attached to the studs as a nailer for the floor beams or roof rafters. This resulted in a maze of interconnected combustible voids that connected the floor assemblies, attic or roof assembly, and the walls. Once fire is in the void space, it is free to travel horizontally and vertically. This is the fire that we all have heard about--the fire started in the basement, but first showed in the attic.

Platform-Frame Construction

The platform-frame construction proceeds from a foundation to the first-floor assembly, then the first-floor walls and the roof or attic assembly for a one-story building. For a multistory building, the second-story walls and floor assembly are completed, then the second-floor walls and a roof assembly.

Platform-frame buildings in years past used solid lumber for the floor and roof assembly joists and rafters. Today, most platform-frame construction uses wood-truss floor and roof assemblies. These assemblies have the inherent dangers mentioned above.

Post-and-Beam Construction

This type of wood-frame construction is typical of barns and other outbuildings. The posts are the supporting columns for the floors and/or roof assembly. They are typically large-sized wooden elements (such as posts 6- by 6-inches or greater). The walls are made of planks or siding and do not support the structure.

Noncombustible Construction

Considered to be the least resistant to collapse, these buildings typically are constructed of all-metal bearing members. They often have structural steel columns and girders with steel bar-joist floor and roof assemblies, or pitched metal truss roof assemblies.

Since bare, unprotected metal weakens at about 1,100 ºF (593 ºC) and cannot hold its own weight at 1,500 ºF (816 ºC), its resistance to the effects of fire and heat is very low. Steel bar-joist has been known to fail in a little as 9 minutes after fire/heat impingement.

Buildings with Metal Roof Decking

Fire officers must be aware of the fire characteristics of metal-decked buildings. The metal decking will not allow the fire impinging on a roof assembly to break through and self-vent. This produces a major build-up of heat under the roof decking and will accelerate the failure time of the roof assembly.

MODERNIZATION

Many of the older heavy timber and ordinary constructed buildings have undergone rehabilitation. This has produced many new combustible void spaces where fire can act on combustible bearing members.

CUE-BASED PREDICTIONS

Given the building construction cues just presented, and adding a fire situation, we can make **predictions**:

- Rapid horizontal spread of the fire can occur in a large open area that is full of combustibles.
- These buildings usually have roof assemblies that are 14 to 18 feet from the ground and, therefore, have a suspended ceiling assembly that conceals duct work, electrical wiring, and plumbing chases. The fire can enter this space and spread rapidly across the store and the roof assembly (if combustible).
- Storage areas usually have high-rack storage and no suspended ceilings. These are very vulnerable to fire spread through the roof or ceiling space.
- The life hazard to civilians usually is very low.

INCIDENT MANAGEMENT CUES

- In fires where there is substantial headway, do vertical and horizontal ventilation early.
- Coordinate forcible entry to the rear with fire attack from this area.
- Consider large-caliber streams early in order to knock the fire down as soon as possible.

INCIDENT MANAGEMENT CUES--AFTER A COLLAPSE

Initial Actions

- Immediately withdraw all personnel from the area of danger. It may not be necessary or desirable to withdraw completely to the outside.
- Take a Personnel Accountability Report (PAR) to ensure that any personnel believed trapped, actually are missing.
- Evaluate the severity and probability of additional collapse, severity of the fire in the collapse area, and risk/benefit of starting rescue operations.
- If the risk/benefit is acceptable, engage the Rapid Intervention Crew (RIC).
- Initiate a reorganization of the Incident Command System (ICS) to deal with the changed situation and include a Rescue Group to provide more personnel, as required, to the rescue of the missing firefighters.

Simulation 7

Homework Assignment

Commercial Building Questions

Directions

1. You were assigned to read the entire SM portion on commercial buildings the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the same groups established for classroom activities. Each of you will provide written answers on the worksheet and bring the worksheets to class to use during the presentation. Only do the two scenarios and the related problems; the rest of the unit will be done in the classroom.

2. After reading the SM, your group will determine the problems facing the IC, based on the limited incident information given. State your initial actions for each scenario.

3. The instructor will review each of the assigned questions by asking the question and selecting several of you to respond with the answers from your worksheets. Other students will be asked to respond from their worksheets if they have additional problems or solutions that were not discussed.

Scenario 1

A one-story, 120' x 150', ordinary construction grocery store has 10-percent involvement of the building. The fire is in the rear storage area on arrival. The roof assembly is beam-and-rafter construction using parallel-chord wood-truss rafters carried on a beam system supported by lally columns. The decking on the trusses is 1-inch plywood, covered with paper and tar.

What are your concerns as the first-in Incident Commander (IC)?

____

____

____

____

____

____

Scenario 2

A two-story, 100' x 120', noncombustible construction clothing store has 25-percent involvement on the second floor at the front of the store on arrival. The roof assembly is steel bar-joist with metal decking and paper and tar.

The second floor suddenly collapses, and your resource status sheet indicates that two companies were working on the second floor.

What initial actions would you take just after the collapse occurred?

In Class
Activity 7.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a commercial building scenario.

Directions

1. You will work in your groups.

2. You will be shown a slide of a commercial building. Following, there is a scenario description, plot/floor plan showing the fire location, and a Strategy Prompter. The Strategy Prompter will be used as the worksheet for the activity.

3. Write your strategies, and convert those strategies into an ICS organization chart. Fill in up to five of the blank boxes with Division and Group nomenclature appropriate for the incident.

4. You have 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time will be limited to no more than 15 minutes, total.

5. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, you must identify which Division or Group is performing that task.

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In Class
Activity 7.1 (cont'd)

Scenario Description

Construction

Noncombustible.
Engineered steel--column, beam and rafter.
Masonry--nonbearing walls.
Roof--steel bar-joist with metal decking, paper and tar.
Nonsprinklered.

Size

150 by 120 feet, two story.

Fire on Arrival

Involves 15 percent of the second floor.

Fire Flow Required

900 gpm.

Initial Fire Attack

Several 2-1/2-inch handlines were advanced to the second floor from Side D. Very little headway was being made, due to the lack of adequate fire flow. Three companies were operating on the second floor while awaiting additional handlines to be sent up.

The roof over the fire area collapsed, extending to some distance away from the fire area.

It is found after the PAR that two companies are missing and probably are under the collapse area.

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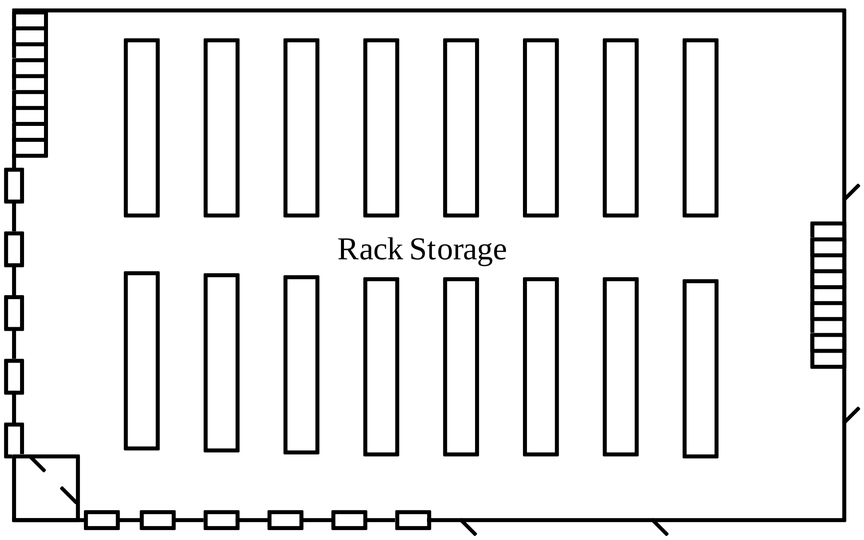
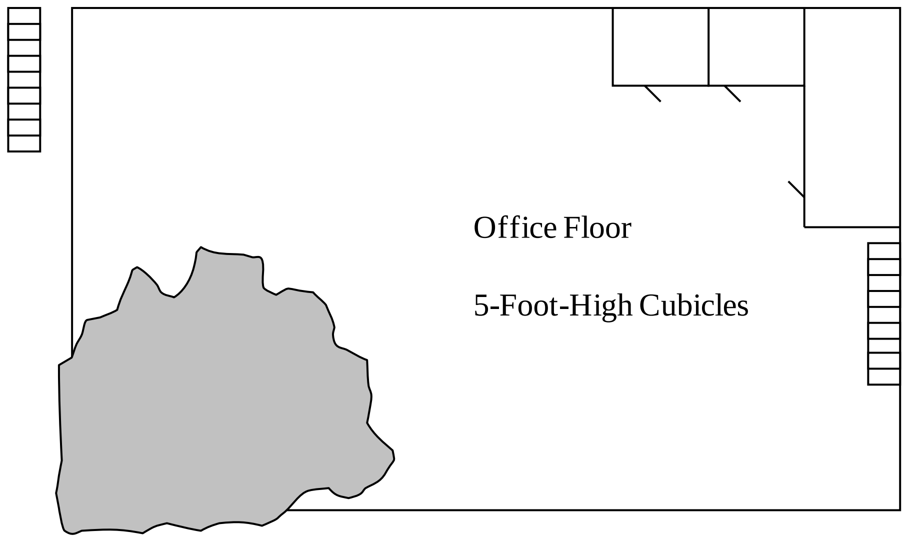
In Class
Activity 7.1 (cont'd)

Plot/Floor Plan



First Floor

Plot/Floor Plan (cont'd)



Second Floor

SIMULATION 7

COMMERCIAL BUILDING COLLAPSE

Incident Description

The 150' x 150' structure was built in 1990 of noncombustible construction. The second floor has masonry walls with a steel bar-joist floor assembly. The floor is concrete covered with carpet. The building has a panelized roof with sandwiched insulation and paper and tar. The interior floor-to-ceiling height is 12 feet on both floors. There is a suspended ceiling on the second floor.

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Simulation 7
Quick Access Prefire Plan

Building Address:
1100 Tonna Lane at 22nd Street

Building Description:
150' x 150', two-story, ordinary

Roof Construction:
Panelized roof, plywood sandwiched insulation, paper, and tar

Floor Construction:
1st: concrete slab; 2nd: steel bar-joist, concrete

Occupancy Type:
Commercial

Initial Resources Required:
4 engines, 1 truck, 1 PM, 1 BC, 1 Safety Officer

Hazards to Personnel:
Weak roof assembly under fire conditions

Location of Water Supply:
Hydrants all around the structure

Available Flow:
5,000 gpm

	Estimated Fire Flow*			
Level of Involvement	*5%*	*10%*	*25%*	*100%*
Estimated Fire Flow	450	900	2,250	9,000

**Fire flow based on second-floor open space with first floor as an exposure (rounded).*

Fire Behavior Prediction:
Rapid horizontal spread, high heat buildup.

Predicted Strategies:
Confinement, Ventilation.

Problems Anticipated:
Roof ventilation, roof collapse, reaching seat of fire, access.

❑ **Standpipe:** *No*

❑ **Sprinklers:** *No*

❑ **Fire Detection:** *No*

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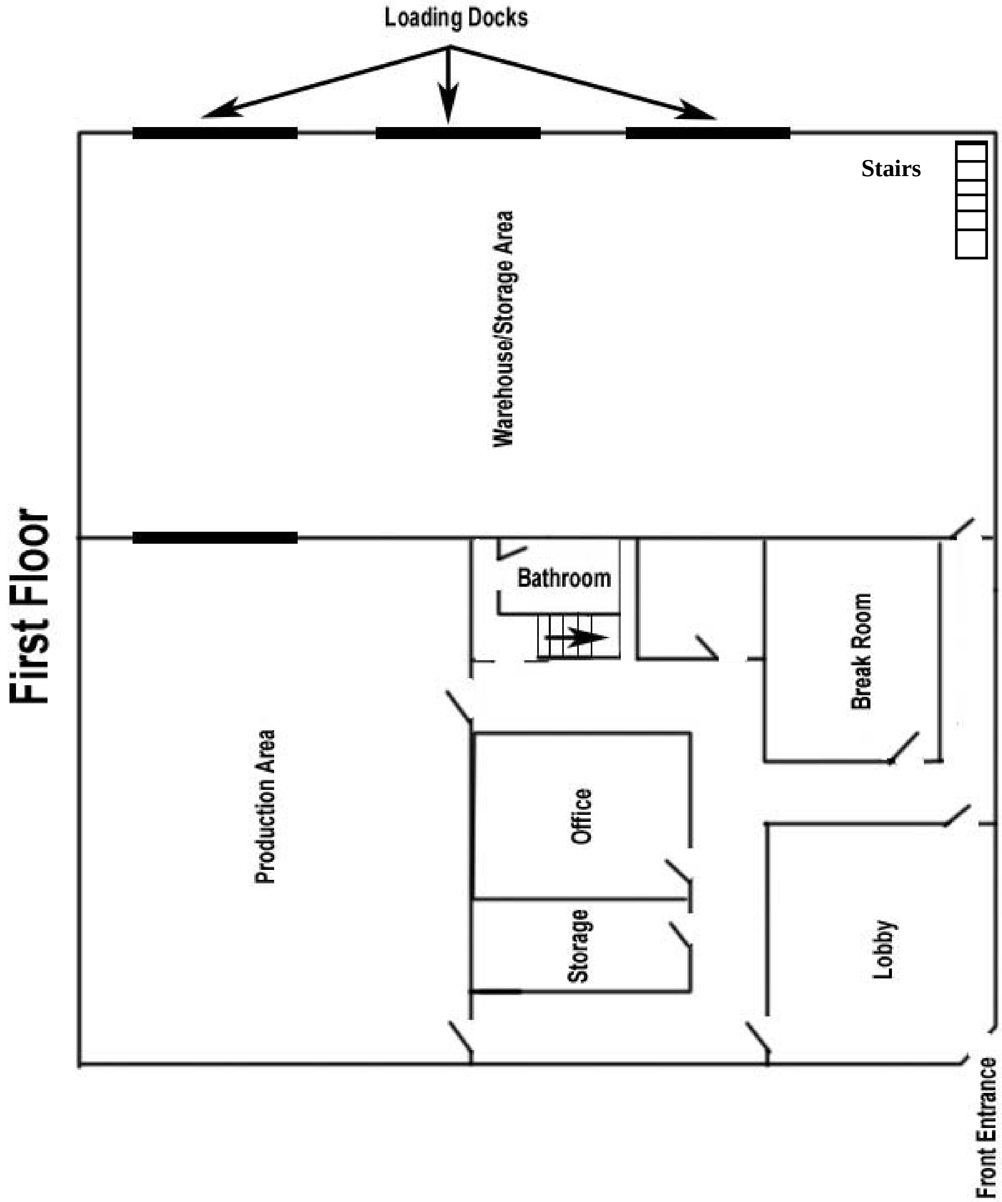
Simulation 7

Plot/Floor Plan



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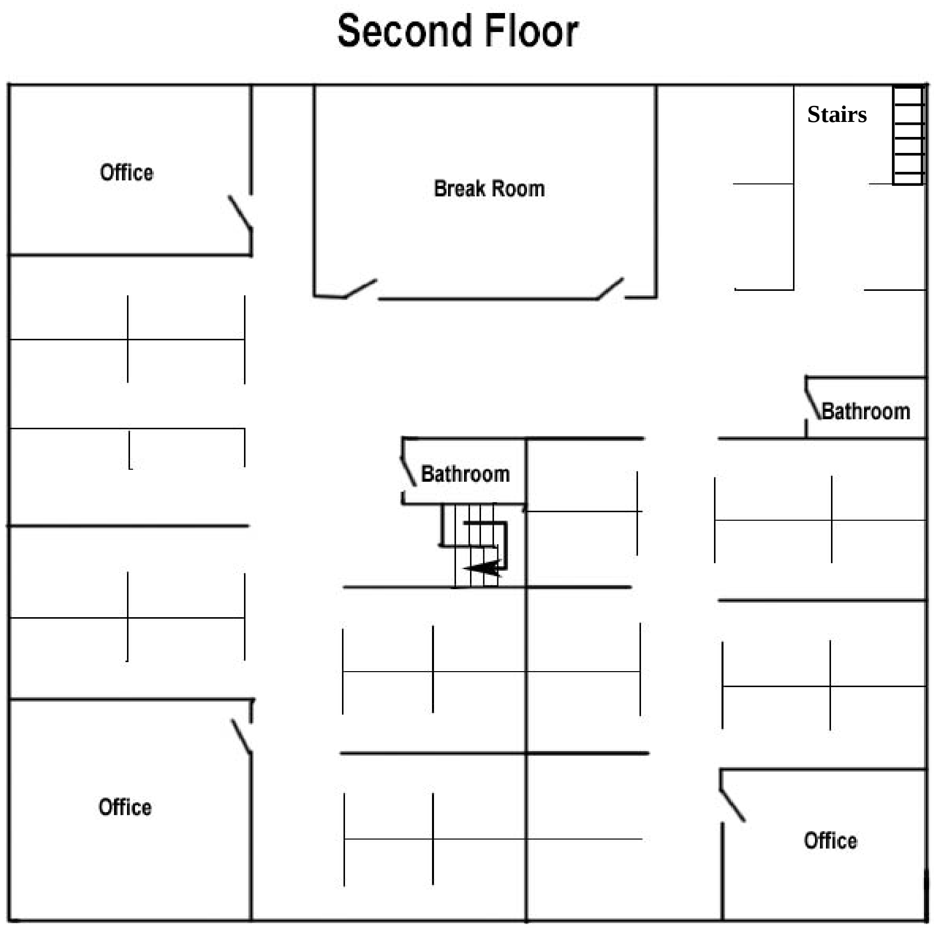
Simulation 7

Plot/Floor Plan (cont'd)



SIMULATION 8: SMALL HOTEL

(OPTIONAL)

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management functions at fires involving small hotels.*

2. *Apply the knowledge, skills, and abilities discussed to manage a simulated fire situation involving a small hotel.*

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INTRODUCTION

A **small hotel**, for the purposes of this unit, is a building providing transient or short-term housing for fewer than 100 people. Occupancies of this type typically are multistory but fewer than eight floors in height. Many occupancies referred to as "boarding homes" will fall into this same category. This unit does not refer to large hotels that house more than 100 persons or are more than eight stories in height. These occupancies normally are newer buildings that fit into the highrise category.

OCCUPANCY-SPECIFIC CUES

The construction type of small hotels will vary with the age of the building, its design, and the building codes that were in effect when it was constructed. These types of buildings may be of ordinary, fire-resistive, or noncombustible construction and, in some isolated cases, even may be wood frame. It is not unusual to find buildings of this type that have been expanded or remodeled and are of mixed construction types. In many cases, modifications to the original basic structure may have occurred during remodeling or renovation.

It must be remembered that construction type refers only to the basic structural elements of the building and not to the furnishings or contents of the building.

Current building and fire codes universally require fire-resistive or noncombustible construction for these types of occupancies.

In terms of separation of space on individual floors, small hotels normally are well compartmented. The concept of compartmentation helps to contain a fire to the area of origin but is valid only if it is maintained by closed doors that separate an area of fire origin from other portions of the building.

Vertical compartmentation in multistoried hotels relies on protected shaft enclosures. This concept can fail if fire enters stairshafts, elevator shafts, or vertical voids that penetrate floors. It also is defeated when fire laps upward on the outside of the building.

The type of construction and code requirements for built-in fire protection will have a dramatic impact on problems encountered in these occupancies.

Alarm systems have to be considered the first line of defense in any habitational occupancy, and in small hotels they can range from nonexistent to state-of-the-art. Many times, even though alarm systems are installed, they are not maintained and fail to function when a fire occurs. Added to this is the fact that hotel staff often are reluctant to report fires until they are beyond the incipient stage.

Sprinkler systems are certainly one of the most effective built-in life safety features, yet they are found only in the newest structures of this type or, in some cases, have been retrofitted under local or State ordinances that were passed following tragic fire losses. Often small hotels will have sprinklers installed only in selected areas such as basements or possibly in common hallways, but not in individual rooms.

Standpipe systems in small hotels usually consist of Class I systems (1-1/2 inch) supplied from the domestic water supply system. These systems should not be considered reliable for primary fire department use. In most cases, they provide low working pressure, minimal water supply, and any equipment attached to them is inferior by fire department standards. If Class I systems are used for initial attack they should be backed up with regular fire department lines from a reliable supply source.

Class II standpipe systems (2-1/2 inch) may be found in some newer small hotels. Class II systems are designed for fire department primary use and may be either wet systems or dry systems. Wet systems normally are supplied by a fire pump that provides much more water volume and pressure than a Class I system.

The location of standpipe outlets in the building should be noted on the preincident plan.

Successful fire control and life safety operations in hotels require knowledge of the building construction and physical layout of the building. Because of the potential for life loss, these occupancies should be preplanned periodically, and Quick Access Prefire Plan (QAP) information should be available at the incident scene for use by Incident Commander (IC).

Because of the occupant load in small hotels, life safety is the major issue. Even though the term "small hotel" is applied, the potential for life loss is great when compared to most other occupancies. The occupant load in a small hotel at any given time will vary according to several factors, such as the size of the structure, the season of the year, and the time of day.

The majority of small hotel occupants are transients who lack knowledge of the structure, exit routes, and any evacuation plan and can have difficulty in understanding instructions. It is possible that some of the occupants do not speak or comprehend the English language, and a translator would be required. In many cases, the life safety problem is compounded by the general behavior of the occupants, which frequently is not consistent with fire safety.

Access to these types of structures will vary, depending on the design of the building and original code requirements. Normally a minimum of two means of ingress/egress is required. In some cases, the number of access points may be determined by exit requirements based on occupant load. Access to all sides of the structure by fire apparatus may be hampered by parking lots filled with vehicles, narrow driveways, and alleys. Because access points can be critical to fire control operations, they should be noted on preplans.

In addition to access to the building, access to the fire floor may be delayed. Smoke and heat in the common hallways may delay access to the area where the fire is burning. This is especially true if the fire is located on an upper floor of a multistoried building. The horizontal distance that must be traveled as well as the lengths of hose required to reach the fire area can delay access in some cases.

It may be difficult to use ground or aerial ladders to access the fire area. Ground-level obstructions may prevent placing apparatus in positions from which ladders can be used. Utility poles, wires, and shrubs are common obstructions that often make ladder placement difficult or sometimes impossible. Many newer multistoried structures may have inoperable windows, which complicates rescue and ventilation.

Multiple stairshafts are common in many multistory hotels. This requires a decision as to which stairway should be used and for what specific purpose. Selection of stairshafts for fire attack, ventilation, and evacuation may be necessary. It also is important to remember that all stairshafts in the building may not provide access to the roof. This can cause serious problems when occupants attempt to evacuate upward in the building, and also limits options for ventilating smoke-filled floors.

Open stairshafts, which can be found in many older occupancies, are particularly dangerous under fire conditions. They can allow immediate spread of fire and smoke on all floors in the building and complicate evacuation of occupants from the building.

Multistory small hotels usually are equipped with elevators, which may be operated hydraulically or electrically. Regardless of the type of elevator system, they are subject to system malfunctions that can cause them to respond to nonselected floors or become stuck in the hoistway. The safest approach to using elevators is that they should not be used by fire personnel until it is determined that they are safe to use. A departmental policy regarding use or non-use of elevators under fire conditions should be in place and followed by all responders.

Water supply in areas where small hotels are located is usually from hydrants that will provide adequate water for most firefighting needs. If the fire involves several rooms or more than one floor, consider the ability of the hydrant supply to deliver the necessary fire flow. If a sprinkler system also must be supplied, it may be necessary to assign additional resources to deliver the required fire flow.

Fire development and behavior in small hotel fires normally are no different than in other types of structures, as the fires usually are confined to a single room or living unit. Extinguishment can be relatively simple if doors to the fire area are closed and vertical lapping does not occur. However, if a door to the unit is open or fails, fire and smoke entering the hallway can create major problems. Any time that fire and smoke are allowed to enter hallways or stairshafts, serious life safety problems are created.

If vertical lapping occurs, the potential exists for fire on more than one floor. The rate of vertical extension will depend on several factors. The volume of fire exiting the area of origin certainly will be a factor, as will the type and thickness of glass and the window frame material on upper floors. Single-strength glass set in aluminum frames can fail very quickly when exposed to flames from a fire below.

Consider resources in terms of fire condition and the amount of work that must be done. A small fire with no extensive search and rescue required usually can be handled with the initial alarm assignment. In these cases, fire attack, limited evacuation, and possibly some simple ventilation will be required. However, a larger fire that can spread rapidly, coupled with a major search and rescue operation and complex ventilation requirements, will require additional resources. If there is any doubt that initial alarm resources are adequate, request additional resources in a timely manner.

Medical Group/Medical Branch

A Medical Group or Medical Branch may have to be established at a multicasualty situation.

The following units may have to be established in a Medical Group/Medical Branch:

- triage;
- treatment (field treatment site);
- transportation;
- medical supply; and
- morgue.

Some agencies establish an emergency medical services (EMS) Staging for patient transport vehicles under the Transportation Unit.

CUE-BASED PREDICTIONS

- A large number of people may become victims in any fire that produces large amounts of smoke. Often years of renovations have created many void spaces.

- The ability to access the floors quickly may be hampered by open stairwells, people evacuating, limited number of stairways, or narrow stairways. Many small hotels have small, cubicle-type single-room occupancies. Some may be a labyrinth of crisscrossing halls and dead-end corridors.

- Lack of a standpipe system may make fire attack more difficult because of long stretches.

- Many occupants are transients, and not familiar with egress.

- Fires often are contained to a single occupancy.

- A Medical Group or Medical Branch may be required to care for the injured.

INCIDENT MANAGEMENT CUES

Working fires in hotels frequently require that several simultaneous tactical operations be performed. Fire attack, search and rescue, and ventilation usually are occurring at the same time. From the standpoint of personnel safety and effective fire control, these operations must be coordinated.

The responsibility for coordinating tactical operations rests with the Command Officers who are directing or supervising these operations. Proper coordination requires not only good communication but also frequent feedback from personnel involved in the specific operations.

Failure to coordinate tactical operations can result in some very serious problems. One result of poor coordination can be "mixed attack modes," where offensive and defensive operations are occurring at the same time in opposition to each other. Delayed or improper ventilation is another example of poor coordination that can have a serious negative effect at incidents of this type.

Lack of coordination of tactical operations during hotel fires can jeopardize the lives of both building occupants and firefighters. Untenable conditions created within the building may prevent evacuation of occupants and emergency egress for responders. Tactical operations may be seriously impeded. Smoke and fire can spread throughout the entire building very quickly.

STRATEGY AND TACTICS

The basic strategy for fires in small hotels should be based on incident priorities:

- life safety;
- incident stabilization; and
- property conservation (loss control).

An effective sizeup that identifies the problems that are present will be critical in determining the proper strategy. However, all the problems may not be evident from outside the building. Use outside observations as an indicator of problems inside the building until additional interior information is available.

Obtain an evaluation of conditions inside the building as soon as possible. In addition to life safety concerns, information should be provided on horizontal or vertical extension of the fire. Once the problems are identified, develop solutions in terms of what the strategy will be and what specific tactical operations will be needed to accomplish all tasks.

Identifying the problems is the first step in determining what resources are required. In simple terms, match the problems with resources. In order to do this, it is necessary to have an understanding of the availability and capability of the resources that are on scene or have been requested. Consider how long it will take requested resources to arrive at the scene and how much work they can do when they get there.

Base the assignment of initial alarm resources on what initial actions will do the most good. In most cases, an immediate and aggressive attack on the fire will ensure the safety of the largest number of building occupants. If an immediate attack on the fire cannot be started, evacuation of building occupants may be the best approach. Ideally, an immediate fire attack coupled with evacuation of those occupants in the most danger, on the fire floor and directly above, will work the best.

Consider how stairways will be used for fire attack and occupant evacuation. Avoid doing both from the same stairway, because it can impede the progress of firefighters and endanger civilians who are trying to exit the building. It is much better to designate one stairway for evacuation and another for fire attack. The stairway used for evacuation purposes should be maintained free of smoke. This can be done by using a stair shaft with a roof opening to remove smoke from the stairway and by properly pressurizing the stair shaft from below.

Attack the fire from a direction that does not push it into unburned areas of the floor. This can be difficult, depending on the location of the fire in relation to access points. Often it is possible to position a separate hoseline to limit fire extension; be careful, however, that this protective hoseline is not used to attack the fire, which could create an opposing hoseline situation.

With regard to hoseline selection, 1-3/4-inch hoselines normally are sufficient for fires that are confined to one room or a small area. Position a backup line as soon as possible. Search and rescue personnel should have a protection line when working in areas exposed to the fire. Heat buildup in hallways may require a large (2-1/2-inch) handline to absorb the heat and provide access to the fire area.

Always conduct a primary and a secondary search during fires in small hotels, beginning in the areas most affected by the fire conditions. This normally will be the area of the floor of origin that is in close proximity to the fire, and floors above to which heat and smoke have traveled. Direct occupants of the building to designated evacuation routes.

In some cases, depending on fire conditions, all occupants of the building may not have to be evacuated. If the fire is contained quickly and smoke removal is started early, many of the building occupants will be in no danger and will be safe staying in their rooms. Base the decision not to evacuate on fire conditions, good judgment, and the knowledge that the fire and smoke are being controlled.

Simple horizontal ventilation can remove smoke and heat for most fires that are confined to one room. Placing smoke ejectors in the hallway and opening windows or sliding doors in the affected areas usually is sufficient. Positive-pressure ventilation also can be used effectively in some situations. One of the difficulties with this approach is that narrow hallways make it difficult to obtain the air seal needed if a single room is to be pressurized directly. An alternative is to pressurize the hallway from the stair shaft and open the door to the fire room or area.

Stair shafts in hotels can be used to exhaust smoke from the building under certain conditions. The first requirement is that the stair shaft have a roof exit and that it be opened. Smoke ejectors can be used to channel smoke down hallways to the stair shaft. Be careful that this type of operation does not jeopardize building occupants who may be attempting to evacuate the building.

Start salvage operations as soon as resources are available. Normally this will entail removal of water from the fire floor and floor below, covering computers and furniture, and smoke removal from the entire building.

Consider safety issues associated with hotel fires. While backdrafts are rare, they can happen, especially in tightly sealed rooms when fires have smoldered for long periods of time. For this reason, be cautious when opening doors on the fire room.

The potential for flashover always exists with any structure fire, and hotel fires are no exception. Even if the fire is free-burning, flashover may not yet have occurred. It is possible that flashover will occur when fire attack is being made. Do not attempt entry into areas with free-burning overhead fire until the area is cooled down with sufficient hose streams.

Fatigue of fire personnel can be a safety factor when fighting a hotel fire. The duration of the incident and exertion associated with performing tasks at aboveground fires can exhaust firefighters quickly and lead to injuries. For this reason, periodic relief and use of a responder rehab area at extended incidents are recommended.

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Simulation 8

Homework Assignment

Small Hotel Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on small hotels the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the groups established for classroom activities. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation.

2. After reading the SM, your group will determine a number of problems facing the IC, based on the limited incident information given. For each problem, you must provide both a tactical solution and an Incident Command System (ICS) solution.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems or solutions that were not discussed.

Scenario 1

A 35' x 90', four-story, boarding house of ordinary construction has a fire in the basement at 0100 hours. The structure has two open stairways from the first to the fourth floor. The interior basement entrance has a standard wooden door. The first floor is filling with smoke and heat. There are two basement windows on each side of the structure, as well as an exterior basement entrance at the rear. There are approximately 30 residents in the building.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ______________________________

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Tactical Solution: ______________________________

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ICS Solution: ______________________________

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What cues led you to this solution? ______________________________

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Problem: ______________________________

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Tactical Solution: ______________________________

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ICS Solution: ______________________________

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What cues led you to this solution? ______________________________

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Problem: ______________________________

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Tactical Solution: ______________________________

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ICS Solution: ______________________________

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What cues led you to this solution? ____

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Scenario 2

A 60' x 80', three-story, small hotel has a fire in the elevator lobby area on the second floor. The hotel is fully sprinklered. What actions should be directed toward the sprinkler system, and what is your reference for such action?

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In Class
Activity 8.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a small hotel scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the worksheet for the activity.

3. The class will be shown a slide of a small hotel. Everyone will review the scenario description and the plot/floor plan.

4. Your group will write its overall goals (strategies) on the Strategy Prompter and convert those goals into an ICS organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident.

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 15 minutes total. Be brief, but to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, you must identify which Division or Group is performing that task.

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In Class
Activity 8.1 (cont'd)

Scenario Description

Construction

90' x 45', three-story, boarding house.
Ordinary construction (masonry wood-joist).
Walls--concrete block with brick veneer.
Roof--ridgepole and rafter, 1" x 6" sheathing, with composition shingles.

Fire Location

One fully involved second-floor bedroom with fire extending into the hall at the front stairs.

Time and Day

0600 hours, Sunday.

Water Supply

1,200 gpm total system flow.

Resources (1st alarm)

4 engines
1 truck
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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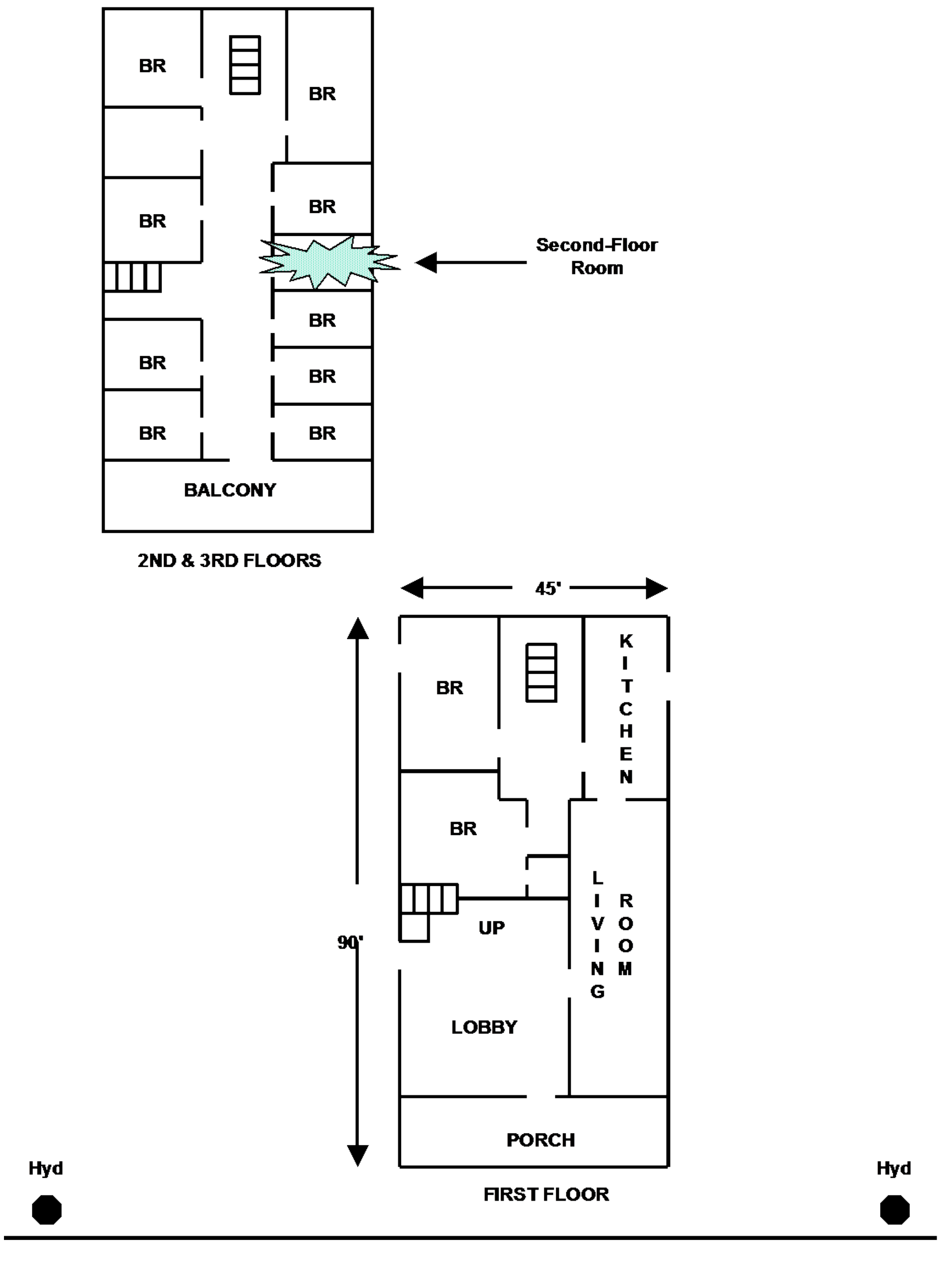
In Class
Activity 8.1 (cont'd)

Plot/Floor Plan



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Simulation 8

SMALL HOTEL SIMULATION

Incident Description

A four-story, 60' x 100', small hotel of ordinary construction. There are two stair shafts, both with roof access. The stair shafts are not enclosed. The fourth floor is under renovation.

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Simulation 8
Quick Access Prefire Plan

Building Address:
200 W Street

Building Description:
4-story hotel, 60' x 100', ordinary construction

Roof Construction:
4" x 12" rafters, 2" decking, rolled asphalt

Floor Construction:
2" x 12" joists, 1" x 6" sheathing, hardwood flooring

Occupancy Type:
Hotel

Initial Resources Required:
4E, 1T, 1C, 1 PM, 1 Safety Officer

Hazards to Personnel:
Potential for rapid spread and vertical extension, high voltage lines around building, renovation work in progress

Location of Water Supply:
Two hydrants within 300 ft. and two within 600 ft.

Available Flow:
1,500 gpm each hydrant

	Estimated Fire Flow*			
Level of Involvement	*10%*	*25%*	*50%*	*100%*
Estimated Fire Flow	350	875	1,750	3,500

**Basic fire flow--3,500 gpm (2,000 for 1 floor plus 500 each for 3 floors as exposures).*

Fire Behavior Prediction:
Potential large fire--possible rapid horizontal and vertical spread.

Predicted Strategies:
Rescue, Confinement, Ventilation.

Problems Anticipated:
Rapid fire growth--possible heavy smoke on fire floor and floors above. Wheelchair apartments on 1st floor. Some elderly occupants on upper floors. Open stairways to upper floors.

[X] **Standpipe:** *Dry system*	[X] **Sprinklers:** *Basement only*	[X] **Fire Detection:** *Smoke detectors*

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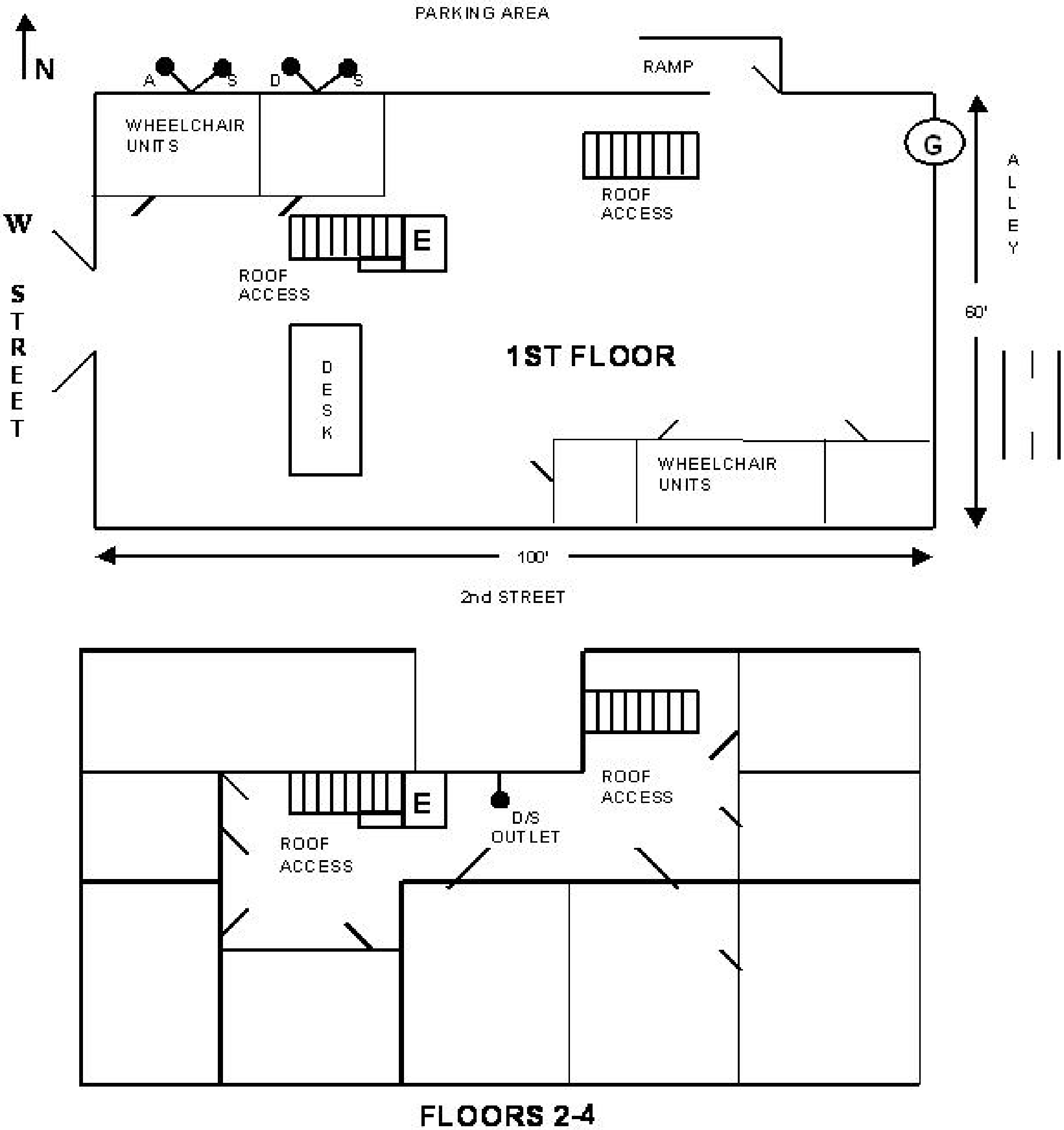
Simulation 8

Plot/Floor Plan



SIMULATION 9: ENCLOSED MALL

(OPTIONAL)

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management tasks at fires involving enclosed malls.*
2. *Perform the management functions required of the Command Officer at fires in enclosed malls.*

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INTRODUCTION

An **enclosed mall**, for the purposes of this course, is a complex of retail stores under one roof with the primary entrances on the inside. These occupancy types are generally two stories and rarely exceed five stories. Malls over two stories in height are usually older buildings that have been remodeled into retail complexes.

INCIDENT-SPECIFIC CUES

The construction of enclosed malls, like all buildings, varies with age, design, and the codes that were in effect when the structure was built. These complexes may be of ordinary, noncombustible, mill-type, or lightweight construction. However, it is more common to find complexes of mixed construction types.

The type of construction refers only to the basic structural elements of the original building and not to the furnishings or contents.

It has been a popular concept for the past 10 years to remodel old office buildings, factories, pier complexes, and canneries into trendy shopping malls. If these buildings are not preplanned, fire personnel will be fooled by "apparent" construction cues. The Incident Commander (IC) will be faced with myriad problems due to the remodeling.

Modern building and fire codes require more exits, built-in systems, fire-resistive construction, and alarm systems. The compartmentalization and separations in modern malls are much better in terms of fire protection; the irony is that the design of malls allows for the storefronts to be open, negating fire protection and promoting rapid spread of heat, fire, and smoke.

Unprotected openings are a serious problem in both renovated and modern malls. The open storefronts, wide walkways, open stairs and escalators, and suspended ceilings all contribute to a rapid spread of fire and smoke.

Lightweight truss construction as well as tile and metal roof coverings present unique problems of their own in terms of collapse and ventilation difficulties.

Designated exits are equipped with panic hardware and doors that swing outward. Storefronts usually are covered with security mesh, and employee doors are metal clad and secured on the inside with a metal bar. These are considerations when planning forcible entry.

Resource Considerations

Good pressures and adequate water supply are always important to fire suppression efforts and can be especially important in an enclosed mall fire for several reasons. First, the size of most malls requires long hose lays unless the fire is on the first floor near an entrance. Long hose lays are time-consuming and require effective pressures. The design of malls allows for relatively small fires to become large ones quickly, requiring large handlines, even interior master streams. An IC must be familiar with the hydrant system and main sizes in the area. Built-in systems can have an effect on confinement as well as strategy.

An incident of any significance will require resources beyond a normal first-alarm assignment. Basically, you are dealing with a horizontal highrise. Stretching long hoselines, moving equipment, and checking the vast number of concealed spaces for fire extension require a large number of personnel. Add to that the personnel demands of a potential major rescue and evacuation, and the rehab demands of the overall operation, and you are looking at a significant number of fire personnel. Resource considerations of this magnitude must be preplanned. If you, as the IC, wait until the incident occurs to develop your resources, you will be too late.

All operations of this magnitude require a great deal of support. Incidents occurring in enclosed malls, particularly in the interior, require much the same support as a highrise, including breathing air operations, portable lighting, and movement of equipment, to name a few.

Structure Deterioration and Collapse Potential

Generally speaking, total collapse is not a problem in mall fires. However, due to excessive fire loads, voids, and unprotected openings, mall fires can overcome resources quickly if a rapid, aggressive interior attack is not started on arrival. Lightweight roof construction of modern malls, coupled with heating, ventilating, and air-conditioning (HVAC) systems and other dead loads mounted on the roof, lends itself to partial collapse.

Improper or illegal modifications, involving structural members or affecting their structural integrity can have a serious effect on fire spread, and promote collapse.

CUE-BASED PREDICTIONS

Certain indicators or "cues" will assist a well-informed IC in making valid predictions.

Construction type is only one of the areas that presents cues. Fire probably will spread more quickly in renovated malls than in those of modern construction. New malls probably will have some lightweight construction features.

Life hazard and rescue potential are major considerations. Time of day, weather conditions, and holiday seasons all can be cues regarding the severity of the problem.

The location of the fire is a major consideration. A fire in the basement or lower floors has a much greater potential for vertical spread than a fire on the top floor. A fire in the center of the complex is a more labor-intensive operation than a fire on the perimeter of the complex.

Based on the open stairwells, walkways, and storefronts, a rapid spread of fire and smoke, as well as a serious salvage problem, can be predicted.

STRATEGY AND TACTICS

The strategies developed for fires in enclosed malls should be based on incident priorities:

- life safety,
- incident stabilization, and
- property conservation.

Thorough preplanning and an effective sizeup will assist in correctly analyzing problems and formulating correct strategies. The problems may not be obvious from the exterior and may require an investigation. Correctly identifying the extent of the problem early will help with timely identification of required resources. It is important to understand the availability and capability of resources.

The incident Command organization is driven by the size and complexity of the incident. At a major fire with heavy smoke and toxic gas conditions, a Branch-level organization normally will be required. It will be desirable to establish a Rescue Branch and possibly a Vent Branch. The fire attack usually can be done using Divisions, but they may be placed under a Suppression Branch.

The Branches normally have Divisions working for them. For example, the Search Branch may have a Search Division 1B, Search Division 1D, Search Division 2B, and a Search Division 2D. The Divisions may have one to five companies assigned to them.

The first-alarm assignment should be committed to those actions that will have the greatest impact on overall mitigation. During hours of occupancy, evacuation must be started at once. Ideally, if resources permit, ventilation and fire attack should begin simultaneously.

If at all possible, fire attack operations should be coordinated with rescue efforts to avoid using the same stairways/exits. This can seriously impede evacuation of occupants. For example, if fire suppression efforts are initiated from the south end of the mall, evacuation should be through the north exits if possible.

Take care when attacking the fire not to "push" the fire into uninvolved areas. Getting hoselines in place to prevent extension of fire into voids and uninvolved stores is equally important.

As long as the mode of operation is offensive, 1-3/4-inch hoselines normally are sufficient for initial attack operation. Because of the large open areas, these lines should be backed up as soon as possible with large handlines.

Ventilation in enclosed malls is especially difficult because of the lack of compartmentalization. Use of the HVAC system will assist in ventilation efforts if the systems are operated properly. A building engineer can be of considerable assistance in this area. Some malls may have skylights that open or other built-in ventilation devices.

Firefighter fatigue and rehab are major concerns at mall operations. Because all facets of this type of an operation are labor intensive, provisions must be made for adequate numbers of personnel and the facilities for rehab.

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Simulation 9

Homework Assignment

Enclosed Mall Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on enclosed malls the evening before the simulation is scheduled. This worksheet of questions pertains to the reading material. You will work in the groups established for classroom activities. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation.

2. After reading the SM, your group will answer the questions pertaining to different situations or problems at enclosed malls.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems that were not discussed.

Scenario 1

At 1930 hours Saturday, a fire is reported at a large two-story enclosed mall whose second floor is a mezzanine open to the first floor. The roof over the mall area is glass. The fire is located in a carpet store in the center of the building on the first floor. On entering, the first company reports "Heavy smoke on the first floor and extreme smoke conditions on the second floor."

What **rescue** problems are created, and what are some tactical rescue solutions? Describe the Incident Command System (ICS) rescue organization.

Rescue Problem: ____

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Tactical Rescue Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Rescue Problem: ____

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Tactical Rescue Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Rescue Problem: ____

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Tactical Rescue Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Scenario 2

At 1930 hours Saturday, a fire is reported at a large two-story enclosed mall whose second floor is a mezzanine open to the first floor. The roof over the mall area is glass. The fire is located in a carpet store in the center of the building on the first floor. On entering, the first company reports "Heavy smoke on the first floor and extreme smoke conditions on the second floor." A large number of victims are reported during the first 10 minutes.

What **medical** problems are created, and what are some tactical medical solutions? Describe the ICS medical organization.

Medical Problem: ____

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Tactical Medical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Medical Problem: ____

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Tactical Medical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Medical Problem: ____

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Tactical Medical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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In Class
Activity 9.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for an enclosed mall scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the worksheet for the activity.

3. The class will be shown a slide of an enclosed mall. Everyone will review the scenario description and the plot/floor plan.

4. Your group will write its overall goals (strategies) on the Strategy Prompter and convert those goals into an ICS organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident.

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 15 minutes total. Be brief, but to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, you must identify which Division or Group is performing that task.

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In Class
Activity 9.1 (cont'd)

Scenario Description

Construction

600' x 200', enclosed mall.
Ordinary construction (masonry, wood-joist).
Walls--concrete block w/brick veneer.
Roof--beam and rafter, 1" x 6" sheathing, with paper, tar, and stone.

Fire Location

One 25-percent-involved occupancy with fire extending into the mall area.

Time and Day

1400 hours, Friday.

Water Supply

4,000 gpm total system flow.

Resources (1st alarm)

4 engines
1 truck
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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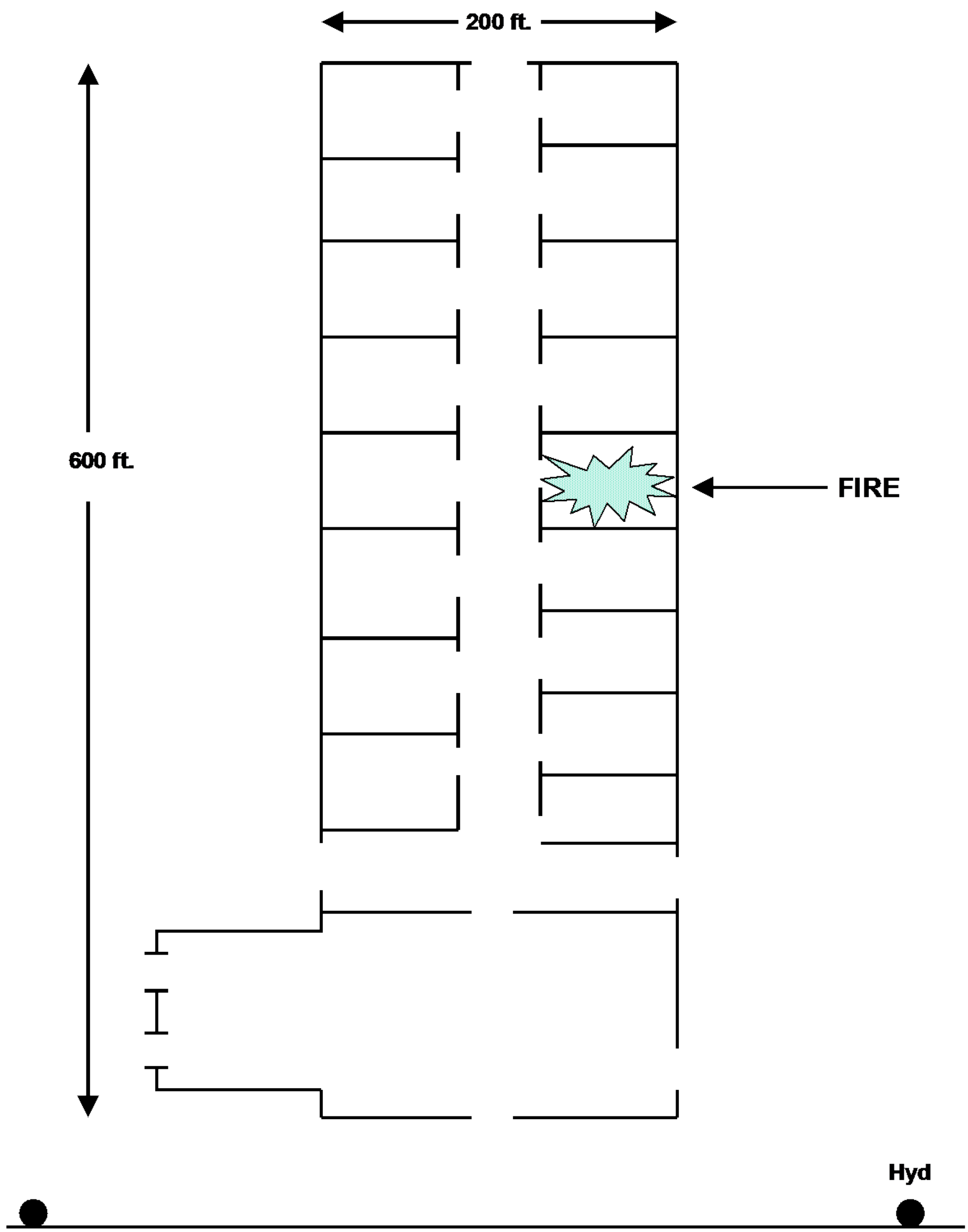
In Class
Activity 9.1 (cont'd)

Plot/Floor Plan



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Simulation 9

ENCLOSED MALL SIMULATION

Incident Description

A very large enclosed mall with four anchor stores. The link stores are on two levels.

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Simulation 9
Quick Access Prefire Plan

Building Address:
2855 28th Street

Building Description:
1,100' x 320', 2-story, noncombustible

Roof Construction:
Common attic, lightweight steel truss with dropped ceiling, Q decking with rolled roofing

Floor Construction:
Poured concrete slab covered with ceramic tile

Occupancy Type:
Mixed retail--Enclosed mall

Initial Resources Required:
4 Engines, 1 B/C, 1 Truck,
1 PM, 1 Safety Officer

Hazards to Personnel:
Roof collapse--disorientation

Location of Water Supply:
Hydrants spaced every 300' around mall building

Available Flow:
7,500 gpm

	Estimated Fire Flow*			
Level of Involvement	*5%*	*10%*	*25%*	*100%*
Estimated Fire Flow	400	800	2,000	7,500

**Fire flow calculated on largest occupancy 100' x 150' with second floor and link store exposures (rounded).*

Fire Behavior Prediction:
Rapid smoke spread, slow horizontal spread of fire, may spread faster in voids.

Predicted Strategies:
Vertical, Horizontal Ventilation, Rescue, and Evacuation. Rapid interior attack and confinement.

Problems Anticipated:
Personnel required for ventilation, rescue, and salvage. Rescue of disabled or overcome occupants.

[X] **Standpipe:** *Wet*	[X] **Sprinklers:** *Partial*	[X] **Fire Detection:** *Yes*

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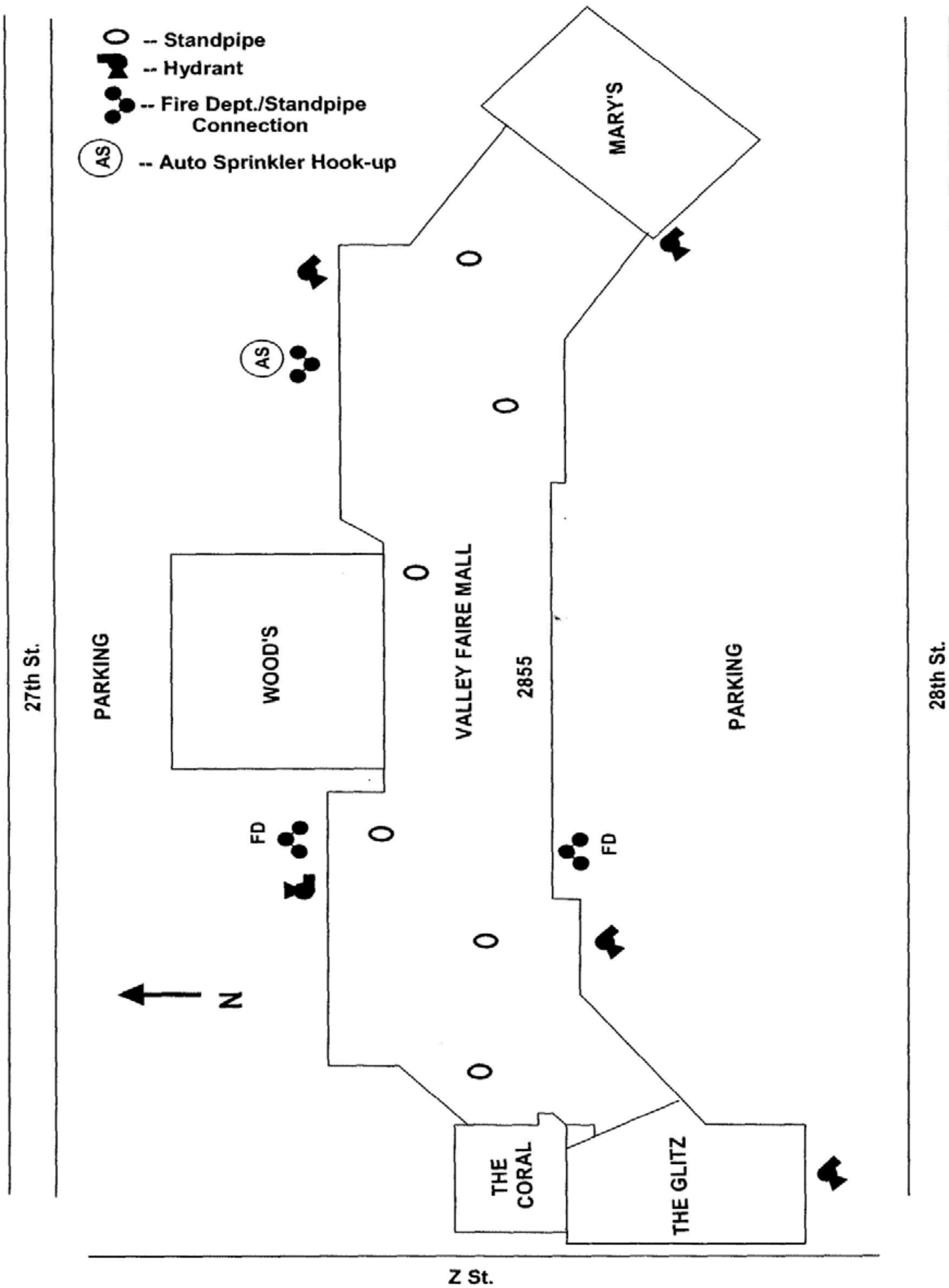
Simulation 9

Plot/Floor Plan



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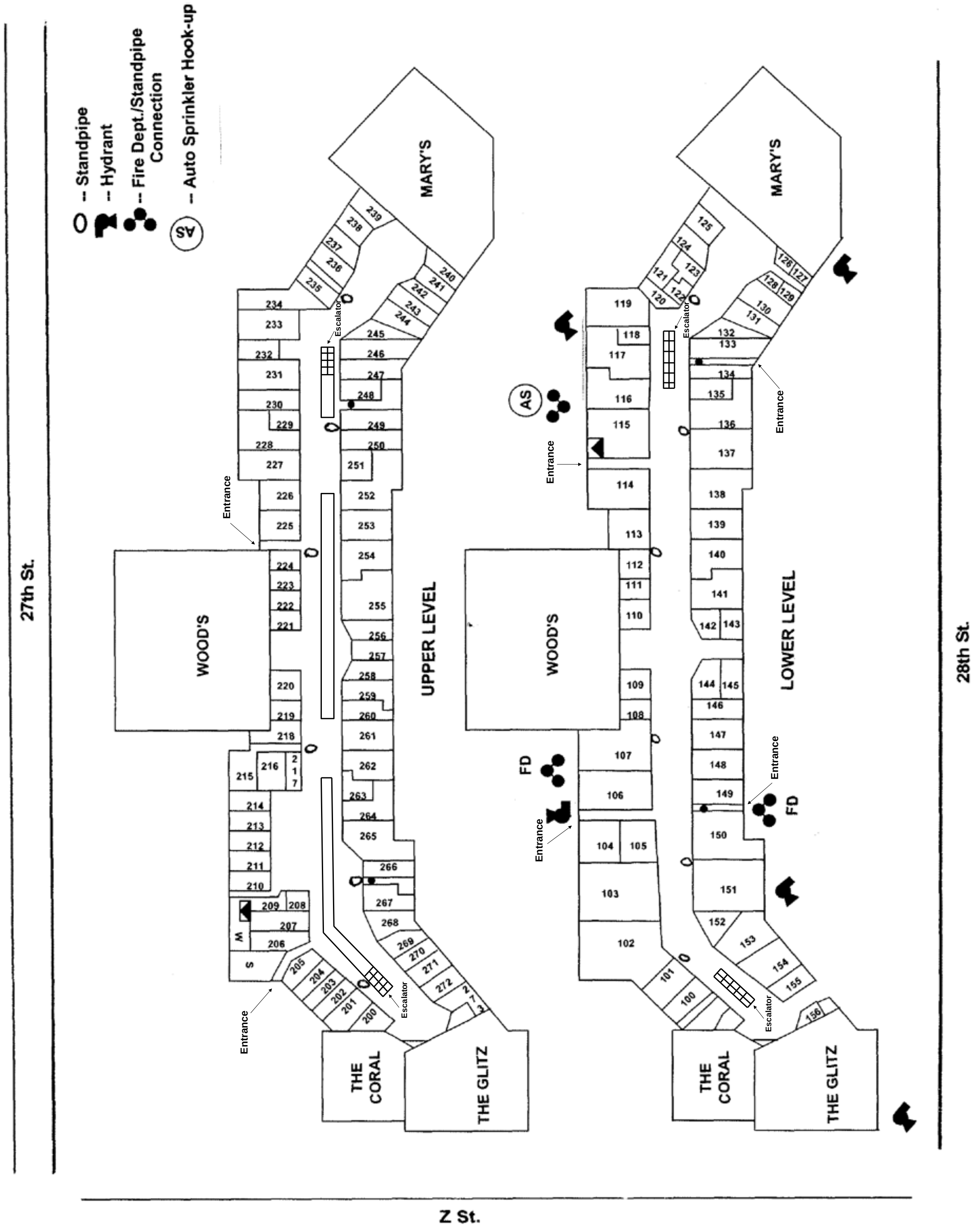
Simulation 9

Plot/Floor Plan (cont'd)



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Enclosed Mall Index for Simulation 9

Telephones
Restrooms
Elevator
Security office
Management office

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101	The Shirt Shop
102	The Cutting Edge
103	Accessory Alley
104	Formal Dress
105	Neck & Neck
106	I.B. Jeweler
107	House of Fitness
108	Bird's Nest
109	Card Shack
110	Vitamins Et Al
111	Bobby's Books
112	Kathy's Kookies
113	Viscarello's
114	Paul Bunyon
115	Smallworld Shoes
116	Walking Trail
117	Kiddie Kritters
118	The Sweet Tooth
119	East India Co.
120	The Free Spirit
121	Tough as Leather
122	Alternative Solution
123	Ideas Galore
124	Bonnie's Boutique
125	Heel & Toe Shoes
126	Sew & Sew
127	The Backpacker
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129	House of Hair
130	The Suitcase Shoppe
131	New Earth
132	Mom's To Be
133	Fruits and Stuff
134	The Nut House
135	Safari
136	Just for Her
137	Casual Corner
138	Music in a Box
139	Custom Clothes
140	Inquiring Minds
141	Finishing Touch
142	This Olde Shoe
143	Fun & Games
144	Small Wonders
145	Ollie's Office Supply
146	Gym Locker
147	All That Glitters
148	Mimi's
149	Lisa Linton's
150	Modem Women
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154	Juniors
155	California Sunshine
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Second-Floor Stores:

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201 The Grape Leaf
202 Salty Sam's Fish & Chips
203 The Eyechart
204 Jewelry Showcase
205 Rhythm Records
206 Casa de Taco
207 Get a Grip
208 A Touch of China
209 Music Express
210 Seashore
211 Cherry Blossom Sushi
212 Large & Chic
213 Stan's Shoes
214 In The Shade
215 Joyce's
216 Expectations
217 Jeans & T-Shirts
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255 Checkmate
256 The Shoe Lady
257 A Glass World
258 Betty Jane's
259 The Frat House
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261 Sport World
262 The Stash
263 Plastic Money
264 Paper Mache
265 Five & Dime
266 Sammy's Sport Shop
267 The Hawaiian Shirt
268 Light in the Dark
269 Sweedish Fish
270 Classy Clothier
271 All-American Food
272 Paper Place
273 Nifty Fifty's

SIMULATION 10: TRANSPORTATION ACCIDENT

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management tasks at fires involving transportation incidents.*

2. *Perform the management functions required of the Command Officer at fires at transportation incidents.*

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INTRODUCTION

Transportation accidents, for the purposes of this course, are those incidents such as collisions, spills, fires, explosions, etc., involving a recognized transportation vehicle (trucks, buses, trains, ships, and aircraft).

COMMON FACTORS IN TRANSPORTATION ACCIDENTS

Construction Features

The construction features of the transportation vehicle can be just as important to the Incident Commander (IC) as the construction features of a building. The vehicle may be steel, aluminum, exotic metals, alloys, or any number of combinations. They may be sparking or nonsparking. They may contribute to a fire or be fire-resistive. They may have built-in safety devices or, as in the case of military aircraft, have built-in explosive devices (i.e., ejection seats).

It is important for Command Officers to develop a good general knowledge of transportation vehicles likely to be found in their response areas:

- trains;
- aircraft, civilian;
- aircraft, military;
- ships;
- hazardous materials (haz mats) involved; and
- freeway operations.

Guidelines should be developed to cover general cues and considerations that almost always apply, safety precautions, special resources or technical specialists, and mitigation techniques. Some examples might be

- how to secure the electrical power to subway trains;
- how to disarm the ejection seat in a military aircraft;
- warning signs of a Boiling Liquid Expanding Vapor Explosion (BLEVE); and
- where resources can be obtained locally (i.e., foam, absorbent, etc.).

Resource Considerations

Good pressure and adequate water supply always are important to fire situations, and transportation fires are no exception. Transportation accidents often occur on freeways, off-road, or in rural areas where hydrant spacing is poor and water pressure is low.

Any major transportation accident usually will require resources beyond the initial dispatch. Whether it is a mass-casualty incident demanding personnel, a gasoline tanker fire that requires a large quality of foam, or a haz mat situation requiring special expertise, the chances are good that the IC will ask for additional resources. Do you know where to get them? Are they available? How long before they arrive?

Structure Deterioration and Collapse Potential

This can be a problem in a transportation accident, not in the same sense as in a building, but still a problem. For example, passenger vehicles such as buses or trains may have come to rest at odd angles, placing stress on the vehicle structure. This structure might collapse or shift part way through rescue operations, causing the problem to escalate. A container may collapse during the operation, allowing the contents to spill, increasing the fire and/or haz mat problem.

It is important to remember that "structural" and scene integrity must be considered in transportation accident as well as in building fires.

CUE-BASED PREDICTIONS

Certain indicators or cues will assist a well-informed IC in making predictions and formulating strategies.

Construction, including integrity, design, and use of the vehicle, is an important indicator. Some of the cues that might influence actions are

- passenger or cargo;
- cargo intact or spilled;
- military or civilian;
- gasoline, diesel, electric powered; and
- operable devices--i.e., pressure relief valve.

If it involves a passenger carrier, there are additional cues to consider, including:

- weather conditions;
- immediate hazard to trapped victims; and
- resources required to effect rescue/evacuation.

Of course fire, or the potential for fire, is always a concern. It may affect victims still trapped. It may escalate the incident and overwhelm your resources by involving the spilled cargo.

INCIDENT-SPECIFIC STRATEGY AND TACTICS

The strategies for transportation accident should be based on incident priorities:

- life safety;
- incident stabilization; and
- property conservation.

Good training programs, thorough preplanning, and an effective sizeup will assist in correctly analyzing problems and formulating correct strategies. In the case of transportation accidents, even though it is the root cause, the original incident often becomes secondary. Issues like rescue, evacuation, containment, and medical treatment take precedence.

The first-alarm assignment should be committed to the actions that will have the greatest overall impact. The most appropriate action may not be the most obvious to the untrained eye. The most important action may be dictated by the **potential** of the incident to escalate.

Take care with standard fire attack methods. Will water make it worse? If so, what do I need as an extinguishing agent? Perhaps establishment of safety zones and confinement should be the initial action.

Firefighter safety is a major concern at transportation accidents. We sometimes become a little complacent because it's just a "vehicle accident." These incidents can be just as labor intensive and hazardous as any building fire.

TRANSPORTATION ACCIDENT SIMULATION

The walkaround slides show

Side A--Derailment
Side B--Brown industrial building due west of incident
Side C--Blue industrial building northwest of incident
Side D--Apex Manufacturing building due east of incident
Plot Plan

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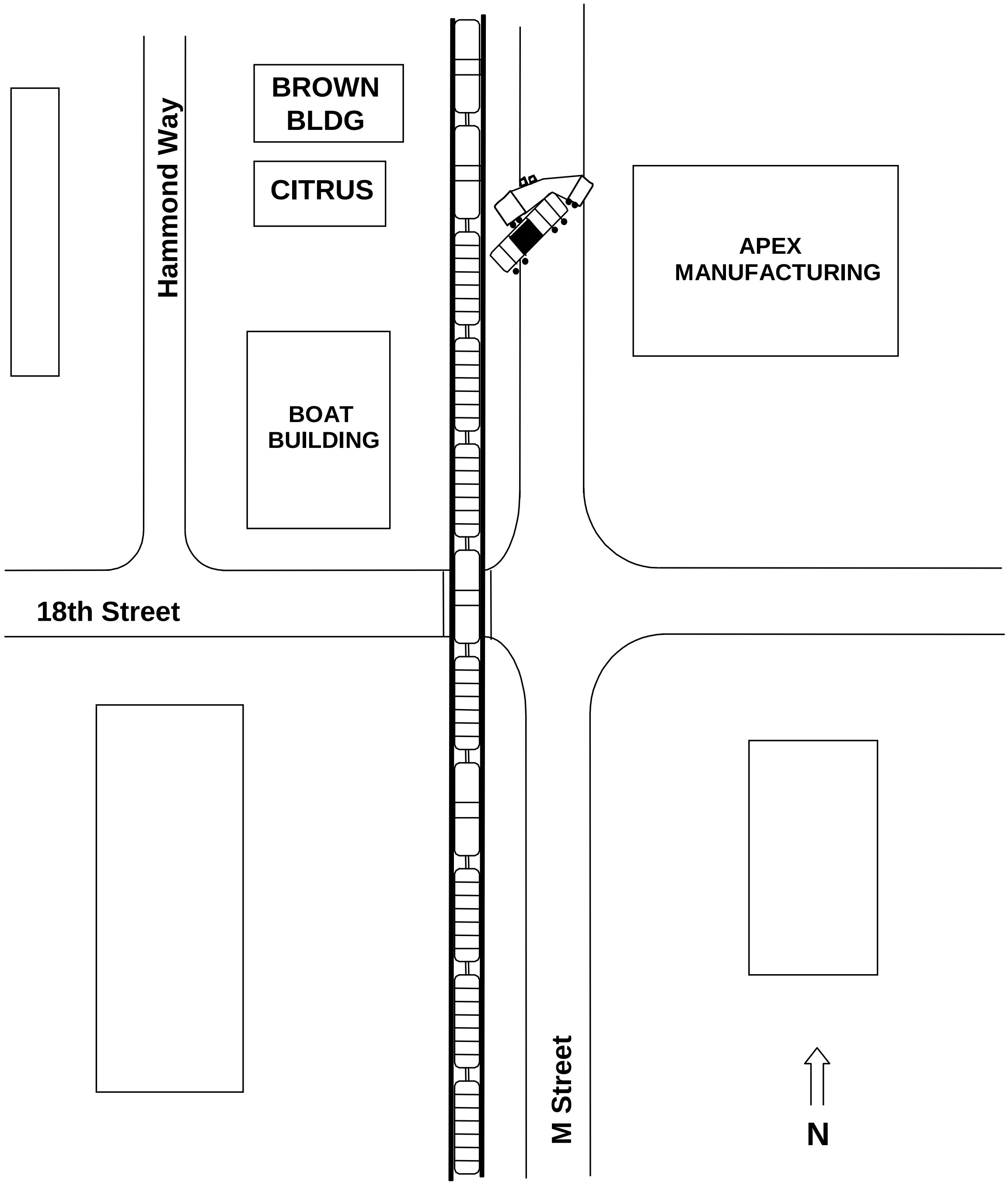
Simulation 10

Plot Plan



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APPENDIX

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Hazardous Material Group Supervisor

First Responder Site Safety Plan

Substance(s) Involved:

1.	U.N. ID #
2.	U.N. ID #
3.	U.N. ID #

Routes of Exposure:

[ ] Inhalation, [ ] Ingestion, [ ] Skin Absorption, [ ] Skin Contact

Fire Hazards: [ ]

Flashpoint ______, LEL ______%, UEL ______%, Other ______________

____

Reactivity Hazards: [ ]

[ ] Unstable, [ ] Water Reactive, [ ] Pyrophoric, [ ] Radioactive,
[ ] Corrosive, [ ] Oxidizer, [ ] Decomposition, Other ______________________________

Site Description:

Perimeter Location ______________________________
Zone Locations Hot - ______________________________
Warm - ______________________________
Cold - ______________________________

Access Points: ______________________________
Staging Area: ______________________________
Other Information: ______________________________
____
____

Personal Protective Equipment:

Minimum PPE: [ ] Full Turnouts/SCBA, [ ] Chemical Clothing,
[ ] Thermal Protective Clothing
PPE in Hot Zone: ______________________________
Warm Zone: ______________________________
Other Information: ______________________________
____

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Plan of Action

Isolation:

[ ] Establish Perimeter ______________________________
[ ] Establish Zones ______________________________
[ ] Deny Entry ______________________________
[ ] Initial Public Protection ______________________________
[ ] Withdrawal ______________________________

Notification:

[ ] Notify Appropriate Authorities ______________________________
[ ] Notify Haz Mat ______________________________
[ ] Request Mutual Aid ______________________________
[ ] Contact CHEMTREC ______________________________
[ ] Contact NRC ______________________________
[ ] Provide Status Report ______________________________
[ ] Establish Staging ______________________________

Identification:

[ ] Use Documentation ______________________________
[ ] Placards and Labels ______________________________
[ ] Reconnaissance ______________________________
[ ] Interview ______________________________
[ ] Review Plans ______________________________

Protection:

[ ] Decontamination ______________________________
[ ] PPE ______________________________
[ ] Secondary Evacuation/In-place ______________________________
[ ] EMS and First Aid ______________________________
[ ] Safety Assessment ______________________________
[ ] Pre-entry Briefing ______________________________
[ ] Pre-entry Medical Monitoring ______________________________

Spill Control:

Release Type - [ ] Gas/Air, [ ] Liquid/Surface, [ ] Liquid/Water [ ] Solid/Surface

Gas/Air:

[ ] Ventilation ______________________________
[ ] Dispersion ______________________________
[ ] Dissolution ______________________________
[ ] Blanketing ______________________________

Liquid/Surface:

[ ] Diking ______________________________
[ ] Diversion ______________________________
[ ] Absorption ______________________________
[ ] Adsorption ______________________________
[ ] Retention ______________________________

Liquid/Water:

[ ] Damming ______________________________
[ ] Diversion ______________________________
[ ] Booming ______________________________
[ ] Absorption ______________________________

Solid/Surface:

[ ] Blanketing ______________________________

Leak Control:

[ ] Remote Shutoffs ______________________________

Fire Control:

[ ] Withdrawal ______________________________
[ ] Controlled Burn ______________________________
[ ] Exposure Protection ______________________________
[ ] Extinguishment ______________________________

Recovery/Termination:

[ ] Cleanup Oversight ______________________________
[ ] Product Transfer Oversight ______________________________
[ ] Container Righting/Removal______________________________
[ ] Release of Callbacks/Mutual Aid ______________________________
[ ] Debriefing ______________________________
[ ] Hazcom ______________________________
[ ] Critique ______________________________
[ ] After-Action Analysis ______________________________
[ ] After-Action Report ______________________________
[ ] After-Action Followup ______________________________

Strategy Prompter

Overall Plan (Strategies):____

____

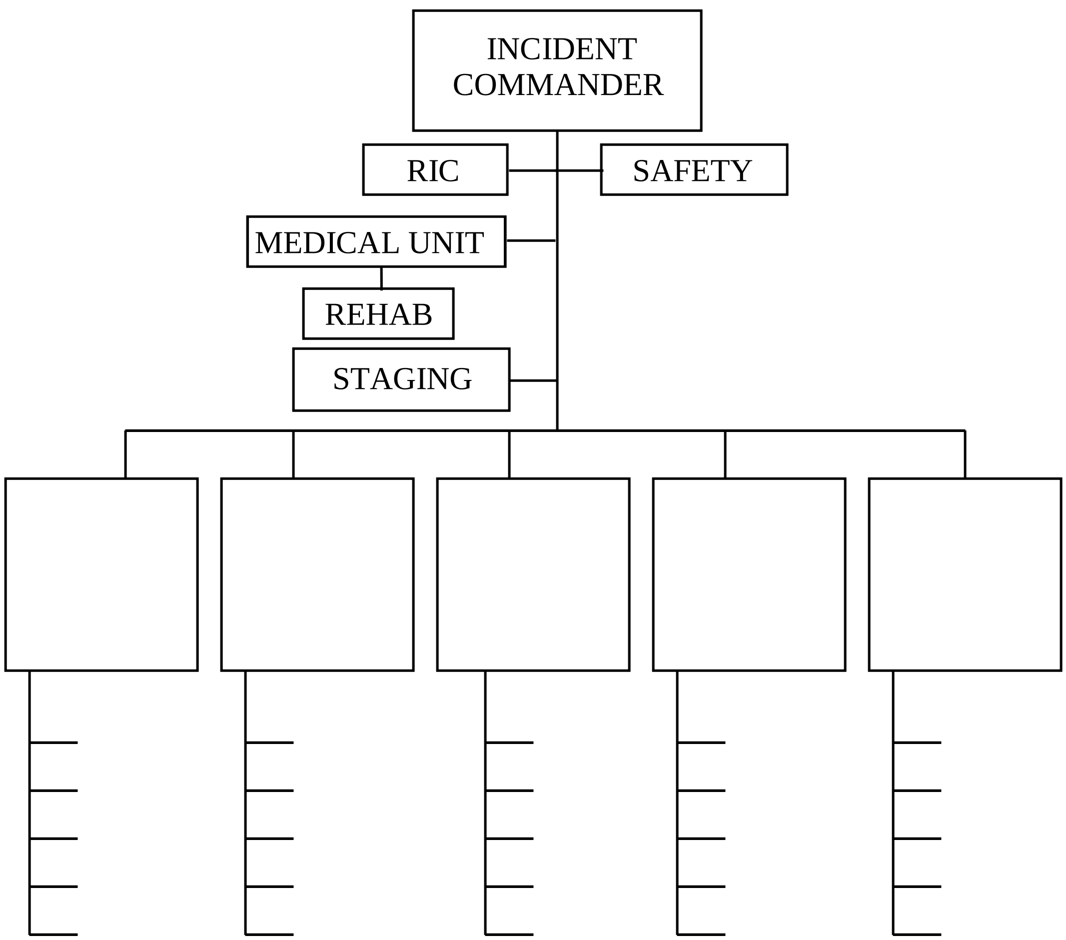
____

____

____

Strategy Examples

Rescue
Exposures
Confinement
Extinguishment
Ventilation



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International Chemical Safety Cards

SULFUR	ICSC: 1166

Flowers of sulfur
Flour sulfur
Brimstone
S or S_8
Molecular mass: 256.5 (S8); Atomic mass: 32.1

ICSC # 1166
CAS # 7704-34-9
RTECS # WS4250000
UN # 1350

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIREFIGHTING
FIRE	Combustible.	NO open flames, NO sparks, and NO smoking.	Water spray. Foam. Powder. Dry sand.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT DISPERSION OF DUST!	
INHALATION	Burning sensation. Cough. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
EYES	Redness. Pain. Blurred vision.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
INGESTION	Burning sensation. Diarrhea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. (Extra personal protection: P2 filter respirator for harmful particles).	Fireproof. Separated from strong oxidants.	R: S: UN Hazard Class: 4.1 UN Packing Group: III

<table>
<tr><td rowspan="1">I
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A</td>
<td>PHYSICAL STATE; APPEARANCE:
YELLOW SOLID IN VARIOUS FORMS

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

CHEMICAL DANGERS:
On combustion, forms toxic and corrosive gases of sulfur oxides including sulfur dioxide (see ICSC 0074). Reacts violently with strong oxidants causing fire and explosion hazard, especially if powdered.

OCCUPATIONAL EXPOSURE LIMITS:
TLV not established.</td>
<td>ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and by ingestion.

INHALATION RISK:
Evaporation at 20 °C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes, the skin and the respiratory tract. Inhalation of powder of this substance may cause inflammation of the nose and the respiratory tract.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the respiratory tract, resulting in chronic bronchitis.</td></tr>
<tr><td>PHYSICAL PROPERTIES</td>
<td>Boiling point: 445 °C
Melting point: (r-sulfur) 107 °C
Melting point: (beta-sulfur) 115 °C
Melting point: (amorphous) 120 °C
Density: 2.1
g/cm^3</td>
<td>Solubility in water:
none
Flashpoint:
160 °C c.c.
Auto-ignition temperature: 232 °C
Explosive limits, vol % in air: 35-1400
g/m^3</td></tr>
<tr><td>ENVIRONMENTAL DATA</td><td colspan="2"></td></tr>
<tr><td colspan="3">N O T E S</td></tr>
<tr><td colspan="3">Often transported in molten state (UN 2448; TEC(R)-115). Molten sulfur reacts with hydrocarbons to form toxic and flammable gases. Depending on the degree of exposure, periodic medical examination is indicated.

Transport Emergency Card: TEC (R)-115A
NFPA Code: H 1; F 1; R 0</td></tr>
</table>

International Chemical Safety Cards

HEXANE — **ICSC: 0279**

Hexyl hydride
C_6H_{14}
Molecular mass: 86.2

ICSC # 0279
CAS # 110-54-3
RTECS # MN9275000
UN # 1208
EC # 601-037-00-0

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIREFIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapor/Air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use nonsparking hand tools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
INHALATION	Dizziness. Drowsiness. Dullness. Headache. Nausea. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
SKIN	Dry skin. Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
EYES	Redness. Pain.	Safety goggles, face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
INGESTION	Abdominal pain (further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELING
Consult an expert! Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapors).	Fireproof. Separated from strong oxidants. Well closed.	F symbol Xn symbol N symbol R: 11-38-48/20-51/53-62-65-67 S: 2-9-16-29-33-36/37-61-62 UN Hazard Class: 3 UN Packing Group: II

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** VOLATILE COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** The vapor is heavier than air and may travel along the ground; distant ignition possible. **CHEMICAL DANGERS:** Reacts with strong oxidants causing fire and explosion hazard. Attacks some plastics, rubber and coatings. **OCCUPATIONAL EXPOSURE LIMITS:** TLV (as TWA): 50 ppm; 176 mg/m^3 skin (ACGIH 1999). OSHA PEL: TWA 500 ppm (1800 mg/m^3) NIOSH REL: TWA 50 ppm (180 mg/m^3) NIOSH IDLH: 1,g100 ppm LEL	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapor and by ingestion. **INHALATION RISK:** A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20 °C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the skin. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. Exposure at high levels could cause lowering of consciousness. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system peripheral nervous system, resulting in polyneuropathy. Animal tests show that this substance possibly causes toxic effects on human reproduction.
PHYSICAL PROPERTIES	Boiling point: 69 °C Melting point: -95 °C Relative density (water = 1): 0.7 Solubility in water, g/100 ml at 20 °C: 0.0013 Vapor pressure, kPa at 20 °C: 17 Relative vapor density (air = 1): 3.0	Relative density of the vapor/air-mixture at 20 °C (air = 1): 1.3 Flash point: -22 °C c.c. Auto-ignition temperature: 225 °C Explosive limits, vol % in air: 1.1-7.5 Octanol/water partition coefficient as log Pow: 3.9
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms.	

International Chemical Safety Cards

LIQUEFIED PETROLEUM GAS	ICSC: 0319

C3H8 / CH3-CH2-CH3
Molecular mass: 44.1
(cylinder)

ICSC # 0319
CAS # 74-98-6
RTECS # TX2275000
UN # 1978

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Extremely flammable.	NO open flames, NO sparks, and NO smoking.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out; in other cases extinguish with water spray.
EXPLOSION	Gas/Air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent buildup of electrostatic charges (e.g., by grounding) if in liquid state. Use nonsparking hand tools.	In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.
EXPOSURE			
INHALATION	Simple asphyxiant.	Ventilation.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
SKIN	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.
EYES	ON CONTACT WITH LIQUID: FROSTBITE.	Face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
INGESTION			

SPILLAGE DISPOSAL	STORAGE	PACKING & LABELING
Evacuate danger area! Consult an expert! Ventilation. NEVER direct water jet on liquid (extra personal protection: chemical suit with self-contained breathing apparatus).	Fireproof. Cool.	F+ symbol R: 12 S: 2-9-16 UN Hazard Class: 2.1

<table>
<tr><td rowspan="1">I M P O R T A N T

D A T A</td>
<td>PHYSICAL STATE; APPEARANCE:
ODOURLESS, COLOURLESS COMPRESSED LIQUEFIED GAS.

PHYSICAL DANGERS:
The gas is heavier than air and may travel along the ground; distant ignition possible, and may accumulate in low ceiling spaces causing deficiency of oxygen. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:

OCCUPATIONAL EXPOSURE LIMITS:
TLV (as): ppm; mg/m3 simple asphyxiant (ACGIH 1995-1996).
MAK: 1,000 ppm; 1,800 mg/m3; IV (1993).
OSHA PEL: TWA 1,000 ppm (1,800 mg/m3)
NIOSH REL: TWA 1,000 ppm (1,800 mg/m3)
NIOSH IDLH: 2100 ppm LEL</td>
<td>ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation.

INHALATION RISK:
On loss of containment this liquid evaporates very quickly causing supersaturation of the air with serious risk of suffocation when in confined areas.

EFFECTS OF SHORT-TERM EXPOSURE:
Rapid evaporation of the liquid may cause frostbite.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</td></tr>
<tr><td>PHYSICAL PROPERTIES</td>
<td>Boiling point: -42 °C
Melting point: -189 °C
Solubility in water, ml/100 ml at 18 °C: 6.5
Relative vapor density (air = 1): 1.6</td>
<td>Flash point: Flammable Gas
Auto-ignition temperature: 450 °C
Explosive limits, vol % in air: 2.1-9.5</td></tr>
<tr><td colspan="3">N O T E S</td></tr>
<tr><td colspan="3">High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death. Check oxygen content before entering area. Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

Transport Emergency Card: TEC (R)-27A
NFPA Code: H1; F4; R0</td></tr>
</table>

International Chemical Safety Cards	
SULPHUR DIOXIDE	**ICSC# 0074**

Sulfur Dioxide
Sulfur oxide
Sulfurous oxide
Sulfurous anhydride
SO_2
Molecular mass: 64.1
(cylinder)

ICSC # 0074
CAS # 7446-09-5
RTECS # WS4550000
UN # 1079
EC # 016-011-00-9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Heating will cause rise in pressure with risk of bursting.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			In case of fire: cool cylinder by spraying with water but avoid contact of the substance with water. Combat fire from a sheltered position.
EXPOSURE		STRICT HYGIENE!	IN ALL CASES CONSULT A DOCTOR!
INHALATION	Cough. Shortness of breath. Sore throat. Symptoms may be delayed (See Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration if indicated. Refer for medical attention. See Notes.
SKIN	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.
EYES	Redness. Pain. Severe deep burns.	Safety goggles, face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor
INGESTION			

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELING
Evacuate danger area! Consult an expert! Ventilation. NEVER direct water jet on liquid (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Fireproof if in building. Provision to contain effluent from fire extinguishing. Separated from incompatible substances (see Chemical Dangers), food and feedstuffs. Cool. Dry.	Do not transport with food and feedstuffs. T symbol R: 23-36/37 S: 1/2-9-26-36/37/39-45 UN Hazard Class: 2.3 UN Subsidiary Risks: 8

<table>
<tr><td></td><td>PHYSICAL STATE; APPEARANCE
COLOURLESS GAS OR COMPRESSED LIQUEFIED GAS, WITH PUNGENT ODOR.</td><td>ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation.</td></tr>
<tr><td>IMPORTANT DATA</td><td>PHYSICAL DANGERS
The gas is heavier than air.

CHEMICAL DANGERS:
The solution in water is a medium strong acid. Reacts violently with ammonia, acrolein, acetylene, alkali metals, chlorine, ethylene oxide, amines, butadiene. Reacts with water or steam causing corrosion hazard. Attacks many metals including aluminum, iron, steel, brass, copper and nickel in presence of water. Incompatible with halogens. Attacks plastics, rubber and coatings in liquid form.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 2 ppm; 5.2 mg/m3 (as TWA); 5 ppm; 13 mg/m3
(STEL) (ACGIH 1992-1993).
MAK: 2 ppm; 5 mg/m3 (1993).
OSHA PEL: TWA 5 ppm (13 mg/m3)
NIOSH REL: TWA 2 ppm (5 mg/m3) ST 5 ppm (13 mg/m3)</td><td>INHALATION RISK:
A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates strongly the eyes and the respiratory tract. Inhalation of the gas may cause lung edema (see Notes). Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the respiratory tract , resulting in asthma-like reactions, reflex spasm of the larynx and respiratory arrest. Exposure may result in death. The effects may be delayed. Medical observation is indicated.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged inhalation exposure may cause asthma.</td></tr>
<tr><td>PHYSICAL PROPERTIES</td><td>Boiling point: -10 °C
Melting point: -75.5 °C
Relative density (water = 1): 1.4 at -10 °C (liquid)</td><td>Solubility in water, ml/100 ml at 25 °C: 8.5
Vapor pressure, kPa at 20 °C: 330
Relative vapor density (air = 1): 2.25</td></tr>
<tr><td>ENVIRONMENTAL DATA</td><td colspan="2">This substance may be hazardous to the environment; special attention should be given to air, water and plants</td></tr>
<tr><td colspan="3">N O T E S</td></tr>
<tr><td colspan="3">Depending on the degree of exposure periodic medical examination is indicated. The symptoms of lung edema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Immediate administration of an appropriate spray by a doctor or a person authorized by him/her should be considered. Do NOT spray water on leaking cylinder (to prevent corrosion of cylinder). Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.
Transport Emergency Card: TEC ® -15</td></tr>
<tr><td colspan="3"></td></tr>
</table>

SIMULATION 11: PLANNING PROCESS: DEVELOPING AN INCIDENT ACTION PLAN

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to organize and conduct a Planning Meeting for the purpose of supporting an ongoing incident and developing an Incident Action Plan (IAP).*

2. *Perform the management functions required of the General and Command Staffs, including use of the appropriate ICS forms.*

3. *Conduct a Planning Meeting, concluding the activities with a completed IAP for a specific incident.*

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INTRODUCTION

In most incidents that emergency services organizations respond to, the development of an Incident Action Plan (IAP) is informal. In many cases, where the actions are held to the first few responding units, the IAP is in the mind of the Incident Commander (IC). The IC may use a tactical chart/worksheet (highly recommended) to ensure that all elements are covered.

A tactical chart or worksheet is the very first form of an IAP. While participating in simulations you've been exposed to a tactical worksheet. You will note that it provides the ability to set the organization chart, provide reminders for notification of appropriate support agencies, rehab, personnel accountability reports (PARs), etc. An Incident Command System (ICS) Form 201 also can be used in the same manner.

However, as an incident expands beyond the initial response and appears to be one that will last more than six hours, the need for a written IAP, using the appropriate ICS forms, exists.

DEFINITION

An Incident Action Plan (IAP), for the purpose of this simulation, is a written document that provides guidelines to all personnel operating at an incident or event. It is the culmination of defining incident objectives, strategies and tactics and providing specific assignments to the organizational elements.

An Incident Management Team (IMT) is comprised of appropriate Command and General Staff personnel assigned to an incident or major event. The IMT is structured to provide incident management assistance to complement and support the existing ICS organization for events that exceed local capabilities or for other reasons. A local agency can request the IMT to perform either incident support or incident management of the overall emergency.

UNIFIED COMMAND

As an incident expands in size it will surely involve multiple agencies. In some incidents it may be strictly within the local jurisdiction, while other incidents may involve multiple jurisdictions and agencies. When the latter occurs there is a need for Unified Command.

With advent of the terrorism potential at all levels Unified Command can involve Federal agencies quickly. Presidential Directive-5 places the Federal Bureau of Investigation (FBI) as the lead agency in all terrorism and weapons of mass destruction (WMD) incidents.

Some of the primary agencies that might be in UC:

- police--local, State, Federal;
- FBI, Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), DHS;
- health--local, State, Federal
- environmental protection departments--local, State, Federal; and
- United States Coast Guard (USCG).

There are many more.

Unified Command is required when other agencies with legal jurisdiction are involved. Agencies that have legally defined and specific responsibilities for various aspects of an incident should be contacted as part of the dispatch procedure.

Before an incident, you must identify the agencies in your State and at the Federal level that have specific coordination or Command responsibilities at incidents. These agencies need to be part of your Planning Meetings. They also must be in the Incident Command Post (ICP) once an incident occurs.

Separate ICP operations by agencies are detrimental to the safety and survival of responders and civilians. Such an arrangement increases confusion and reduces the coordination, understanding, and cohesion of the operating forces.

COMMAND STAFF

Safety Officer

An Incident Safety Officer, with Assistant Safety Officers, may be needed in large scale incidents. In the case of a hazardous materials incident the Assistant Safety Officer requires special training. Other unusual incidents will require Assistant Safety Officers with specialized training.

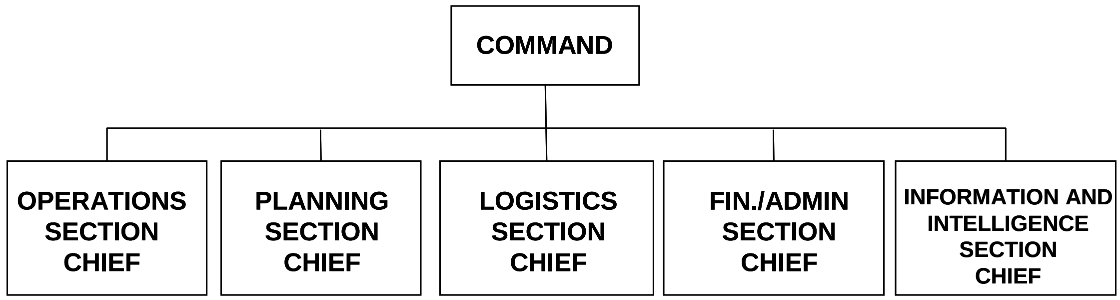
Liaison Officer

Organizations or agencies will respond that do not have specific legal responsibilities for the outcome, but do have needed resources. A Liaison Officer must be appointed to provide an interface and buffer for the IC. The Liaison Officer should establish a designated Liaison Area specifically reserved for these agencies and organizations. Do not place it too close to the ICP.

Public Information Officer

Even on small incidents, the press may appear. The media needs to be given information and to be continuously updated on the situation. The Public Information Officer (PIO) should establish an Information Area in a suitable position away from the ICP.

GENERAL STAFF



Operations Section Chief

Depending on the incident complexity, the Operations Section Chief function may be staffed. It is normal on all but the smallest incidents to staff this position. There are so many demands on the IC that it is nearly impossible to be both the strategist and the tactician. What are the triggering points for establishing Operations?

Planning Section

The gathering and analysis of information at a major incident can quickly overwhelm a Command Officer. Staffing the Planning Section will provide assistance and reduce the pressure. It is critical to have a Resource Unit Leader to track the arrival and placement of response personnel. In addition, the Situation Unit will provide ongoing incident information, such as weather and probabilities. Observers can be used to provide onsite information that will allow the Planning Section to do incident forecasting. Initially, the technical advisors will report to Planning.

Logistics Section

This section is required on all but the least complex incidents to provide services and support to the operational forces. Setting up the ICP and base is critical, as are scene communications, medical and responder rehab, and ground support.

Finance/Administration Section

State and Federal laws allow for reimbursement of the costs of operations at various incidents. Reimbursement may be from the carrier, shipper, or manufacturer in a hazardous materials incident, or from State or Federal agencies for natural and manmade disasters. Those providing reimbursement will expect good documentation of costs and expenditures before paying. This Section also manages the legal risks of the incident.

Intelligence/Investigation

With advent of the National Incident Management System (NIMS) the ICS was modified to provide for an Intelligence/Information component. It may be located at one of four positions in the ICS: as part of the Command Staff, a unit within the Operations Section, a unit within the Planning Section or as a General Staff Section. The intent of this function is to provide Command with intelligence and information that might affect the objectives, strategies, and tactics used to combat an incident.

INITIAL OPERATIONS

Predesignated Personnel for Specific Incident Command System Functions

When an incident requires the use of all ICS positions, many organizations will find a shortage of trained and available fire department personnel to support Command. Emergency response organizations may need to look to other agencies for assistance.

As an example, the fire department supply facility personnel may be able to fill multiple positions in the Logistics Section, while budget office employees can be trained to function within the Finance/Administration Section.

This can be accomplished with the organization and training of IMTs in the jurisdiction or a region. IMT positions are filled by personnel from various agencies in the jurisdiction or region.

OPERATIONAL LOCATIONS

Incident Command Post

The ICP should be in a safe location where weather (wind) changes or incident escalation won't require the ICP personnel to run to save their lives. When the IC and Command Staff are running to save their own lives, they will not worry about your survival until they are safe.

Provide either police (best), fire-police or firefighters as security for the ICP. Allow only essential personnel to have access to the ICP. You cannot function effectively (think) in large crowds.

Be sure to support the ICP fully with radios, lights, tables, pads, easel pads, etc., and rope it off.

Incident Staging and Base

The Staging Area should be in a safe location. Place it where it will not have to be moved for safety reasons. On complex incidents, Staging should be staffed by at least a full company to provide coordination and organization. On a multiple alarm incidents, there will be large quantities of resources.

The Base is a marshaling point for resources. A school makes an excellent base--offices, telephones, cafeteria, auditorium, large parking lot, etc. The Base also is used as a feeding and rehab area.

Operations

Operations should be staffed early to allow the IC to focus on the "big picture." Operations will be at the ICP or between the ICP and the incident scene. Operations determine the tactics--the how, who, where, and when. If the IC gets involved in tactics, the incident is not being managed.

Planning

Planning should be staffed early, too. It should be located at or close to the ICP to allow easy access to the IC.

Logistics

Logistics will normally be located at Base. It could be where a bottleneck in the supply process exists, but from the standpoint of servicing and supporting the incident, Base becomes its operating area.

Command Staff

The PIO and Liaison Officers will need to establish areas away from the ICP. The PIO may need a facility where news conferences may be held or be located where media representatives can observe the incident safely. The Liaison Officer needs to capture all agency representatives in order to have quick access to resources provided by that agency. The Incident Safety Officer should be at the ICP with ASOs assigned in the field to provide the best possible scene coverage.

PLANNING PROCESS

Agency Administrator Briefing

Prior to the IC/UC meeting with the Command and General Staffs the IC/UC needs to determine the parameters of the incident, the jurisdictions objectives, political hot spots, commitment of resources, etc., from the Agency Administrator.

The Agency Administrator could be the highest elected official such as the mayor or executive or it could be the highest paid official such as the chief administrative officer or city manager or the fire chief.

Authority to Act

When working in the local jurisdiction the Authority to Act is assumed as part of the duties of those assigned to an IMT. When the IMT is requested to assist in another jurisdiction a formal the Authority to Act document, including any significant issues, needs to be obtained before any actions are taken. (Appendix E has sample Authority to Act forms.)

Incident Briefing

During the Transfer-of-Command process a briefing, using ICS Form 201, provides the incoming IC/UC with basic information regarding the incident situation and the resources allotted to the incident. Most importantly it functions as the IAP for the initial response and remains in force and continues to develop until the response ends or the Planning Section generates the incident's first IAP. It is also suitable for briefing individuals newly assigned to the Command and General Staff, as well as needed assessment briefings for the staff.

ICS Form 201 facilitates documentation of response objectives, situational awareness, resource employment and deployment, and significant actions taken. This form is essential for future planning and the effective management of initial response activities. A department's tactical worksheet may be used for the initial briefing as long as it captures all the critical information about the incident.

Incident Briefing

When: New IC/UC; staff briefing as required.
Facilitator: Current IC/UC.
Attendees: Prospective IC/UC; Command and General Staff, as required.

General Tasks

Incident Commander:
- obtain incident brief using ICS Form 201;
- assess operational requirements; and
- determine organizational and response requirements and objectives.

Operations:
- obtain briefing from IC;
- consider available Contingency Plan;
- develop strategies and tactics;
- assemble resources; and
- conduct response using ICS Form 201.

Planning: If/When activated, orders staff.

Logistics: If/When activated, orders staff.

Finance/Administration: If/When activated, orders staff.

Agenda

Using ICS Form 201 as an outline, include
1. Situation (note territory, exposures, safety concerns, etc.; use map/charts).
2. Current priorities.
3. Strategy(s) and tactics.
4. Current organization.
5. Resource assignments.
6. Resources en route and/or ordered.
7. Facilities established.

Initial Unified Command Meeting

This meeting provides UC officials with an opportunity to discuss and concur on important issues prior to joint incident action planning. The meeting should be brief, and important points documented. Prior to the meeting, parties should have an opportunity to review and prepare to address the agenda items. Planning Meeting participants will use the results of this meeting to guide the operational efforts prior to the first Tactics Meeting.

Initial Unified Command Meeting

When: The UC is formed prior to the first meeting.
Facilitator: UC member.
Attendees: Only ICs who will make up the UC.

General Tasks

Incident Commander:

- determine need for UC;
- negotiate/facilitate UC participation;
- clarify UC roles and responsibilities;
- negotiate and agree on response organization, facilities, and support; and
- determine Operational Period length/start time.

Operations: Brief UC members on current operations.

Planning: If activated, contact UC members as directed by IC.

Logistics: May not be activated at this time.

Finance/Administration: May not be activated at this time.

Agenda

1. Identify UC, based on Chapter 6 criteria.
2. Identify jurisdictional priorities and objectives.
3. Present jurisdictional limitations, concerns, and restrictions.
4. Develop a collective set of Incident Objectives and strategies.
5. Establish and agree on acceptable priorities.
6. Agree on basic organization structure.
7. Designate the best-qualified and acceptable Operations Section Chief.
8. Agree on General Staff personnel designations and planning, logistical, and financial agreements and procedures.
9. Agree on resource ordering procedures to follow.
10. Agree on cost-sharing procedures.
11. Agree on informational matters.
12. Designate a UC PIO.

Incident Commander/Unified Command Objectives

The IC/UC will identify/review and prioritize objectives for the next operational period on ICS Form 202. In this process, objectives from the previous operational period are reviewed and any new objectives are identified.

Incident Objectives and Strategy

Incident Objectives are statements of guidance and direction necessary for the selection of appropriate strategy(s), and the tactical direction of resources. Incident Objectives are based on realistic expectations of what can be accomplished when all allocated resources have been deployed effectively. Incident Objectives must be **SMART**: specific, measurable, action-oriented, realistic, and time-sensitive, yet flexible enough to allow for strategic and tactical alternatives.

Strategy is the general plan or direction selected to accomplish Incident Objectives. Strategies are broad goals. In structural firefighting they are rescue, exposures, confinement, extinguishment, overhaul, ventilation, and salvage.

At this meeting the IC/UC sets initial Incident Objectives.

Definitions and Examples

Agency direction--Remove people from the 100-year floodplain.

Incident Objective--Provide evacuation and transportation for people in the floodplain area.

Strategy--Evacuate all areas of the floodplain.

Tactics--Divide the floodplain into manageable areas. Use fire and police personnel and support vehicles for removal. Establish medical care and shelters for victims.

Initial Strategy Meeting

When: Prior to tactics meeting.
Facilitator: UC Member or IC if UC not established
Attendees: UC Members; Command and General Staff as appropriate

General Tasks

Incident Commander (IC/UC):

- develop SMART incident objectives and supporting strategies;
- consider "Best Response"; and
- delegate and provide guidance to Command and General Staff.

Operations: May be present if invited.

Planning:

- may be present if invited; and
- propose draft SMART objectives to IC/UC.

Logistics: May be present if invited.

Finance/Administration: May be present if invited.

Agenda

1. Review/identify objectives for the next operational period (Clearly stated and attainable with the resources available, yet flexible enough to allow members to choose tactics).

2. Review any open agenda items from initial/previous meetings.

Tactics Meeting

This meeting creates the blueprint for tactical deployment during the next operational period. In preparation for the Tactics Meeting, the Planning Section and Operations Section Chiefs review the first stage of response operations, or the current IAP situation status information as provided by the Situation Unit, to assess work progress against IAP objectives. Jointly they develop primary and alternate strategies to meet objectives for consideration at the next Planning Meeting. The Safety Officer will evaluate safety aspects of the primary and alternate strategies.

Tactics Meeting

When: Prior to Planning Meeting.
Facilitator: Planning Section Chief.
Attendees: Planning Section Chief, Operations Section Chief, Logistics Section Chief, Resources Unit Leader, and Safety Officer.

General Tasks

Incident Commander: Provide guidance/clarification.

Safety Officer: Analyze safety needs using ICS Form 215A, *Safety Analysis.*

Operations:
- be prepared!
- brief current operations; and
- develop tactics and resource needs using ICS Form 215, *Operational Planning Worksheet*; and
- facilitate meeting.

Planning:
- may attend; and
- Resource Unit leader will attend.

Logistics:
- participate/contribute logistics information as necessary; and
- verify support requirements.

Finance/Administration: Not normally present.

Agenda

1. Review the objectives for the next operational period and develop strategies (primary and alternatives).

2. Prepare a draft of ICS Form 215 (used in Planning Meeting) to identify resources that should be ordered through Logistics.

CONTINGENCY PLANS

Contingency planning needs to be accomplished during this time period.

Contingency planning includes

- Plan B, Plan C, etc.;
- Evacuation Plans;
- Control and Containment Plans;
- Structure Protection Plans; and
- Demobilization Plans.

The elements of a Contingency Plan require that three questions be answered:

- What is the probability of success of Plan A?
- What are the consequences of failure of Plan A?
- What is the worst-case scenario if Plan A fails?

Once those questions are answered a problem statement and objectives can be developed for the contingency plans. The problem statement should define the need for action and be based on the current situation.

Incident Objectives, again following the SMART concept, are written to achieve the solution to the problem and should be specific to the problem.

Pretactical actions may need to be taken such as moving equipment to Staging Areas and developing organizational structures.

A triggering point to activate the Contingency Plan must be determined. When that occurs the Contingency Plan is activated.

PREPARE FOR THE PLANNING MEETING

During this phase of the Planning Cycle, the Section Chiefs and their associated staff members begin the work of preparing for the upcoming Planning Meeting. Section Chiefs are responsible for ensuring that their Planning Meeting responsibilities are met. The **Planning Section Chief** should facilitate this to the greatest extent possible to ensure that the material, information, resources, etc., to be used or discussed in the Planning Meeting is organized and prepared. There are to be no surprises in the Planning Meeting.

Preparing for the Planning Meeting

When: After the Tactics Meetings.
Facilitator: PSC.

General Tasks

Incident Commander:
- provide guidance/clarification; and
- monitor ongoing operations.

Operations:
- continue Operations; and
- prepare for Planning Meeting.

Planning:
- facilitate General Staff and attendees' preparations for Planning Meeting;
- publish/distribute meeting schedule and ensure attendees know roles;
- allow no surprises; and
- Begin drafting the 203 and 204s.

Logistics:
- prepare for Planning Meeting; and
- verify support requirements.

Finance/Administration:
- prepare for Planning Meeting; and
- verify financial and administrative requirements.

PLANNING MEETING

This is a show-and-tell meeting. It defines Incident Objectives, strategies, and tactics and identifies resource needs for the next operational period. All participants should have agreed to support the plan prior to this meeting. This is not a time for surprises such as "I don't think we can do that!" type statements. Depending on incident complexity, this meeting should last no longer than 45 minutes. This meeting fine tunes objectives and priorities, identifies and solves problems, and defines work assignments and responsibilities on a completed ICS Form 215.

Displays in the meeting room should include ICS Form 202 for the next period, large sketch maps or charts clearly dated and timed, a poster-sized ICS Form 215 and ICS-215A, a current resource inventory prepared by the Resource Unit, and current situation status displays prepared by the Situation Unit. After the meeting, ICS Form 215 is used by the Logistics Section Chief to prepare the off-incident tactical and logistical resource orders, and used by the Planning Section Chief to develop IAP assignment lists.

Planning Meeting

When: After the UC and Tactics Meetings.
Facilitator: PSC.
Attendees: Determined by IC/UC, generally IC/UC, Command Staff, General Staff, Air Operations Branch Director, the Resources Unit Leader, Safety Officer, and Technical Specialists, as required.

General Tasks

Incident Commander:

- provide appropriate leadership; and
- brief incident objectives.

Operations:

- brief operational strategies, and tactics using ICS-215, maps, charts, etc.; and
- brief Branch/Division/Group functions and boundaries.

Planning:

- facilitate Planning Meeting agenda;
- brief present situation; and
- address/resolve response coordination issues as needed, gain consensus.

Logistics: brief logistical support and resource ordering status.

Finance/Administration: Brief administrative and financial status/projections, etc.

Agenda

Components	Primary Responsibility
1. State incident objectives and policy issues.	IC/UC
2. Briefing of situation, critical and sensitive areas, weather forecast, and resource status/availability.	SUL
3. State primary and alternative strategies to meet objectives.	OPS
4. Designate Branch, Division, and Group boundaries and functions as appropriate, use maps and ICS Form 215.	OPS
5. Specify tactics for each Division, note limitations.	OPS
6. Specify resources needed by Divisions/Groups.	OPS
7. Specify operations facilities and reporting locations and plot on map	OPS/LSC
8. Develop resources, support, and overhead order (orders).	LSC
9. Consider support: communications, traffic, safety, medical, etc.	LSC
10. Contributing organization/agency considerations regarding work plan.	LO
11. Safety considerations regarding work plan; use ICS-215A.	SO
12. Media considerations regarding work plan.	IO
13. Report on expenditures and claims.	F/ASC
14. Finalize and approve work plan for the next operational period.	IC/UC

INCIDENT ACTION PLAN PREPARATION

Attendees immediately prepare their assignments for the IAP to meet the Planning Section Chief deadline for assembling the IAP components. The deadline will be early enough to permit timely IC/UC approval and duplication of sufficient copies for the Operations Briefing and for overhead. If drafts were done previously, this time is used to tweak them as required.

Incident Action Plan Preparation

When: Immediately following the Planning Meeting, the PSC assigns the deadline.
Facilitator: Planning Section Chief.

General Tasks

Incident Commander: Review, approve, and sign IAP.

Operations:
- provide required information for inclusion into IAP; and
- communicate incident status changes.

Planning:
- facilitate General Staff's IAP input;
- ensure assignments and expectations are clear;
- provide completed IAP to IC/UC for review/approval; and
- distribute completed IAP.

Logistics:
- provide logistics information for IAP; and
- verify resources ordered.

Finance/Administration: Verify financial and administrative requirements for IAP.

Agenda

Components	Primary Responsibility
1. Incident Objectives (ICS Form 202).	Resources Unit
2. Organization List/Chart (ICS Forms 203/207).	Resources Unit
3. Assignment List (ICS Form 204).	Resources Unit
4. Communication Plan (ICS Form 205).	Communications Unit
5. Medical Plan (ICS Form 206).	Medical Unit
6. Incident Map.	Situation Unit
7. Safety Plan.	Safety Officer
8. Decontamination Plan (if necessary)	Technical Specialist
9. Waste Management or Disposal Plan (if necessary)	Technical Specialist
Optional Components (use as pertinent):	
1. Air Operations Summary (ICS Form 220).	Air Operations Branch Director
2. Traffic Plan.	Ground Support Unit
3. Demobilization Plan.	Demobilization Unit

OPERATIONS BRIEFING

This 30 minute or less meeting presents the IAP to the oncoming shift of the response organization. After this meeting, off going supervisors should be interviewed by their relief and by Operations in order to further confirm or adjust the course of the oncoming shift's IAP. Shifts in tactics may be made by the Division/Group Supervisor in whose purview they are. Similarly, a Supervisor may reallocate resources within that Division to adapt to changing conditions.

Operations Briefing

When: About an hour prior to each shift change.
Facilitator: Planning Section Chief.
Attendees: IC/UC, Command Staff, General Staff, Branch Directors, Division/Group Supervisors, Task Force/Strike Team Leaders (if possible), Unit Leaders, others as appropriate.

General Tasks

Incident Commander:
- provide guidance / clarification; and
- provide leadership presence.

Operations:
- provide Operations Briefing for next operational period; and
- ensure ICS Form 204 tasking is clear.

Planning:
- facilitate General Staff and attendees briefing responsibilities; and
- resolve questions.

Logistics: Brief transportation, communication, and supply issues.

Finance/Administration: Brief administrative issues and provide financial report.

Agenda

Component	Responsibility
1. Review IC/UC objectives and changes to IAP.	PSC
2. Discuss current response actions and last shift's accomplishments.	OPS
3. Review weather conditions forecast.	SUL
4. Division/Group and Air Operations assignment.	OPS
5. Trajectory analysis.	SUL
6. Transport, communications, and supply updates.	LSC
7. Safety message.	SO
8. Incident Action Plan (IAP) approval and motivational remarks.	IC/UC

EXECUTE PLAN, ASSESS PROGRESS AND VALIDATE OR ADJUST OBJECTIVES

Following the Operations Briefing all Section Chiefs will review the incident response progress. Field Observers may be used in this process. As Command continues to assess the results of its plan it needs to validate those actions. If progress towards accomplishing the objectives and Strategies is not being made then Command may need to adjust the objectives (see Planning P). As the incident progresses Command should be alert to the need to add or delete objectives. When new objectives are established then there is a need for another Strategy Meeting.

Assess Progress

When: After Operations Briefing
Facilitator: Incident Commander

General Tasks

Incident Commander:

- monitor ongoing operations;
- measure progress against stated objectives; and
- consider "Best Response."

Operations:

- monitor on-going operations and make tactical changes as necessary; and
- measure/ensure progress against stated objectives.

Planning:

- facilitate General Staff's effectiveness and efficiency as appropriate; and
- provide response objectives recommendations to IC/UC.

Logistics: Verify resources, resolve logistical problems.

Finance/Administration: Facilitate smooth administrative and financial reporting.

STRATEGY MEETING IF OBJECTIVES ADJUSTED

If the objectives are adjusted, the IC/UC will need to hold another Strategy Development Meeting. The same process that was used at the beginning of the Planning Process is used again. Once the strategies to meet the new objectives are developed the Tactics Meeting will be held again.

SPECIAL-PURPOSE MEETINGS

The special-purpose meetings are most applicable to larger incidents requiring an Operational Period Planning Cycle, but may be useful during initial response and assessment.

Command Staff Meeting--Coordinate Command Staff functions, responsibilities, and objectives. It is held before the Tactics Meeting. Command Staff (IC/UC, Safety Officer, Liaison Officer, PIO) attend.

Command and General Staff Meeting--An opportunity for the Command and General Staffs to gather under informal conditions (breakfast/dinner) to discuss developing issues.

Business Management Meeting--This under-30-minute meeting develops and updates the operating plan for finance and logistical support. The agenda could include documentation issues, cost sharing, cost analysis, finance requirements, resource procurement, and financial summary data. Attendees include Finance/Administration Section Chief, Cost Unit Leader, Logistics Section Chief, SUL, DUL.

Agency Representative Meeting--This meeting is held to update Agency Representatives and ensure that they can support the IAP. It is conducted by the Liaison Officer, and attended by Agency Representatives. It is most appropriately held after the Planning Meeting in order to announce plans for the next Operational Period. It allows for changes should the plan not meet the expectations of the Agency Representatives.

News Briefing--This meeting briefs media and the public on the most current and accurate facts. It is set up by the PIO, moderated by a UC spokesperson, and features selected spokespersons. This briefing must be held away from the ICP. Spokespersons should be prepared by the PIO to address anticipated issues. The briefing should be well-planned, organized, and scheduled to meet the media's needs.

SOME NOTES ON PLANNING

A reminder: The IC needs assistance as soon as possible on a complex incident. The Planning Section Chief operates with the IC at the ICP and assists with gathering and processing incident information. In the early phase of the incident, the Planning Chief often has a focus into the future, while the IC is dealing with the here and now.

The IC can become overwhelmed quickly with information that must be processed. The Planning Section Chief, working at the ICP, can assist the IC in gathering and processing critical information and provide input into decisions.

Many departments have the first-in chief remain as Planning after the next-ranking chief arrives and assumes Command. This keeps the person with the best knowledge of the incident in the ICP. It also allows the new IC time to mentally "catch up" to the operation. Additional assistants may be required at the ICP.

Planning Meeting--When the IMT has worked its way through the process the next-to-last major element is the Planning Meeting. Throughout the process the IC may gather members of the Command and General Staff to obtain updates and check on incident progress. When most all elements of the IAP are ready in draft it's time for the formal Planning Meeting: this would include the incident objectives, and strategies. A Tactics Meeting held earlier would determine the resources required and planned action. This is displayed on an ICS Form 215. The IC segregates him/herself and the essential managers in an area where they will not be disturbed. The Unified Command personnel, the Command Staff, the General Staff and invited guests attend the meeting. Invited guests could be the Agency Administrator, local, Sate and Federal officials, etc.

The Planning Section Chief facilitates the Planning Meeting. He/She will use the agenda (see *Field Operations Guide* (FOG) page 8-4).

The staff shares information, queries each other, and analyzes incident information. The individuals focus on their areas of ICS assignment. The IC determines the overall plan and gives the others direction in their areas of endeavor. Minutes should be taken and distributed.

After the Planning Meeting, the planners return to their parts of the organization. The various assistants in each part of the organization are briefed on the plan and the supporting requirements. Those draft documents used for the IAP are corrected, if necessary, assembled, and each is signed by the appropriate ICS member. At this point the IAP is ready for duplication.

Planning Meetings may be held as often as necessary in the early stages of the incident, and less frequently as control is gained.

An Operational Briefing Meeting is scheduled about 1-hour before the beginning of the next Operational Period. At this meeting copies of the completed IAP are distributed to Branch Directors and Division/Group Supervisors.

PLANNING PROCESS

The checklist below provides basic steps appropriate for use in almost any incident situation. **Not all incidents require written plans.** The need for written plans and attachments is based on incident requirements and the decision of the IC.

Checklist Responsibility		Primary
1.	Briefing on situation and resource status	PSC
2.	Set control objectives	IC
3.	Plot control lines and Division boundaries	OPS
4.	Specify tactics for each Division	OPS
5.	Specify resources needed by Division/Group	OPS, PSC
6.	Specify Operations facilities and reporting locations; plot on map	LSC
7.	Place resource and personnel order	LSC
8.	Consider Communications, Medical, and Traffic Plan requirements	PSC, LSC
9.	Finalize, approve, and implement Incident Action Plan	PSC, IC, OPS

IC = Incident Commander
PSC = Planning Section Chief
OPS = Operations Section Chief
LSC = Logistics Section Chief

How to Conduct A Planning Meeting

The Planning Meeting is the session that drives the completion of the IAP. The Planning Section Chief needs to ensure that all of the work required in the Preparing for the Planning Meeting has been accomplished. Following are some general guidelines for conducting the Planning Meeting.

A. **Purpose**--to identify all pieces of information on an incident and the development of a course of action for incident control.

B. **Who attends**--IC to determine who is to attend. Don't fall into the trap of having too many people. Command and General Staff plus whoever else is needed. Include the Agency Administrator and others.

The Planning Section Chief facilitates the Planning Meeting.

C. **How.**

1. Set a time for the meeting and hold it. (Would like to start no later than __ hours and should complete within ________ hour(s).)

2. Get verbal presentations from all functions on accomplishments and problem areas. Also need presentation from specialists. Operations usually makes the first presentation. Planning function is last to make presentation, and presents alternate plans.

3. Modification of a proposed plan to fit conditions of the incident, and selection by the IC/UC. (Starts out as roundtable discussion, with IC/UC making the final decision.)

4. Select alternative—IC/UC has final responsibility. (Must sign and date approved plan).

5. Safety Officer sometimes makes a final presentation at the meeting to present observations for the day and recommendations.

6. Close meeting on time.

D. **Information sharing**--(PSC should conduct and control meeting).

1. General picture (Planning presents information gathered).

   a. Maps (incident location, topography, fuels, etc.).

   b. History (history of incident to now, control status).

   c. Situation (behavior--weather, values at stake, etc.).

   d. Control action now in effect--present control, type and rate, holding action in progress.

   e. Staffing--equipment, air and ground.

   f. Communication equipment.

   g. Resources--en route or available.

2. **Input from Logistics.**

   a. Transportation--all types.

   b. Communications.

c. Supply arrangements--present and future.

d. Personal facilities--first aid, feeding, etc.

3. **Input from Finance/Administration**.

a. Financial management considerations.

b. Commissary and welfare.

4. **Input from Operations.**

a. History (history of incident to now, control status).

b. Situation (behavior--weather, values at stake, etc.).

c. Control action now in effect--present control, type, and rate; holding action in progress.

5. **General information considerations** (Planning to assimilate this information from responsible Command and General Staff, etc.).

a. Local problems.

b. Specialized equipment.

c. Personnel sources.

d. Local customs and crew supervision.

e. Size and location of incident.

f. Method of operation.

g. How safety is to be handled, precautions, specific dangers.

h. Forces assignments, overhead, manpower, equipment, air equipment, communications, etc.

E. The written Incident Action Plan (IAP)

1. The Planning function assimilates the various parts of the plan into a complete package.

2. The IC approves the plan.

3. Planning duplicates and distributes the IAP.

4. A good IAP consists of the following:

   a. Incident objectives (ICS Form 202)

   b. Organization assignment list (ICS Form 203)

   c. Assignment lists (ICS Form 204)

   d. Communication Plan (ICS Form 205)

   e. Medical Plan (ICS Form 206)

   f. Safety message.

   h. Incident map.

   i. Traffic Plan.

   j. Security Plan (optional).

   k. Vicinity map (optional).

   l. Weather forecast (if needed).

   m. Resource Summary Sheet.

Activity 11.1

Understanding the Completion of Incident Command System Forms Associated With an Incident Action Plan

Purpose

To learn how to fill out ICS forms for a given scenario and to prepare you for Activity 11.2.

Directions

1. You will be shown a program that details the completion of ICS Forms 202, 203, 204, 205, 206, and 215. The latter must be completed prior to completion of the Form 204s.

2. Do not worry about the typing of engines, dozers, or crews for this incident.

3. This scenario shows five Groups and Divisions assigned to a fire in the Central Auto Parts. These groups are Division 1 and Exposure, Medical, Law Enforcement and Search & Rescue Groups.

4. The fire's most significant exposure is Grant Lumber, to the east of the incident.

5. This sample IAP:

    a. Demonstrates the use of an ICS Form 215 to determine resource needs to accomplish the Incident Objectives (ICS Form 202).

    b. Displays the incident organization (ICS Form 203).

    c. Defines the incident work assignments (ICS Forms 204--one for each Division and Group on the incident).

    d. Clarifies the incident communications (ICS Form 205).

    e. Sets forth a Medical Plan (ICS Form 206) for the operational period.

6. Instructions for completing ICS Form 215 can be found in Appendix D.

7. Other IAP elements may include those listed on the slide.

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INCIDENT OBJECTIVES	1. Incident Name	2. Date	3. Time
4. Operational Period			
5. General Control Objectives for the Incident (include alternatives)			
6. Weather Forecast for Period			
7. General Safety Message			
8. Attachments (mark if attached)			
☐ Organization List - ICS 203	☐ Medical Plan - ICS 206	☐ (0ther)	
☐ Div. Assignment Lists - ICS 204	☐ Incident Map	☐	
☐ Communications Plan - ICS 205	☐ Traffic Plan	☐	
9. Prepared by (Planning Section Chief)	10. Approved by (Incident Commander)		

ORGANIZATION ASSIGNMENT LIST

1. Incident Name	
2. Date	**3. Time**
4. Operational Period	
Position	**Name**
5. **Incident Commander and Command Staff**	
Incident Commander	
Deputy	
Safety Officer	
Information Officer	
Liaison Officer	
6. **Agency Representative**	
Agency	Name
7. **Planning/Intelligence Section**	
Plans/Intel Chief	
Deputy	
Resources Unit	
Situation Unit	
Documentation Unit	
Demobilization Unit	
Technical Specialists	
Human Resources	
Training	
GIS	
8. **Logistics Section**	
Logistics Chief	
Deputy	
Supply Unit	
Facilities Unit	
Ground Support Unit	
Communications Unit	
Medical Unit	
Food Unit	

9. Operations Section		
Op's Chief		
Deputy		
a. **Branch I**		
Branch Director		
Deputy		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Staging Area		
b. **Branch II**		
Branch Director		
Deputy		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Staging Area		
c. **Branch III**		
Branch Director		
Deputy		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
d. **Air Operations Branch**		
Air Operations Branch Director		
Air Tactical Supervisor		
Air Support Supervisor		
Helicopter Coordinator		
Air Tanker Coordinator		
10. Finance/Administration Section		
Finance/Admin. Chief		
Deputy		
Time Unit		
Procurement Unit		
Compensation/Claims Unit		
Cost Unit		
Prepared by (Resource Unit Leader)		

ICS 203

DIVISION ASSIGNMENT LIST	1. Branch	2. Division/Group
3. Incident Name	4. Operational Period Date: Time:	

5. Operations Personnel			
Operations Chief		Division/Group Supervisor	
Branch Director		Air Attack Supervisor No.	

6. Resources Assigned this Period					
Strike Team/Task Force/ Resource Designator	Leader	Number Persons	Trans. Needed	Drop Off PT./Time	Pick Up PT./Time

7. Control Operations

8. Special Instructions

9. Division/Group Communication Summary							
Function	Frequency	System	Channel	Function	Frequency	System	Channel
Command		King NIFC		Logistics		King NIFC	
Tactical Div/Group		King NIFC		Air to Ground		King NIFC	

Prepared by (Resource Unit Leader)	Approved by (Planning Section Chief)	Date	Time

ICS 204

NFES 1328

INCIDENT RADIO COMMUNICATIONS PLAN	1. Incident Name	2. Date/Time Prepared	3. Operational Period Date/Time

4. Basic Radio Channel Utilization

Radio Type/Cache	Channel	Function	Frequency/Tone	Assignment	Remarks
King NIFC					
King NIFC					
King NIFC					
King NIFC					
King NIFC					
King NIFC					
King NIFC					
King NIFC					

5. Prepared by (Communications Unit)

ICS 205

NFES 1330

MEDICAL PLAN	1. Incident Name	2. Date Prepared	3. Time Prepared	4. Operational Period

5. Incident Medical Aid Station

Medical Aid Stations	Location	Paramedics Yes	Paramedics No

6. Transportation

A. Ambulance Services

Name	Address	Phone	Paramedics Yes	Paramedics No

B. Incident Ambulances

Name	Location	Paramedics Yes	Paramedics No

7. Hospitals

Name	Address	Travel Time Air	Travel Time Ground	Phone	Helipad Yes	Helipad No	Burn Center Yes	Burn Center No

8. Medical Emergency Procedures

Prepared by (Medical Unit Leader)	10. Reviewed by (Safety Officer)

ICS 206

OPERATIONAL PLANNING WORKSHEET

1. INCIDENT NAME	2. DATE PREPARED	TIME PREPARED	3. OPERATIONAL PERIOD (DATE/TIME)

4. DIVISION OR OTHER LOCATION	5. WORK ASSIGNMENTS	6. RESOURCES BY TYPE (SHOW STRIKE TEAM AS ST)		7. REPORTING LOCATION	8. REQUESTED ARRIVAL TIME
		RESOURCE			
		TYPE			
		REQ			
		HAVE			
		NEED			
		REQ			
		HAVE			
		NEED			
		REQ			
		HAVE			
		NEED			
		REQ			
		HAVE			
		NEED			
		REQ			
		HAVE			
		NEED			
		REQ			
		HAVE			
		NEED			
		REQ			
		HAVE			
		NEED			
		REQ			
		HAVE			
		NEED			
215 ICS 9-66	9. TOTAL RESOURCES REQUIRED	SINGLE RESOURCES / STRIKE TEAMS		10. PREPARED BY (NAME AND POSITION)	
	TOTAL RESOURCES ON HAND				
	TOTAL RESOURCES NEEDED				

NFES 1338

Activity 11.2

Developing an Incident Action Plan

Purpose

To develop an IAP, based on information gathered in the Transportation Simulation.

Directions

Your instructors will guide you in this Activity.

Incident Scenario

Earlier today a Great Atlantic and Pacific freight train derailed just north of 18th Street on M Street in Central City. Several railroad cars have blocked north-south traffic on M Street between 18th and 19th Streets. This train carried various hazardous materials. Flammable liquids have been burning from ruptured drums in a boxcar, liquid sulfur is leaking, an LPG tank car is exposed and has vented several times, occupants in a nearby factory have been taken ill, and a toxic plume is moving east into a residential area.

This incident is as you left it at the last simulation. You were directed to save all paperwork, worksheets, and charts to allow for the planning process to take place.

Central City's IMT was in a training session at FS4 when this incident occurred. The fire chief has contacted the IMT and directed them to take management of this incident and prepare an IAP. The IMT will need to decide what time it will "take control" of the incident. Based on the number of students the members of the city IMT will be the:

- fire chief;
- police chief;
- public works director (includes roads, water, and sewer);
- Coast Guard/EPA/DNR;
- schools: and
- health department director

New IMT positions have been appointed.

Should it be necessary to evacuate any part of the community the following shelters will be opened:

- U.S. Grant High School--"I" Street and 11th Street--west side of Central City. Capacity--1,200; and
- Central City Junior High School--"AA" Street and 19th Street--east side of Central City. Capacity--1,000.

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INCIDENT OBJECTIVES	1. Incident Name	2. Date	3. Time
4. Operational Period			
5. General Control Objectives for the Incident (include alternatives)			
6. Weather Forecast for Period			
7. General Safety Message			
8. Attachments (mark if attached)			
☐ Organization List - ICS 203	☐ Medical Plan - ICS 206	☐ (0ther)	
☐ Div. Assignment Lists - ICS 204	☐ Incident Map	☐	
☐ Communications Plan - ICS 205	☐ Traffic Plan	☐	
9. Prepared by (Planning Section Chief)	10. Approved by (Incident Commander)		

ICS 202

ORGANIZATION ASSIGNMENT LIST	
1. Incident Name	
2. Date	**3. Time**
4. Operational Period	
Position	**Name**
5. **Incident Commander and Command Staff**	
Incident Commander	
Deputy	
Safety Officer	
Information Officer	
Liaison Officer	
6. **Agency Representative**	
Agency	Name
7. **Planning/Intelligence Section**	
Plans/Intel Chief	
Deputy	
Resources Unit	
Situation Unit	
Documentation Unit	
Demobilization Unit	
Technical Specialists	
Human Resources	
Training	
GIS	
8. **Logistics Section**	
Logistics Chief	
Deputy	
Supply Unit	
Facilities Unit	
Ground Support Unit	
Communications Unit	
Medical Unit	
Food Unit	

9. Operations Section		
Op's Chief		
Deputy		
a. **Branch I**		
Branch Director		
Deputy		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Staging Area		
b. **Branch II**		
Branch Director		
Deputy		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Staging Area		
c. **Branch III**		
Branch Director		
Deputy		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
d. **Air Operations Branch**		
Air Operations Branch Director		
Air Tactical Supervisor		
Air Support Supervisor		
Helicopter Coordinator		
Air Tanker Coordinator		
10. Finance/Administration Section		
Finance/Admin. Chief		
Deputy		
Time Unit		
Procurement Unit		
Compensation/Claims Unit		
Cost Unit		
Prepared by (Resource Unit Leader)		

ICS 203

DIVISION ASSIGNMENT LIST	1. Branch	2. Division/Group
3. Incident Name	4. Operational Period Date: Time:	

5. Operations Personnel			
Operations Chief		Division/Group Supervisor	
Branch Director		Air Attack Supervisor No.	

6. Resources Assigned this Period

Strike Team/Task Force/ Resource Designator	Leader	Number Persons	Trans. Needed	Drop Off PT./Time	Pick Up PT./Time

7. Control Operations

8. Special Instructions

9. Division/Group Communication Summary

Function	Frequency	System	Channel	Function	Frequency	System	Channel
Command		King NIFC		Logistics		King NIFC	
Tactical Div/Group		King NIFC		Air to Ground		King NIFC	

Prepared by (Resource Unit Leader)	Approved by (Planning Section Chief)	Date	Time

ICS 204 NFES 1328

INCIDENT RADIO COMMUNICATIONS PLAN	1. Incident Name	2. Date/Time Prepared	3. Operational Period Date/Time

4. Basic Radio Channel Utilization

Radio Type/Cache	Channel	Function	Frequency/Tone	Assignment	Remarks
King NIFC					
King NIFC					
King NIFC					
King NIFC					
King NIFC					
King NIFC					
King NIFC					
King NIFC					

5. Prepared by (Communications Unit)

ICS 205

NFES 1330

MEDICAL PLAN	1. Incident Name	2. Date Prepared	3. Time Prepared	4. Operational Period

5. Incident Medical Aid Station

Medical Aid Stations	Location	Paramedics Yes	No

6. Transportation

A. Ambulance Services

Name	Address	Phone	Paramedics Yes	No

B. Incident Ambulances

Name	Location	Paramedics Yes	No

7. Hospitals

Name	Address	Travel Time Air	Ground	Phone	Helipad Yes	No	Burn Center Yes	No

8. Medical Emergency Procedures

Prepared by (Medical Unit Leader)	10. Reviewed by (Safety Officer)

ICS 206

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SITE SAFETY AND CONTROL PLAN ICS 208	1. Incident Name:	2. Date Prepared:	3. Operational Period: Time:

Section I. Site Information

4. Incident Location:

Section II. Organization

5. Incident Commander:	6. HM Group Supervisor:	7. Tech. Specialist - HM Reference:
8. Safety Officer:	9. Entry Leader:	10. Site Access Control Leader:
11. Asst. Safety Officer - HM:	12. Decontamination Leader:	13. Safe Refuge Area Mgr:
14. Environmental Health:	15.	16.

17. Entry Team: (Buddy System) Name:	PPE Level	18. Decontamination Element: Name:	PPE Level
Entry 1		Decon 1	
Entry 2		Decon 2	
Entry 3		Decon 3	
Entry 4		Decon 4	

Section III. Hazard/Risk Analysis

19. Material:	Container type	Qty.	Phys. State	pH	IDLH	F.P.	I.T.	V.P.	V.D.	S.G.	LEL	UEL

Comment:

Section IV. Hazard Monitoring

20. LEL Instrument(s):	21. O_2 Instrument(s):
22. Toxicity/PPM Instrument(s):	23. Radiological Instrument(s):

Comment:

Section V. Decontamination Procedures

24. Standard Decontamination Procedures:	YES:	NO:

Comment:

Section VI. Site Communications

25. Command Frequency:	26. Tactical Frequency:	27. Entry Frequency:

Section VII. Medical Assistance

28. Medical Monitoring:	YES:	NO:	29. Medical Treatment and Transport In-place:	YES:	NO:

Comment:

ICS 208 Page 1 of 3 3/98

Section VIII. Site Map
30. Site Map:
Weather ❑ Command Post ❑ Zones ❑ Assembly Areas ❑ Escape Routes ❑ Other ❑

Section IX. Entry Objectives
31. Entry Objectives:

Section X. SOP'S and Safe Work Practices		
32. Modifications to Documented SOP's or Work Practices:	YES:	NO:
Comment:		

Section XI. Emergency Procedures
33. Emergency Procedures:

Section XII. Safety Briefing	
34. Asst. Safety Officer - HM Signature:	Safety Briefing Completed (Time):
35. HM Group Supervisor Signature:	36. Incident Commander Signature:
ICS 208 Page 2 of 3	3/98

INSTRUCTIONS FOR COMPLETING THE SITE SAFETY AND CONTROL PLAN ICS 208

A Site Safety and Control Plan must be completed by the Hazardous Materials Group Supervisor and reviewed by within the Hazardous Materials Group prior to operations commencing within the Exclusion Zone.

Item Number	Item Title	Instructions
1.	Incident Name/Number	Print name and/or incident number.
2.	Date and Time	Enter date and time prepared.
3.	Operational Period	Enter the time interval for which the form applies.
4.	Incident Location	Enter the address and or map coordinates of the incident.
5 - 16.	Organization	Enter names of all individuals assigned to ICS positions. (Entries 5 & 8 mandatory). Use Boxes 15 and 16 for other functions: i.e. Medical Monitoring.
17 - 18.	Entry Team/Decon Element	Enter names and level of PPE of Entry & Decon personnel. (Entries 1 - 4 mandatory buddy system and backup.)
19.	Material	Enter names and pertinent information of all known chemical products. Enter "UNK" if material is not known. Include any that apply to chemical properties. (Definitions: ph = Potential for Hydrogen (Corrosivity), IDLH = Immediately Dangerous to Life and Health, F.P. = Flash Point, I.T. = Ignition Temperature, V.P. = Vapor Pressure, V.D. = Vapor Density, S.G. = Specific Gravity, LEL = Lower Explosive Limit, UEL = Upper Explosive Limit)
20 - 23.	Hazard Monitoring	List the instruments that will be used to monitor for chemical.
24.	Decontamination Procedures	Check "NO" if modifications are made to standard decontamination procedures and make appropriate Comments including type of solutions.
25 - 27.	Site Communications	Enter the radio frequency(ies) that apply.
28 - 29.	Medical Assistance	Enter comments if "NO" is checked.
30.	Site Map	Sketch or attach a site map that defines all locations and layouts of operational zones. (Check boxes are mandatory to be identified.)
31.	Entry Objectives	List all objectives to be performed by the Entry Team in the Exclusion Zone and any parameters that will alter or stop entry operations.
32 - 33.	SOP's, Safe Work Practices, and Emergency Procedures	List in Comments if any modifications to SOP's and any emergency procedures that will be affected if an emergency occurs while personnel are within the Exclusion Zone.
34 - 36.	Safety Briefing	Have the appropriate individual place their signature in the box once the Site Safety and Control Plan is reviewed. Note the time in box 34 when the safety briefing has been completed.

OPERATIONAL PLANNING WORKSHEET	1. Incident Name	2. Date Prepared Time Prepared	3. Operational Period (Date/Time)

4. Division/Group or Other Location	5. Work Assignments		Resource by Type (Show Strike Team as ST)																6. Reporting Location	7. Requested Arrival Time
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
		Req																		
		Have																		
		Need																		
		Req																		
		Have																		
		Need																		
		Req																		
		Have																		
		Need																		
9. Total Resources - Single		Req																		
		Have																		
		Need																		
Total Resources - Strike Teams		Req																	Prepared by (Name and Position)	
		Have																		
		Need																		

INCIDENT ACTION PLAN SAFETY ANALYSIS

1. Incident Name | 2. Date | 3. Time

LCES* Analysis of Tactical Applications Lookouts Communications Escape routes Safety zones												Other Risk Analysis						
Divison/Group	Indirect Fireline	Downhill Fireline	Underslung Fireline	Mid-slope Fireline	Frontal Assault	Anchor Points	Extreme Conditions (Spotting, Wind-driven)	Reburn Potential			LCES Mitigations	Hazard Materials	Transportation, 1 Hr +	Communications	Structure Protection			Other Risk Mitigations

Prepared by (Name and Position)

ICS 215A

3/2007

ICS 223 **TENTATIVE RELEASE LIST** 9/86

1. Function ______________________________

2. The following resources are surplus to my needs as of __________ hours on ______________.
At that time, these resources are available for release processing.

3.

	Name of Individual /Crew or Equipment	Position on Incident
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		

4. ______________________ ______________ ______________
Signature of Section Chief Date Time

TENTATIVE RELEASE LIST (ICS FORM 223)

a. PURPOSE: The Tentative Release List provides the Planning function a list of those resources that are available for release from an incident.

b. INITIATION OF LIST: The Tentative Release List is initiated by the unit leader, managers, etc., and approved by section chiefs.

c. DISTRIBUTION: The approved (by section chief) Tentative Release List is sent to the Planning function.

INSTRUCTIONS FOR COMPLETING THE TENTATIVE RELEASE LIST

ITEM 1: Enter the function; such as Logistics, Air Operations, etc.

ITEM 2: Enter the time prepared (24-hour clock) and date (day, month, year)

ITEM 3: Enter identifiers of resources being released, name, strike/team member, crew names, etc., and Resources Ordered/Request Number and positions filling on the incident.

ITEM 4: The Tentative Release List must be approved (signature) by the section chief. Enter date (day, month, year) and time (24-hour clock).

COMPENSATION FOR INJURY LOG
(See reverse side for instructions)

1. Incident ______________ 2. Date ______________ 3. Operational Period ______________

4. Date	5. Time	6. Name	7. Agency	8. Nature of Injury	9. Agency Reps Advised	10. Medical Unit Advised	11. Investi-gation Started	12. Injury Report Initiated	13. Injury Report Completed	14. Status

ICS Form 226 12/88

INSTRUCTIONS FOR COMPLETING THE COMPENSATION FOR INJURY LOG (ICS FORM 226)

ITEM NUMBER	ITEM TITLE	INSTRUCTIONS
1.	Incident	Enter incident name and/or number.
2.	Date	Enter date of beginning of operational period.
3.	Operational Period	Enter the operational period this log covers.
4.	Date	Enter date of notification of injury.
5.	Time	Enter 24-hour time of notification of injury.
6.	Name	Enter name of individual injured-separate entries should be made for each individual injured.
7.	Agency	Employee's agency.
8.	Nature of Injury	Enter nature of injury as first described.
9.	Agency Reps Advised	Initial when Agency Rep from employing agency is advised.
10.	Medical Unit Advised	Initial when Medical Unit is advised.
11.	Investigation Started	Initial when an investigation has been initiated.
12.	Injury Report Initiated	Initial when it is confirmed that an injury report has been started.
13.	Injury Report Completed	Initial when/if you receive a completed injury report copy.
14.	Status	Report status of log entry at completion of operational period (e.g., pending, dropped, completed, etc.).

CLAIMS LOG
(See reverse side for instructions)

1. Incident ______________ 2. Date __________ 3. Operational Period ______________

4. Time	5. Claim	6. Property Owner	7. Location on Incident	8. Claims Form Initiated	9. Agency Reps Advised	10. Property Owner Contacted	11. Investi-gation Started	12. Claims Form Completed	13. Status

ICS Form 227 12/88

INSTRUCTIONS FOR COMPLETING THE CLAIMS LOG (ICS FORM 227)

ITEM NUMBER	ITEM TITLE	INSTRUCTIONS
1.	Incident	Enter incident name and/or number.
2.	Date	Enter date operational period begins.
3.	Operational Period	Enter the operational period this log covers.
4.	Time	Enter military time of notification of accident and/or injury.
5.	Claim	Enter nature of claim (e.g., damaged fence, dislocated shoulder, etc.)
6.	Property Owner	Enter property owners name if property is involved.
7.	Location on Incident	Enter general location in order to assist with follow-up.
8.	Claims Form Initiated	Initial when claims form is initiated.
9.	Agency Reps Advised	Initial when Agency Rep from employing agency is advised.
10.	Property Owner Contacted	Initial when property owner has been contacted.
11.	Investigation Started	Initial if an investigation is started.
12.	Claims Form Completed	Initial when claims form is completed.
13.	Status	Report status of log entry at completion of operational period (e.g., pending, dropped, completed, etc.).

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APPENDIX A

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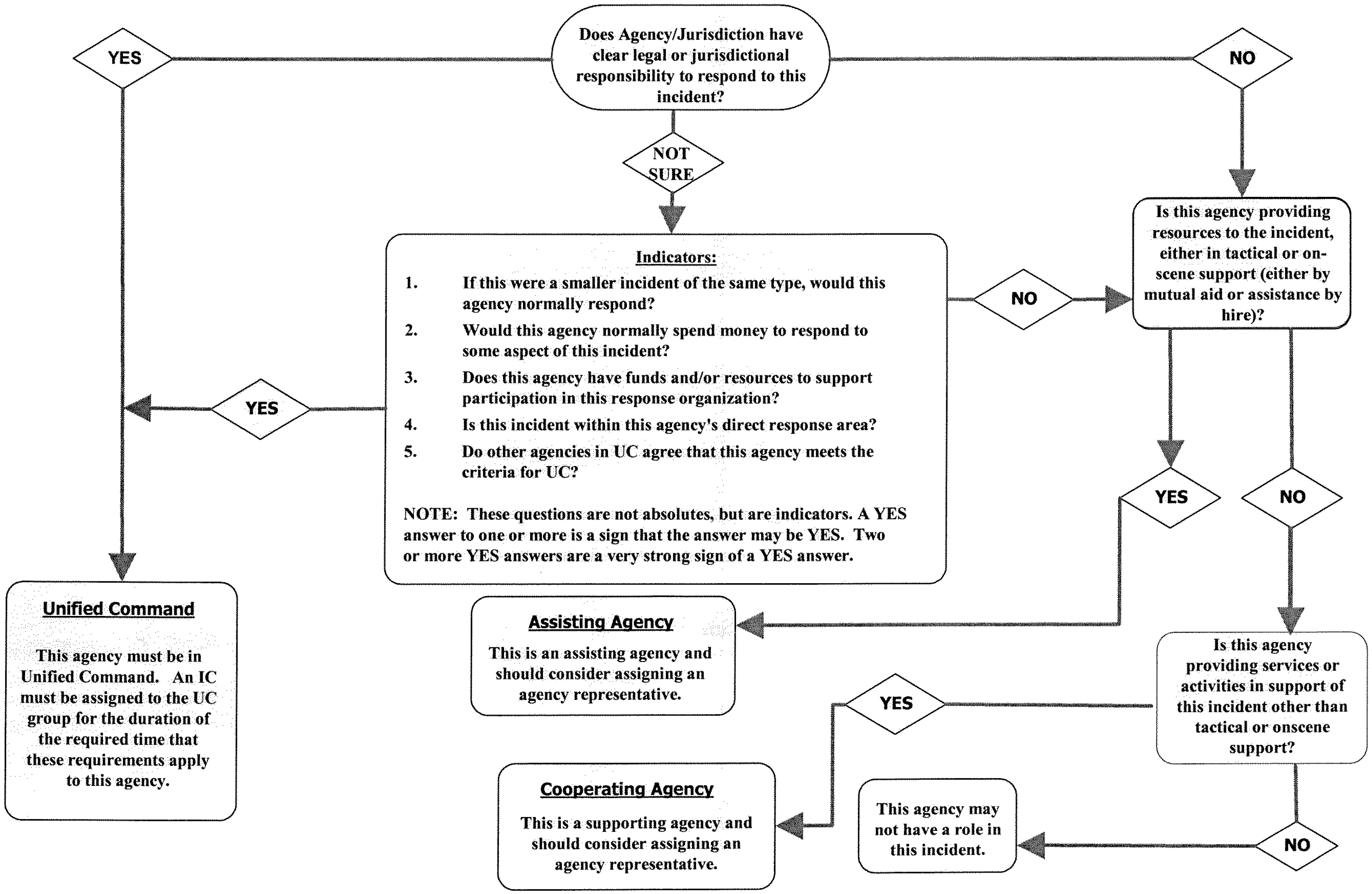
Determining Agency Fit on an Incident



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APPENDIX B

CENTRAL CITY MAP

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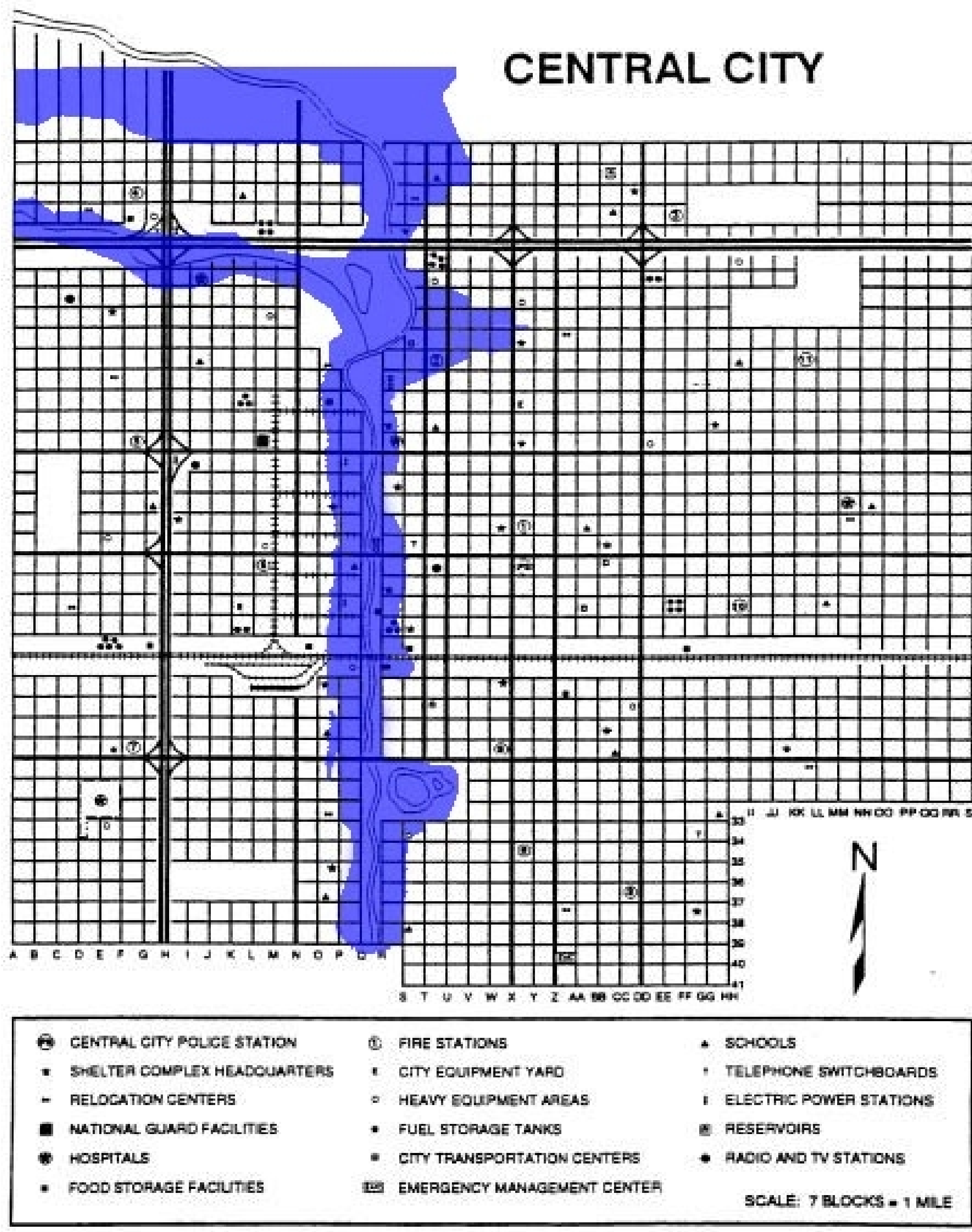
CENTRAL CITY
N
CENTRAL CITY POLICE STATION
SHELTER COMPLEX HEADQUARTERS
RELOCATION CENTERS
NATIONAL GUARD FACILITIES
HOSPITALS
FOOD STORAGE FACILITIES
FIRE STATIONS
CITY EQUIPMENT YARD
HEAVY EQUIPMENT AREAS
FUEL STORAGE TANKS
CITY TRANSPORTATION CENTERS
EMERGENCY MANAGEMENT CENTER
SCHOOLS
TELEPHONE SWITCHBOARDS
ELECTRIC POWER STATIONS
RESERVOIRS
RADIO AND TV STATIONS
SCALE: 7 BLOCKS = 1 MILE

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APPENDIX C

MATERIAL SAFETY DATA SHEETS

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<table>
<tr><th colspan="4">International Chemical Safety Cards</th></tr>
<tr><th colspan="3">SULFUR</th><th>ICSC: 1166</th></tr>
<tr><td colspan="4">Flowers of sulfur
Flour sulfur
Brimstone
S or S_8
ICSC 1166
CAS 7704-34-9
RTEC SWS4250000
UN 1350</td></tr>
<tr><th>TYPES OF HAZARD/ EXPOSURE</th><th>ACUTE HAZARDS/ SYMPTOMS</th><th>PREVENTION</th><th>FIRST AID/ FIRE FIGHTING</th></tr>
<tr><td>FIRE</td><td>Combustible.</td><td>NO open flames, NO sparks, and NO smoking.</td><td>Water spray. Foam. Powder. Dry sand.</td></tr>
<tr><td>EXPLOSION</td><td>Finely dispersed particles form explosive mixtures in air.</td><td>Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding).</td><td>In case of fire: keep drums, etc., cool by spraying with water.</td></tr>
<tr><td>EXPOSURE</td><td></td><td>PREVENT DISPERSION OF DUST!</td><td></td></tr>
<tr><td>INHALATION</td><td>Burning sensation. Cough. Sore throat.</td><td>Local exhaust or breathing protection.</td><td>Fresh air, rest. Half-upright position. Refer for medical attention.</td></tr>
<tr><td>SKIN</td><td>Redness.</td><td>Protective gloves.</td><td>Remove contaminated clothes. Rinse skin with plenty of water or shower.</td></tr>
<tr><td>EYES</td><td>Redness. Pain. Blurred vision.</td><td>Safety goggles.</td><td>First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.</td></tr>
<tr><td>INGESTION</td><td>Burning sensation. Diarrhea.</td><td>Do not eat, drink, or smoke during work.</td><td>Rinse mouth. Refer for medical attention.</td></tr>
</table>

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. (Extra personal protection: P2 filter respirator for harmful particles).	Fireproof. Separated from strong oxidants.	R: S: UN Hazard Class: 4.1 UN Packing Group: III

<table>
<tr><td rowspan="1">I M P O R T A N T D A T A</td><td>PHYSICAL STATE; APPEARANCE:
YELLOW SOLID IN VARIOUS FORMS

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

CHEMICAL DANGERS:
On combustion, forms toxic and corrosive gases of sulfur oxides including sulfur dioxide (see ICSC 0074). Reacts violently with strong oxidants causing fire and explosion hazard, especially if powdered.

OCCUPATIONAL EXPOSURE LIMITS:
TLV not established.</td><td>ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and by ingestion.

INHALATION RISK:
Evaporation at 20 °C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes, the skin and the respiratory tract. Inhalation of powder of this substance may cause inflammation of the nose and the respiratory tract.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the respiratory tract , resulting in chronic bronchitis.</td></tr>
<tr><td>PHYSICAL PROPERTIES</td><td>Boiling point: 445 °C
Melting point: (r-sulfur) 107 °C
Melting point: (beta-sulfur) 115 °C
Melting point: (amorphous) 120 °C
Density: 2.1
g/cm^3</td><td>Solubility in water:
none
Flash point:
160 °C c.c.
Auto-ignition temperature: 232 °C
Explosive limits, vol% in air: 35-1400
g/m^3</td></tr>
<tr><td>ENVIRONMENTAL DATA</td><td colspan="2"></td></tr>
<tr><td colspan="3">NOTES</td></tr>
<tr><td colspan="3">Often transported in molten state (UN 2448; TEC(R)-115). Molten sulfur reacts with hydrocarbons to form toxic and flammable gases. Depending on the degree of exposure, periodic medical examination is indicated.

Transport Emergency Card: TEC (R)-115A
NFPA Code: H 1; F 1; R 0</td></tr>
</table>

International Chemical Safety Cards

HEXANE	ICSC: 0279

Hexyl hydride
C_6H_{14}
Molecular mass: 86.2

ICSC # 0279
CAS # 110-54-3
RTECS # MN9275000
UN # 1208
EC # 601-037-00-0

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapor/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking hand tools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
INHALATION	Dizziness. Drowsiness. Dullness. Headache. Nausea. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
SKIN	Dry skin. Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
EYES	Redness. Pain.	Safety goggles, face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
INGESTION	Abdominal pain (further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELING
Consult an expert! Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapors).	Fireproof. Separated from strong oxidants. Well closed.	F symbol Xn symbol N symbol R: 11-38-48/20-51/53-62-65-67 S: 2-9-16-29-33-36/37-61-62 UN Hazard Class: 3 UN Packing Group: II

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** VOLATILE COLORLESS LIQUID , WITH CHARACTERISTIC ODOR. **PHYSICAL DANGERS:** The vapor is heavier than air and may travel along the ground; distant ignition possible. **CHEMICAL DANGERS:** Reacts with strong oxidants causing fire and explosion hazard. Attacks some plastics, rubber and coatings. **OCCUPATIONAL EXPOSURE LIMITS:** TLV (as TWA): 50 ppm; 176 mg/m3 skin (ACGIH 1999). OSHA PEL: TWA 500 ppm (1800 mg/m3) NIOSH REL: TWA 50 ppm (180 mg/m3) NIOSH IDLH: 1100 ppm LEL	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapor and by ingestion. **INHALATION RISK:** A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the skin. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. Exposure at high levels could cause lowering of consciousness. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system peripheral nervous system, resulting in polyneuropathy. Animal tests show that this substance possibly causes toxic effects upon human reproduction.
PHYSICAL PROPERTIES	Boiling point: 69 °C Melting point: -95 °C Relative density (water = 1): 0.7 Solubility in water, g/100 ml at 20 °C: 0.0013 Vapor pressure, kPa at 20 °C: 17 Relative vapor density (air = 1): 3.0	Relative density of the vapor/air-mixture at 20 °C (air = 1): 1.3 Flash point: -22 °C c.c. Auto-ignition temperature: 225 °C Explosive limits, vol % in air: 1.1-7.5 Octanol/water partition coefficient as log Pow: 3.9
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms.	

International Chemical Safety Cards			
PROPANE			ICSC: 0319
C3H8 / CH3-CH2-CH3 Molecular mass: 44.1 (cylinder) ICSC # 0319 CAS # 74-98-6 RTECS # TX2275000 UN # 1978			
TYPES OF HAZARD/ EXPOSURE	**ACUTE HAZARDS/ SYMPTOMS**	**PREVENTION**	**FIRST AID/ FIRE FIGHTING**
FIRE	Extremely flammable.	NO open flames, NO sparks, and NO smoking.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out; in other cases extinguish with water spray.
EXPLOSION	Gas/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding) if in liquid state. Use non-sparking hand tools.	In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.
EXPOSURE			
INHALATION	Simple asphyxiant.	Ventilation.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
SKIN	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.
EYES	ON CONTACT WITH LIQUID: FROSTBITE.	Face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
INGESTION			

SPILLAGE DISPOSAL	STORAGE	PACKING & LABELING
Evacuate danger area! Consult an expert! Ventilation. NEVER direct water jet on liquid (extra personal protection: chemical suit with self-contained breathing apparatus).	Fireproof. Cool.	F+ symbol R: 12 S: 2-9-16 UN Hazard Class: 2.1

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** ODORLESS, COLORLESS COMPRESSED LIQUEFIED GAS. **PHYSICAL DANGERS:** The gas is heavier than air and may travel along the ground; distant ignition possible, and may accumulate in low ceiling spaces causing deficiency of oxygen. As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** **OCCUPATIONAL EXPOSURE LIMITS:** TLV (as): ppm; mg/m3 simple asphyxiant (ACGIH 1995-1996). MAK: 1000 ppm; 1800 mg/m3; IV (1993). OSHA PEL: TWA 1000 ppm (1800 mg/m3) NIOSH REL: TWA 1000 ppm (1800 mg/m3) NIOSH IDLH: 2100 ppm LEL	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation. **INHALATION RISK:** On loss of containment this liquid evaporates very quickly causing supersaturation of the air with serious risk of suffocation when in confined areas. **EFFECTS OF SHORT-TERM EXPOSURE:** Rapid evaporation of the liquid may cause frostbite. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: -42 °C Melting point: -189 °C Solubility in water, ml/100 ml at 18 °C: 6.5 Relative vapor density (air = 1): 1.6	Flash point: Flammable Gas Auto-ignition temperature: 450 °C Explosive limits, vol % in air: 2.1-9.5
NOTES		
High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death. Check oxygen content before entering area. Turn leaking cylinder with the leak up to prevent escape of gas in liquid state. Transport Emergency Card: TEC (R)-27A NFPA Code: H1; F4; R0		

International Chemical Safety Cards	
SULPHUR DIOXIDE	**ICSC# 0074**

Sulfur oxide
Sulfurous oxide
Sulfurous anhydride
SO2
Molecular mass: 64.1
(cylinder)

ICSC # 0074
CAS # 7446-09-5
RTECS # WS4550000
UN # 1079
EC # 016-011-00-9

TYPES OF HAZARD	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Heating will cause rise in pressure with risk of bursting.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			In case of fire: cool cylinder by spraying with water but avoid contact of the substance with water. Combat fire from a sheltered position.
EXPOSURE		STRICT HYGIENE!	IN ALL CASES CONSULT A DOCTOR!
INHALATION	Cough. Shortness of breath. Sore throat. Symptoms may be delayed (See Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration if indicated. Refer for medical attention. See Notes.
SKIN	ON CONTACT WITH LIQUID:FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.
EYES	Redness. Pain. Sever deep burns.	Safety goggles, face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor
INGESTION			

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELING
Evacuate danger area! Consult an expert! Ventilation. NEVER direct water jet on liquid (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Fireproof if in building. Provision to contain effluent from fire extinguishing. Separated from incompatible substances (see Chemical Dangers), food and feedstuffs. Cool. Dry.	Do not transport with food and feedstuffs. T symbol R: 23-36/37 S: 1/2-9-26-36/37/39-45 UN Hazard Class: 2.3 UN Subsidiary Risks: 8

	PHYSICAL STATE; APPEARANCE COLORLESS GAS OR COMPRESSED LIQUEFIED GAS , WITH PUNGENT ODOR.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation.
IMPORTANT DATA	**PHYSICAL DANGERS** The gas is heavier than air. **CHEMICAL DANGERS:** The solution in water is a medium strong acid. Reacts violently with ammonia, acrolein, acetylene, alkali metals, chlorine, ethylene oxide, amines, butadiene. Reacts with water or steam causing corrosion hazard. Attacks many metals including aluminum, iron, steel, brass, copper and nickel in presence of water. Incompatible with halogens. Attacks plastics, rubber and coatings in liquid form. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 2 ppm; 5.2 mg/m3 (as TWA); 5 ppm; 13 mg/m3 (STEL) (ACGIH 1992-1993). MAK: 2 ppm; 5 mg/m3 (1993). OSHA PEL: TWA 5 ppm (13 mg/m3) NIOSH REL: TWA 2 ppm (5 mg/m3) ST 5 ppm (13 mg/m3)	**INHALATION RISK:** A harmful concentration of this gas in the air will be reached very quickly on loss of containment. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates strongly the eyes and the respiratory tract. Inhalation of the gas may cause lung edema (see Notes). Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the respiratory tract , resulting in asthma-like reactions, reflex spasm of the larynx and respiratory arrest. Exposure may result in death. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged inhalation exposure may cause asthma.
PHYSICAL PROPERTIES	Boiling point: -10 °C Melting point: -75.5 °C Relative density (water = 1): 1.4 at -10 °C (liquid)	Solubility in water, ml/100 ml at 25 °C: 8.5 Vapor pressure, kPa at 20 °C: 330 Relative vapor density (air = 1): 2.25
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air, water and plants	
NOTES		
Depending on the degree of exposure periodic medical examination is indicated. The symptoms of lung edema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Immediate administration of an appropriate spray by a doctor or a person authorized by him/her should be considered. Do NOT spray water on leaking cylinder (to prevent corrosion of cylinder). Turn leaking cylinder with the leak up to prevent escape of gas in liquid state. Transport Emergency Card; TEC ® -15		

APPENDIX D

QUICK ACCESS PREFIRE PLAN

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Quick Access Prefire Plan

Building Address:

Building Description:

Roof Construction:

Floor Construction:

Occupancy Type:	**Initial Resources Required:**

Hazards to Personnel:

Location of Water Supply:	**Available Flow:**

	Estimated Fire Flow			
Level of Involvement				*100%*
Estimated Fire Flow				

Fire Behavior Prediction:

Predicted Strategies:

Problems Anticipated:

❑ **Standpipe:**	❑ **Sprinklers:**	❑ **Fire Detection:**

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APPENDIX E

INCIDENT COMMAND SYSTEM FORMS AND DIRECTIONS

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INCIDENT COMMAND SYSTEM FORMS

Forms and records which are routinely used in the ICS are listed below. Those marked with an (*) are commonly used in written Incident Action Plans.

Incident Briefing	ICS Form 201
*Incident Objectives	ICS Form 202
*Organization Assignment List	ICS Form 203
*Division Assignment List	ICS Form 204
*Incident Radio Communications Plan	ICS Form 205
*Medical Plan	ICS Form 206
Incident Organization Chart	ICS Form 207
Incident Status Summary	ICS Form 209
Status Change Card	ICS Form 210
Check-In List	ICS Form 211
General Message	ICS Form 213
Unit Log	ICS Form 214
Operational Planning Worksheet	ICS Form 215
Radio Requirements Worksheet	ICS Form 216
Radio Frequency Assignment Worksheet	ICS Form 217
Support Vehicle Inventory	ICS Form 218
Resource Status Card (1-8)	ICS Form 219
Air Operations Summary Worksheet	ICS Form 220

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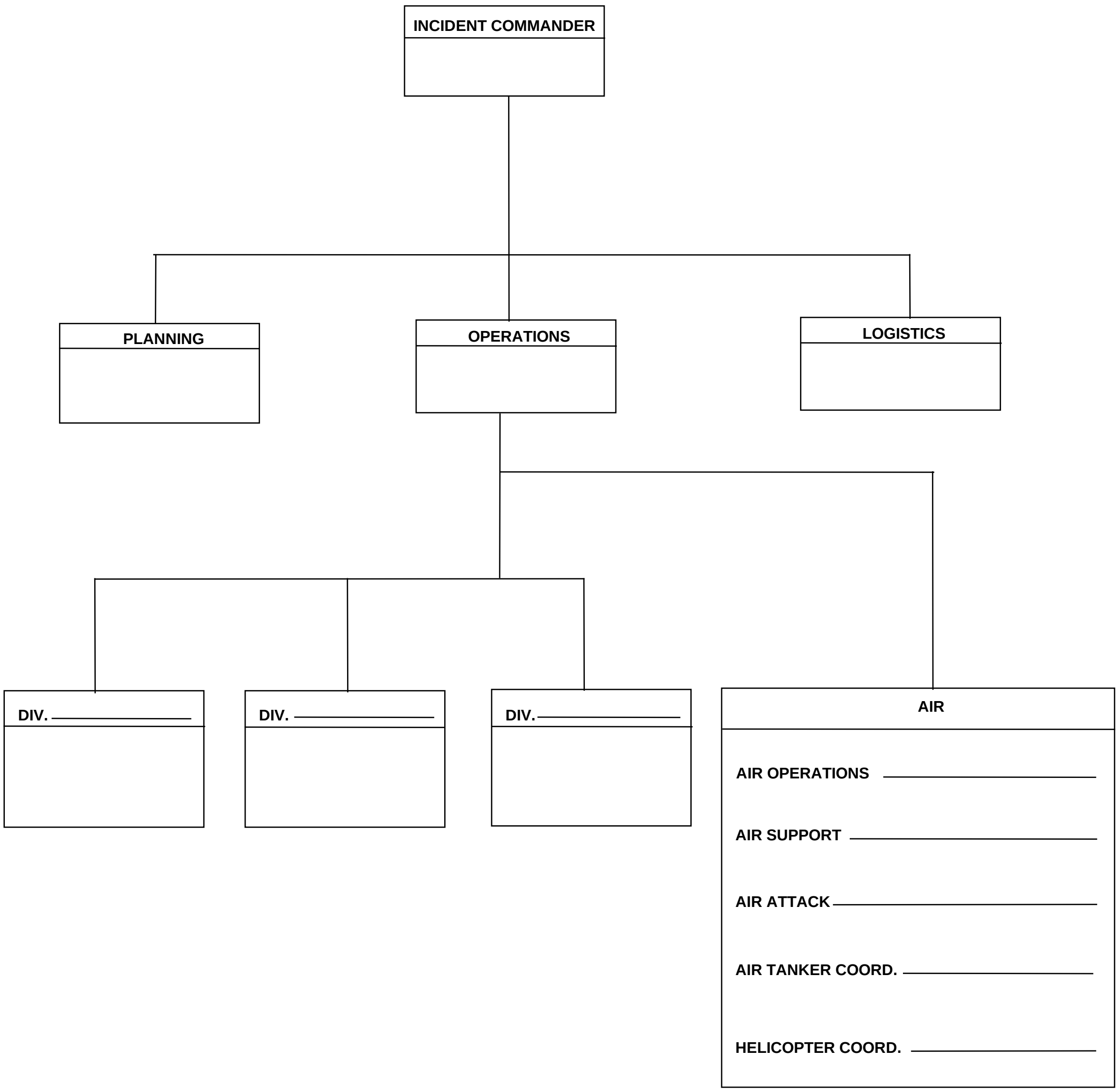
INCIDENT BRIEFING	1. INCIDENT NAME	*2. DATE PREPARED*	3. TIME PREPARED
4. MAP SKETCH			
201 ICS 3-82	PAGE 1	8. PREPARED BY (NAME AND POSITION) 7540-130-0282	

7. SUMMARY OF CURRENT ACTIONS			
201	ICS 3-82	Page 2	

6. CURRENT ORGANIZATION



201	**ICS 3-82**	**PAGE 3**

5. RESOURCES SUMMARY				
RESOURCES ORDERED	RESOURCE IDENTIFICATION	ETA	ON SCENE √	LOCATION/ASSIGNMENT
201	ICS 3-82	PAGE 4		

INSTRUCTIONS FOR COMPLETING THE INCIDENT OBJECTIVES (ICS FORM 202)

ITEM NUMBER	ITEM TITLE	INSTRUCTIONS
		Note: ICS Form 202, Incident Objectives, serves only as a cover sheet and is not considered complete until attachments are included.
1.	**Incident Name**	Print the name assigned to the incident.
2.	**Date Prepared**	Enter the date prepared (month, day, year).
3.	**Time Prepared**	Enter time prepared (24-hour clock).
4.	**Operational Period**	Enter the time interval for which the form applies. Record the start time and end time and include date(s).
5.	**General Control Objectives (include alternatives)**	Enter short, clear, and concise statements of the objectives for managing the incident, including alternatives. The control objectives usually apply for the duration of the incident.
6.	**Weather Forecast for Operational Period**	Enter weather prediction information for the specified operational period.
7.	**General/Safety Message**	Enter information such as known safety hazards and specific precautions to be observed during this operational period. If available, a safety message should be referenced and attached.
8.	**Attachments**	The form is ready for distribution when appropriate attachments are completed and attached to the form.
9.	**Prepared By**	Enter the name and position of the person completing the form (usually the Planning Section Chief).
10.	**Approved By**	Enter the name and position of the person approving the form (usually the Incident Commander).

INCIDENT OBJECTIVES	1. INCIDENT NAME FLOOD	2. DATE PREPARED 5/09/03	3. TIME PREPARED 0600

4. OPERATIONAL PERIOD (DATE/TIME) MAY 9, 2003 1200-2400

5. GENERAL CONTROL OBJECTIVES FOR THE INCIDENT (INCLUDE ALTERNATIVES)

Provide for the safety of all response personnel throughout the incident
Remove all endangered occupants from flood area by 2300 hours
Rescue any trapped civilians by 1600 hours
Evacuate Columbia Vets Hospital by 1400 hours
Treat/Transport all injured to medical facility throughout operational period
Provide police security for evacuated areas throughout operational period
Sandbag appropriate areas by 2300 hours
Provide shelters for displaced persons throughout the incident

6. WEATHER FORECAST FOR OPERATIONAL PERIOD

Continued heavy rain for the next 48 hours

7. GENERAL SAFETY MESSAGE

All personnel working flood area to wear flotation devices

8. ATTACHMENTS (√ IF ATTACHED)

- [x] ORGANIZATION LIST (ICS 203)
- [x] ASSIGNMENT LIST (ICS 204)
- [x] COMMUNICATIONS PLAN (ICS 205)
- [x] MEDICAL PLAN (ICS 206)
- [x] INCIDENT MAP
- [ ] TRAFFIC PLAN
- [ ] __________
- [ ] __________
- [ ] __________

202 ICS 3-80	9. PREPARED BY (PLANNING SECTION CHIEF)	10. APPROVED BY (INCIDENT COMMANDER)

INCIDENT OBJECTIVES	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED
4. OPERATIONAL PERIOD (DATE/TIME)			
5. GENERAL CONTROL OBJECTIVES FOR THE INCIDENT (INCLUDE ALTERNATIVES)			
6. WEATHER FORECAST FOR OPERATIONAL PERIOD			
7. GENERAL SAFETY MESSAGE			

8. ATTACHMENTS (√ IF ATTACHED)

☐	ORGANIZATION LIST (ICS 203)	☐	MEDICAL PLAN (ICS 206)	☐	____________
☐	ASSIGNMENT LIST (ICS 204)	☐	INCIDENT MAP	☐	____________
☐	COMMUNICATIONS PLAN (ICS 205)	☐	TRAFFIC PLAN	☐	____________

202 ICS 3-80	9. PREPARED BY (PLANNING SECTION CHIEF)	10. APPROVED BY (INCIDENT COMMANDER)

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INSTRUCTIONS FOR COMPLETING THE ORGANIZATION ASSIGNMENT LIST (ICS FORM 203)

ITEM NUMBER	ITEM TITLE	INSTRUCTIONS
		An Organization Assignment List may be completed any time the number of personnel assigned to the incident increases or decreases or a change in assignment occurs.
1.	**Incident Name**	Print the name assigned to the incident.
2.	**Date Prepared**	Enter the date prepared (month, day, year).
3.	**Time Prepared**	Enter time prepared (24-hour clock).
	Operational Period	Enter the time interval for which the form applies. Record the start time and end time and include date(s).
4. thru 8.		Enter the names of personnel staffing each of the listed positions. Use at least first initial and last name. For units indicate Unit Leader and for Divisions/Group indicate Division/Group Supervisor. Use an additional page if more then three branches are activated.
9.	**Prepared By**	Enter the name and position of the person completing the form (usually the Planning Section Chief).

POSITION	NAME
5. INCIDENT COMMANDER AND STAFF	
INCIDENT COMMANDER	D/C E. Burns
DEPUTY	
SAFETY OFFICER	B/C J. Willis
PUBLIC INFORMATION OFFICER	Capt. T. Morris
LIAISON OFFICER	Capt. J. Jones

6. AGENCY REPRESENTATIVES

AGENCY	NAME
Police	Maj. D. Devilbiss
P.W.	T. Friedman
Health	M. Arthur
U.S.C.G.	Cdr. R. Smith

7. PLANNING SECTION

CHIEF	D/C B. Phelps
DEPUTY	
RESOURCES UNIT	Lt. P. Taylor
SITUATION UNIT	B/C N. Cannes
DOCUMENTATION UNIT	Lt. W. Parks
DEMOBILIZATION UNIT	
TECHNICAL SPECIALISTS	

8. LOGISTICS SECTION

CHIEF	D/C P. McLaughlin
DEPUTY	
a. SUPPORT BRANCH	
DIRECTOR	Capt. D. Tuel
SUPPLY UNIT	Lt. R. Stroebel
FACILITIES UNIT	Lt. R. Cookus
GROUND SUPPORT UNIT	Capt. T. Brown
b. SERVICE BRANCH	
DIRECTOR	Capt. B. Chandler
COMMUNICATIONS UNIT	Capt. B. Loud
MEDICAL UNIT	B/C G. Oldershaw
FOOD UNIT	Capt. L. Mooreland

4. OPERATIONAL PERIOD (DATE/TIME)

5/9/03 1200-2400

9. OPERATIONS SECTION

CHIEF		D/C G. Rogers
DEPUTY		
a. West BRANCH		
BRANCH DIRECTOR		B/C T. Baker
DEPUTY		
DIVISION/GROUP	A	Capt. L. Short
DIVISION/GROUP	Z	Capt. Q. Miler
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
b. East BRANCH		
BRANCH DIRECTOR		B/C S. Tiger
DEPUTY		
DIVISION/GROUP	B	Capt. R. Simons
DIVISION/GROUP	C	Capt. C. Parks
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
c. BRANCH III - DIVISION/GROUPS		
BRANCH DIRECTOR		
DEPUTY		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
d. AIR OPERATIONS BRANCH		
AIR OPERATIONS BR. DIR.		
AIR TACTICAL GROUP SUP.		
AIR SUPPORT GROUP SUP.		
HELICOPTER COORDINATOR		
AIR TANKER/FIXED-WING CRD.		

10. FINANCE SECTION

CHIEF	J. Boerger
DEPUTY	
TIME UNIT	T. Melvin
PROCUREMENT UNIT	M. Goodman
COMPENSATION/CLAIMS UNIT	L. Smith
COST UNIT	C. Woodward

9. PREPARED BY (RESOURCES UNIT)

Lt. P. Taylor

203 **ICS** 1/96

ORGANIZATION ASSIGNMENT LIST	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED

POSITION	NAME	4. OPERATIONAL PERIOD (DATE/TIME)	
5. INCIDENT COMMANDER AND STAFF			

INCIDENT COMMANDER		**9.** OPERATIONS SECTION		
DEPUTY		CHIEF		
SAFETY OFFICER		DEPUTY		
PUBLIC INFORMATION OFFICER		**a.** BRANCH I - DIVISION/GROUPS		
LIAISON OFFICER		BRANCH DIRECTOR		
6. AGENCY REPRESENTATIVES		DEPUTY		
AGENCY	**NAME**	DIVISION/GROUP		
		DIVISION/GROUP		
		DIVISION/GROUP		
		DIVISION/GROUP		
		DIVISION/GROUP		
		b. BRANCH II - DIVISION/GROUPS		
		BRANCH DIRECTOR		
7. PLANNING SECTION		DEPUTY		
CHIEF		DIVISION/GROUP		
DEPUTY		DIVISION/GROUP		
RESOURCES UNIT		DIVISION/GROUP		
SITUATION UNIT		DIVISION/GROUP		
DOCUMENTATION UNIT		DIVISION/GROUP		
DEMOBILIZATION UNIT		**c. BRANCH III - DIVISION/GROUPS**		
TECHNICAL SPECIALISTS		BRANCH DIRECTOR		
		DEPUTY		
		DIVISION/GROUP		
		DIVISION/GROUP		
		DIVISION/GROUP		
		DIVISION/GROUP		
8. LOGISTICS SECTION		DIVISION/GROUP		
CHIEF		**d. AIR OPERATIONS BRANCH**		
DEPUTY		AIR OPERATIONS BR. DIR.		
a. SUPPORT BRANCH		AIR TACTICAL GROUP SUP.		
DIRECTOR		AIR SUPPORT GROUP SUP.		
SUPPLY UNIT		HELICOPTER COORDINATOR		
FACILITIES UNIT		AIR TANKER/FIXED-WING CRD.		
GROUND SUPPORT UNIT		**10. FINANCE SECTION**		
b. SERVICE BRANCH		CHIEF		
DIRECTOR		DEPUTY		
COMMUNICATIONS UNIT		TIME UNIT		
MEDICAL UNIT		PROCUREMENT UNIT		
FOOD UNIT		COMPENSATION/CLAIMS UNIT		
		COST UNIT		

PREPARED BY (RESOURCES UNIT)

NFES 1327

203 **ICS** 1/96

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INSTRUCTIONS FOR COMPLETING THE ASSIGNMENT LIST (ICS FORM 204)

ITEM NUMBER	ITEM TITLE	INSTRUCTIONS
		A separate sheet is used for each Division or Group. The identification letter of the Division is entered in the form title. Also enter the number (roman numeral) assigned to the Branch.
1.	**Incident Name**	Print the name assigned to the incident.
2.	**Date Prepared**	Enter the date prepared (month, day, year).
3.	**Time Prepared**	Enter time prepared (24-hour clock).
4.	**Operational Period**	Enter the time interval for which the form applies. Record the start time and end time and include date(s).
5.	**Operations Personnel**	Enter the name of the Operations Chief, applicable Branch Director, and Division Supervisor.
6.	**Resources Assigned Strike Team/Task Force/Resource Designator**	List resource designators, leader name, and total number of personnel for strike teams, task forces, or single resources assigned.
7.	**Control Operations**	Provide a statement of the tactical objectives to be achieved within the operational period. Include any special instructions for individual resources.
8.	**Special Instructions**	Enter statement calling attention to any safety problems or specific precautions to be exercised or other important information.
9.	**Division Communication Summary**	The Communications Unit provides this information on the form for Command, Division, Tactical, Support, and Ground-to-Air frequencies.
10.	**Prepared By**	Enter the name of the Resources Unit Member preparing the form.
11.	**Approved By**	Enter the name of the person approving the form (usually the Planning Section Chief).

1. BRANCH	2. DIVISION/~~GROUP~~	ASSIGNMENT LIST
West	A	

3. INCIDENT NAME	4. OPERATIONAL PERIOD
Flood	DATE 3/9/03 TIME 1200-2400

5. OPERATIONS PERSONNEL

OPERATIONS CHIEF D/C G. Rogers

DIVISION/GROUP SUPERVISOR Capt. L. Short

BRANCH DIRECTOR B/C T. Baker

AIR TACTICAL GROUP SUPERVISOR

6. RESOURCES ASSIGNED THIS PERIOD

STRIKE TEAM/TASK FORCE RESOURCE DESIGNATOR	EMT	LEADER	NUMBER PERSONS	TRANS. NEEDED	DROP OFF PT/TIME	PICK-UP PT/TIME
E-4	√	Lt. D. Helper	4	No		
E-5	√	Capt. N. Carr	4	No		
Boat 4	√	FF. C. Teddy	2	No		
T-5	√	Lt. E. Michaels	4	No		
A-4	ALS	FF. D. Nelms	2	No		

7. CONTROL OPERATIONS

Evaluate threatened areas in division.
Provide Medical Care/Transport as needed
Perform water rescue as required.

8. SPECIAL INSTRUCTIONS

Keep a constant eye on water level and rate of rise.
Operate North of 15th St, west of the roaring River

9. DIVISION/GROUP COMMUNICATIONS SUMMARY

FUNCTION		FREQ.	SYSTEM	CHAN.	FUNCTION		FREQ.	SYSTEM	CHAN.
COMMAND	LOCAL		CCFD	2	SUPPORT	LOCAL		CCFD	3
	REPEAT					REPEAT			
DIV/GROUP TACTICAL			CCFD	4	GROUND-TO-AIR				

10. PREPARED BY (RESOURCES UNIT)	11. APPROVED BY (PLANNING SECTION CHIEF)	DATE	TIME
Lt. P. Taylor	D/C B. Phelps	5/9/03	0600

204 ICS 1/99

1. BRANCH	2. DIVISION/GROUP	**ASSIGNMENT LIST**
3. INCIDENT NAME		4. OPERATIONAL PERIOD ***DATE*** ________ TIME ________

5. OPERATIONS PERSONNEL

OPERATIONS CHIEF ________________ DIVISION/GROUP SUPERVISOR ________________

BRANCH DIRECTOR ________________ AIR TACTICAL GROUP SUPERVISOR ________________

6. RESOURCES ASSIGNED THIS PERIOD

STRIKE TEAM/TASK FORCE RESOURCE DESIGNATOR	EMT	LEADER	NUMBER PERSONS	TRANS. NEEDED	DROP OFF PT/TIME	PICK-UP PT/TIME

7. CONTROL OPERATIONS

8. SPECIAL INSTRUCTIONS

9. DIVISION/GROUP COMMUNICATIONS SUMMARY

FUNCTION		FREQ.	SYSTEM	CHAN.	FUNCTION		FREQ.	SYSTEM	CHAN.
COMMAND	LOCAL				SUPPORT	LOCAL			
	REPEAT					REPEAT			
DIV/GROUP TACTICAL					GROUND-TO-AIR				

10. PREPARED BY (RESOURCES UNIT)	11. APPROVED BY (PLANNING SECTION CHIEF)	DATE	TIME

204 ICS 1/99

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INSTRUCTIONS FOR COMPLETING THE INCIDENT RADIO COMMUNICATIONS PLAN (ICS FORM 205)

ITEM NUMBER	ITEM TITLE	INSTRUCTIONS
1.	**Incident Name**	Print the name assigned to the incident.
2.	**Date/Time Prepared**	Enter date (month, day, year) and time prepared (24-hour clock).
3.	**Operational Period Date/Time**	Enter the date and time interval for which the Radio Communications Plan applies. Record the start time and end time and include date(s).
4.	**Basic Radio Channel Utilization System/Cache**	Enter the radio cache system(s) assigned and used on the incident (e.g., Boise Cache, FIREMARS, Region 5 Emergency Cache, etc.)
	Channel Number	Enter the radio channel numbers assigned.
	Function	Enter the function each channel number is assigned (i.e., command, support, division tactical, and ground-to-air).
	Frequency	Enter the radio frequency tone number assigned to each specified function (e.g., 153.400).
	Assignment	Enter the ICS organization assigned to each of the designated frequencies (e.g., Branch I, Division A).
	Remarks	This section should include narrative information regarding special situations.
5.	**Prepared By**	Enter the name of the Communications Unit Leader preparing the form.

INCIDENT COMMUNICATIONS PLAN		1. INCIDENT NAME FLOOD	2. DATE / TIME PREPARED 5/9/03 0600	3. OPERATIONAL PERIOD 5/9/03 1200-2400	
SYSTEM / CACHE	CHANNEL	FUNCTION	FREQ / TONE	ASSIGNMENT	REMARKS
CCFD	1	Dispatch	800.25	All Dispatchers	
CCFD	2	Command	800.30	IC / Section Chiefs	
CCFD	3	Support	800.35	Logistics Units	
CCFD	4	West Branch	800.40	All West Branch Tactical	
CCFD	5	East Branch	800.45	All East Branch Tactical	
205 ICS	5. PREPARED BY: (COMMUNICATIONS UNIT) CAPT. B. LOUD				

INCIDENT RADIO COMMUNICATIONS PLAN	1. INCIDENT NAME	2. DATE/TIME PREPARED	3. OPERATIONAL PERIOD DATE/TIME

4. BASIC RADIO CHANNEL UTILIZATION

SYSTEM/CACHE	CHANNEL	FUNCTION	FREQUENCY	ASSIGNMENT	REMARKS

205 ICS 9/86	5. PREPARED BY (COMMUNICATIONS UNIT)

NFES 1330

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INSTRUCTIONS FOR COMPLETING THE MEDICAL PLAN (ICS FORM 206)

ITEM NUMBER	ITEM TITLE	INSTRUCTIONS
1.	**Incident Name**	Print the name assigned to the incident.
2.	**Date Prepared**	Enter date (month, day, year).
3.	**Time Prepared**	Enter time prepared (24-hour clock).
4.	**Operational Period Date/Time**	Record the date and time of the operational period for which this plan is in effect.
5.	**Incident Medical Aid Stations**	Enter name and location of the incident medical aid stations (e.g., Cajon Staging Area, Cajon Campground) and indicate with a √ if paramedics are located at the site.
6.	**Transportation**	
	A. Ambulance Services	List name and address of ambulance services (e.g., Shaeffer, 4358 Brown Parkway, Corona). Provide phone number and indicate if ambulance company has paramedics.
	B. Incident Ambulances	Name of organization providing ambulances and the incident location. Also indicate if paramedics are aboard.
7.	**Hospitals**	List hospitals which could serve this incident. Incident name, address, the travel time by air and ground from the incident to the hospital, phone number, and indicate with a √ if the hospital is a burn center and has a helipad.
8.	**Medical Emergency Procedures**	Note any special emergency instructions for use by incident personnel.
9.	**Prepared By**	Enter the name of the Medical Unit Leader preparing the form.
10.	**Reviewed By**	Obtain the name of the Safety Officer who must review the plan.

MEDICAL PLAN	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED	4. OPERATIONAL PERIOD
	FLOOD	5/9/03	0600	5/9/03 1200-2400

5. INCIDENT MEDICAL AID STATIONS

MEDICAL AID STATIONS	LOCATION	PARAMEDICS YES	PARAMEDICS NO
West Br. Aid Station #1	10th & B St.	√	
West Br. Aid Station #2	32 & D St.	√	
East Br. Aid Station #1	12 & U St.	√	
East Br. Aid Station #2	30 & P St.	√	

6. TRANSPORTATION

A. AMBULANCE SERVICES

NAME	ADDRESS	PHONE	PARAMEDICS YES	PARAMEDICS NO
CCFD	Fire Headquarters	911	√	

B. INCIDENT AMBULANCES

NAME	LOCATION	PARAMEDICS YES	PARAMEDICS NO
CCFD	All Aid Stations	√	

7. HOSPITALS

NAME	ADDRESS	TRAVEL TIME AIR	TRAVEL TIME GRND	PHONE	HELIPAD YES	HELIPAD NO	BURN CENTER YES	BURN CENTER NO
CC Hospital	'D' Street	5	10	483-7000	√		√	
Faith Hospital	'S' & 14th	5	12	725-6500		√		√
Levine Hospital	MM & 17th	5	10	725-8000	√			√
Fisherville Hospital	S & 1st, Fisherville	10	22	861-1500	√			√

8. MEDICAL EMERGENCY PROCEDURES

Treat and transport all injured response personnel to CC hospital

Fully document treatment and transportation

ICS 206 5-94	9. PREPARED BY (MEDICAL UNIT LEADER)	10. REVIEWED BY (SAFETY OFFICER)
	B/C G. Oldershaw	B/C J. Willis

MEDICAL PLAN	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED	4. OPERATIONAL PERIOD

5. INCIDENT MEDICAL AID STATIONS

MEDICAL AID STATIONS	LOCATION	PARAMEDICS	
		YES	NO

6. TRANSPORTATION

A. AMBULANCE SERVICES

NAME	ADDRESS	PHONE	PARAMEDICS	
			YES	NO

B. INCIDENT AMBULANCES

NAME	LOCATION	PARAMEDICS	
		YES	NO

7. HOSPITALS

NAME	ADDRESS	TRAVEL TIME		PHONE	HELIPAD		BURN CENTER	
		AIR	GRND		YES	NO	YES	NO

8. MEDICAL EMERGENCY PROCEDURES

ICS 206 5-94	9. PREPARED BY (MEDICAL UNIT LEADER)	10. REVIEWED BY (SAFETY OFFICER)

NPES 1331

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INSTRUCTIONS FOR COMPLETING THE INCIDENT STATUS SUMMARY (ICS FORM 209)

ITEM NUMBER	INSTRUCTIONS
1.	Enter date and time report completed (mandatory).
2.	Check appropriate space (mandatory-no computer entry).
3.	Provide name given to incident by Incident Commander or Agency (mandatory).
4.	Enter number assigned to incident by Agency (mandatory).
5.	Enter first initial and last name of Incident Commander (optional).
6.	Enter Agency or Municipality (mandatory).
7.	Enter County where incident is occurring (optional).
8.	Enter type incident, e.g., wildland fire (enter fuel type), structure fire, hazardous chemical spill, etc. (mandatory).
9.	Enter legal description and general location. Use remarks for additional date if necessary (mandatory).
10.	Enter date and zulu time incident started (mandatory - maximum of 6 characters for date and 4 characters for time).
11	Enter specific cause or under investigation (mandatory).
12.	Enter area involved, e.g., 50 acres, top three floors of building, etc. (mandatory).
13	Enter estimate of percent of containment (mandatory).
14.	Enter estimate of date and time of total containment (mandatory).
15.	Enter estimated date and time of control (mandatory).
16.	Enter actual date and time fire was declared controlled (mandatory).
17.	Report significant threat to structures, watershed, timber, wildlife habitat, or other valuable resources (mandatory).
18.	Enter control problems, e.g., accessibility, fuels, rocky terrain, high winds, structures (mandatory).
19.	Enter estimated dollar value of total damage to date. Include structures, watershed, timber, etc. Be specific in remarks (mandatory).
20.	Enter estimate of values saved as result of all suppression efforts (optional).
21.	Enter any serious injuries or deaths which have occurred since the last report. Be specific in remarks (mandatory).
22.	Indicate the extent of line completed by chains or other units of measurement (optional).
23.	Indicate line to be constructed by chains or other units of measurement (optional).
24.	Indicate current weather conditions at the incident (mandatory).
25.	Indicate predicted weather conditions for the next optional period (mandatory).
26.	Provide total incident cost to date (optional).
27.	Provide estimated total cost for entire incident (optional).
28.	List agencies which have resources assigned to the incident (mandatory).
29.	Enter resource information under appropriate Agency column by single resource or strike team (mandatory).
30.	List by name those agencies which are providing support, e.g., Salvation Army, Red Cross, Law Enforcement, National Weather Service, etc. (mandatory).
31.	The remarks space can be used to (1) list additional resources not covered in Section 28/29; (2) provide more information on location; (3) enter additional information regarding threat control problems, anticipated release or demobilization, etc. (mandatory).
32.	This will normally be the incident Situation Unit Leader (mandatory).
33.	This will normally be the incident Planning Section Chief (mandatory).
34.	The ID of the Agency entering the report will be entered (optional-no computer entry).

Incident Status Summary (ICS-209)

1: Date	2: Time	3: Initial | | Update | | Final | |	4: Incident Number	5: Incident Name

6: Incident Kind	7: Start Date / Time	8: Cause	9: Incident Commander	10: IMT Type	11: State-Unit

12: County	13: Latitude and Longitude Lat: Long:	14: Short Location Description (in reference to nearest town):

Current Situation

15: Size/Area Involved	16: % Contained or MMA	17: Expected Containment Date: Time:	18: Line to Build (# chains)	19: Costs to Date	20: Declared Controlled Date: Time:

21: Injuries this Reporting Period:	22: Injuries to Date:	23: Fatalities

25: Threat to Human Life/Safety:
Evacuation(s) in progress _____
No evacuation(s) imminent _____
Potential future threat _____
No likely threat _____

24: Structure Information

Type of Structure	# Threatened	# Damaged	# Destroyed
Residence			
Commercial Property			
Outbuilding/Other			

26: Communities/Critical Infrastructure Threatened (in 12, 24, 48 and 72 hour time frames):

12 hours:

24 hours:

48 hours:

72 hours:

27: Critical Resource Needs (kind & amount, in priority order):

1.
2.
3.

28: Major problems and concerns (control problems, social/political/economic concerns or impacts, etc.) Relate critical resources needs identified above to the Incident Action Plan.

29: Resources threatened (kind(s) and value/significance):

ICS-209 (06/03) NFES 1333 Previous editions obsolete

30: Current Weather Conditions Wind Speed: mph Temperature: Wind Direction: Relative Humidity:	31: Resource benefits/objectives (for prescribed/wildland fire use only):

32: Fuels/Materials Involved:

Enter the predominant fuel from the Thirteen Fuel Models for Fire Behavior in the adjacent box to the right.

List additional fuels and/or materials involved in the block below.

33: Today's observed fire behavior (leave blank for non-fire events):

34: Significant events today (closures, evacuations, significant progress made, etc.):

Outlook

35: Estimated Control Date and Time:	36: Projected Final Size:	37: Estimated Final Cost:	38: Tomorrow's Forecasted Weather Wind Speed: mph Temperature: Wind Direction: Relative Humidity:

39: Actions planned for next operational period:

40: Projected incident movement/spread during next operational period:

41: For fire incidents, describe resistance to control in terms of:

1. Growth Potential -
2. Difficulty of Terrain -

42: How likely is it that containment/control targets will be met, given the current resources and suppression/control strategy?

43: Projected demobilization start date:

44: Remarks:

ICS-209 (06/03) NFES 1333 Previous editions obsolete

45: Committed Resources																
Agency	CRW1		CRW2		HEL1	HEL2	HEL3	ENGS		DOZR		WTDR	OVHD	Camp Crews	Total Personnel
	SR	ST	SR	ST	SR	SR	SR	SR	ST	SR	ST	SR	SR		
Total															

46: Cooperating and Assisting Agencies Not Listed Above:

Approval Information

47: Prepared by:	48: Approved by:	49: Sent to: by: Date: Time:

ICS-209 (06/03) NFES 1333 Previous editions obsolete

GENERAL MESSAGE (ICS FORM 213)

The General Message form in use within the ICS is a three-part form.

Purpose. The General Message form is used by:

1. Incident dispatchers to record incoming messages which cannot be orally transmitted to the intended recipients.
2. Command Post and other incident personnel to transmit messages to the Incident Communications Center for transmission via radio or telephone to the addressee.
3. Incident personnel to send any message or notification to incident personnel which requires hard-copy delivery.

Initiation of Form. The General Message form may be initiated by incident dispatchers and any other personnel on an incident.

Distribution. Upon completion, the General Message may be:

1. Hand carried to the addressee.
2. Hand carried to the incident Communication Center for transmission.

INSTRUCTIONS FOR COMPLETING THE GENERAL MESSAGE (ICS FORM 213)

ITEM TITLE	**INSTRUCTIONS**
To	Indicate Unit/Person the General Message is intended for. Be specific.
Office	Indicate the location where the Unit/Person is located, e.g., Ground Support Unit Leader, Simpson Camp, Communications, etc.
From	Indicate appropriate designation and location of sender.
Subject	Fill in if applicable.
Date	List the date and time.
Message	Briefly complete. Think through your message before writing it down. Try to be as concise as possible.
Reply	This section is intended to be used by the Unit/Person who receives the message to reply to your message.
Date	Record the date and time of reply.
Signature	Record signature and title of person replying.

White Copy/Pink Copy Both copies are sent by person who initiates the message.
Yellow Copy Retained by the person who initiates the message.
Pink Copy May be returned to the person who initiates the message.

*U.S. GPO: 1009-793-975

GENERAL MESSAGE

TO:	POSITION		
FROM	POSITION		
SUBJECT		DATE	

MESSAGE:

DATE	TIME	SIGNATURE/POSITION

213 ICS 1/79
NFES 1336

PERSON RECEIVING GENERAL MESSAGE KEEP THIS COPY

SENDER REMOVE THIS COPY FOR YOUR FILES

UNIT LOG (ICS FORM 214)

Purpose. The Unit Log is used to record details of unit activity including strike team activity. The file of these logs provides a basic reference from which to extract information for inclusion in any after-action report.

Initiation of Log. A Unit Log is initiated and maintained by Command Staff members, Division/Group Supervisors, Air Operations Groups, Strike Team/Task Force Leaders, and Unit Leaders. Completed logs are forwarded to supervisors who provide to the Documentation Unit.

Distribution. The Documentation Unit maintains a file of all Unit Logs. It is necessary that one copy of each log be submitted to the Documentation Unit.

INSTRUCTIONS FOR COMPLETING THE UNIT LOG (ICS FORM 214)

ITEM NUMBER	ITEM TITLE	INSTRUCTIONS
1.	Incident Name	Print the name assigned to the incident.
2.	Date Prepared	Enter date prepared (month, day, year).
3.	Time Prepared	Enter time prepared (24-hour clock).
4.	Unit Name	Enter the title of the organizational unit or resource designator (e.g., Facilities Unit, Safety Officer, Strike Team).
5.	Unit Leader	Enter the name of the individual in charge of the Unit.
6.	Operational Period	Enter the time span covered by the log (e.g., 1800 Oct. 12 to 0600 Oct. 13).
7.	Personnel Roster	List the name, position, and home base of each Member assigned to the unit during the operational period.
8.	Activity Log	Enter the time and briefly describe each significant occurrence or event (e.g., task assignments, task completions, injuries, difficulties encountered, etc.)
9.	Prepared By	Enter the name and title of the person approving the log. Provide log to immediate supervisor at the end of each operational period.

UNIT/ACTIVITY LOG **ICS 214 5-94**	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED

4. ORGANIZATION POSITION	5. LEADER NAME	6. OPERATIONAL PERIOD

7. PERSONNEL ROSTER ASSIGNED

NAME	ICS POSITION	HOME BASE

8. ACTIVITY LOG (CONTINUE ON REVERSE)

TIME	MAJOR EVENTS

TIME	MAJOR EVENTS
	9. PREPARED BY (NAME AND POSITION)

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INSTRUCTIONS FOR COMPLETING THE OPERATIONAL PLANNING WORKSHEET (ICS FORM 215)

ITEM NUMBER	ITEM TITLE	INSTRUCTIONS
1.	**Incident Name**	Print the name assigned to the incident.
2.	**Date/Time Prepared**	Enter date (month, day, year) and time prepared (24-hour clock).
3.	**Operational Period**	Enter the time interval for which the information applies. Record the start time and end time and date(s).
4.	**Division or Other Location**	Enter the Division letter or location of the work assignment for the resources.
5.	**Work Assignments**	Enter the specific work assignments given to each of the Divisions.
6.	**Resource**	Complete resource headings, both for kind and type appropriate for the incident. Enter, for the appropriate resources, the number of resources by type (engines, crew, etc.) required "REQ," and the number of resources available "HAVE" to perform the work assignment. Then record the number of resources needed "NEED" by subtracting the number in the "HAVE" row from the number in the "REQ" row.
7.	**Reporting Location**	Enter the specific location the "needed" resources are to report for the work assignment (staging area, location on the fire line, etc.).
8.	**Requested Arrival Time**	Enter time resources are requested to arrive at the reporting location.
9.	**Total Resources Required, On Hand, Ordered**	Enter the total number of resources by type (engines, crews, dozers, etc.) required, on hand, and ordered.
10.	**Prepared By**	Record the name and position of the person completing the form.

OPERATIONAL PLANNING WORKSHEET

1. INCIDENT NAME	2. DATE PREPARED	TIME PREPARED	3. OPERATIONAL PERIOD (DATE/TIME)
FLOOD	5/9/03	0100	5/90/3 1200-2400

4. DIVISION OR OTHER LOCATION	5. WORK ASSIGNMENTS	6. RESOURCES BY TYPE (SHOW STRIKE TEAM AS ST) RESOURCE	ENGINES	AMB	BOAT	BUS	POLICE	DUMP TRUCKS	7. REPORTING LOCATION	8. REQUESTED ARRIVAL TIME
		TYPE								
DIV A	Evacuate Columbia Vets Hospital	REQ	5	10		7	6		Staging	1200
		HAVE	2	5		5	3			
		NEED	3	5		2	3			
DIV B	Evacuate Colonial Hghts Subdivision	REQ	6	2	2	3	10		Staging	1200
		HAVE	3	1	1	1	2			
		NEED	3	1	1	2	8			
DIV C	Sandbag Tank Farm at R St. 7 & 24th St.	REQ	2		1			5	Staging	1200
		HAVE	1		0			0		
		NEED	1		1			5		
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								

9.	SINGLE RESOURCES / STRIKE TEAMS	ENGINES	AMB	BOAT	BUS	POLICE	DUMP TRUCKS
TOTAL RESOURCES REQUIRED	SINGLE RESOURCES	13	12	3	10	16	5
TOTAL RESOURCES ON HAND	SINGLE RESOURCES	6	6	1	6	5	0
TOTAL RESOURCES NEEDED	SINGLE RESOURCES	7	6	2	4	11	5

10. PREPARED BY (NAME AND POSITION)

Tom Jones

LOG. Section Chief

215 ICS 2-98

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OPERATIONAL PLANNING WORKSHEET

1. INCIDENT NAME	2. DATE PREPARED	3. OPERATIONAL PERIOD (DATE/TIME)
	TIME PREPARED	

4. DIVISION OR OTHER LOCATION	5. WORK ASSIGNMENTS	6. RESOURCES BY TYPE (SHOW STRIKE TEAM AS ST)							7. REPORTING LOCATION	8. REQUESTED ARRIVAL TIME
		RESOURCE								
		TYPE								
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
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		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
		REQ								
		HAVE								
		NEED								
215 ICS 9-66	9. TOTAL RESOURCES REQUIRED	SINGLE RESOURCES / STRIKE TEAMS							10. PREPARED BY (NAME AND POSITION)	
	TOTAL RESOURCES ON HAND									
	TOTAL RESOURCES NEEDED									

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INCIDENT COST WORKSHEET

Incident Name: ____

Date: ______________________ Operational Period: ____________

I. ENGINE COSTS (ALL AGENCIES/ALL TYPES)

Number Engines ____________ Est. Cost ____________

II. HAND CREW COSTS (ALL AGENCIES)

Number Agency Crews ____________ Est. Cost ____________

Number Pick-up Labor Crews____________ Est. Cost ____________

Number Custodial Agency Personnel ____________ Est. Cost ____________

TOTAL ____________

III. DOZER COSTS

1. Agency Owned (All Agencies/All Types)

Number Dozers ____________ Est. Cost ____________

Number Tenders ____________ Est. Cost ____________

Number Transports ____________ Est. Cost ____________

Subtotal ____________

2. Rental Dozers

Number Dozers ____________ Est. Cost ____________

Number Tenders ____________ Est. Cost ____________

Number Transports ____________ Est. Cost ____________

TOTAL ____________

IV. AIRCRAFT COSTS (ALL AGENCIES /ALL TYPES)

Number Air Attack/Airtanker Coord Ships ____________ Est. Cost ____________

Number Airtankers ____________ Est. Cost ____________

Number Recon ____________ Est. Cost ____________

Number Helicopters (agency owned) ______ Est. Cost ____________

Number Helicopters (hired) ________ Est. Cost ____________

Gallons Retardant ____________ Est. Cost ____________

TOTAL ____________

V. OVERHEAD/STAFF COSTS (ALL AGENCIES/ALL TYPES)

Number Command Staff ____________ Est. Cost ____________

Number Operators Section __________ Est. Cost ____________

Number Planning Section_____ Est. Cost ____________

Number Logistics Section ________ Est. Cost ____________

Number Finance Section ________ Est. Cost ____________

TOTAL ____________

VI. MISCELLANEOUS

Field kitchen or Caterer (inc. reefer vans) Est. Cost ____________

Shower Units Est. Cost ____________

Trash Collection Est. Cost ____________

Rental Support Vehicles Est. Cost ____________

IR Aircraft Est. Cost ____________

____________ Number ____________ Est. Cost ____________

____________ Number ____________ Est. Cost ____________

____________ Number ____________ Est. Cost ____________

____________ Number ____________ Est. Cost ____________

____________ Number ____________ Est. Cost ____________

TOTAL ____________

Private Resources	Capability	Equipment Cost Per Hour (Includes Fuel)	Operator Cost Per Hour Rate (Includes Fringe Benefits)	Other
Backhoe (tracks)	1.75 cubic yard bucket	142.00	50.00	
Backhoe loader 4-wheel drive	1.0 cubic yard loader	35.00	50.00	
Front-end loader 4-wheel drive	5.50 cubic yard	115.00	50.00	
Bulldozer (tracks)	71 HP	45.00	50.00	
Bulldozer, midsize	140 HP	75.00	50.00	
Dump truck 10-wheeler	15 cubic yards	60.00	45.00	
Dump truck 6-wheeler	7 cubic yards	35.00	45.00	
Crane	15-ton lift 60' extension boom	100.00	50.00	
Crane	113-ton lift 50' extension boom	250.00	100.00	
Crane	450-ton lift 80' extension boom	800.00	100.00	
Recycled concrete (fine)		10.00 cubic yard (includes loading & delivery)		1-1/2-hour roundtrip time
Sand (fine or lumpy)		10.00 cubic yard (includes loading & delivery)		1-1/2-hour roundtrip time
Sandbags--filled		30.00 cubic yard (includes loading & delivery)		1-1/2-hour roundtrip time
Broken concrete		10.00 cubic yard (includes loading & delivery)		1-1/2-hour roundtrip time
Salt/Cinders		10.00 cubic yard (includes loading & delivery)		1-1/2-hour roundtrip time
Foam--all purpose		500.00 (per 55 gallon drum)		
Containment boom		100.00 cubic yard (includes delivery)		
Laborers			40.00	
Portable lights	30' tower (6 lights)		17.00 (includes fuel)	
Centrifugal pumps	4" diesel heavy-duty 40,000 GPH		25.00	
Chainsaws	Wood/Metal		2.00	

Local Government Resource	Capability	Equipment Cost Per Hr. (Includes Fuel)	Operator Cost Per Hour Rate (Includes Fringe Benefits)	Other
Firefighters			35.00	14% difference between ranks
Pumpers	1500 GPM	125.00	See firefighter rate	
Ladder truck	100' aerial	150.00	See firefighter rate	
Tower ladder	85' bucket	160.00	See firefighter rate	
Command cars/vans		50.00	See firefighter rate	
Bunker gear	Per set	400.00		
Tyvex suit	Per set	40.00		
Dispatchers			30.00	14% difference between ranks
Police officers			35.00	14% difference between ranks
Police cruiser		50.00	See police officer rate	
EMS personnel		35.00	See EMS personnel rate	14% difference between ranks
EMS ambulance		20.00	75.00	
Health department personnel		20.00	40.00	
Gas company resources		100.00	35.00	
Power company resources		100.00	35.00	
Public works resources		See private resources	35.00	See private resources
Public health resources		100.00	40.00	
Medical teams			1500.00 (includes two surgeons & three nurses)	
Engineers			100.00	
			100.00	
Chainsaws	Concrete		6.00	
Buses	Regular	70.00	40.00	
Buses	Handicapped equipped	75.00	40.00	

Local Government Resource	Capability	Equipment Cost Per Hr. (Includes Fuel)	Operator Cost Per Hour Rate (Includes Fringe Benefits)	Other
Vans (paratrans)	Eight-passenger handicapped equipped	50.00	30.00	
Tow trucks	Light duty	75.00	40.00	
Tow trucks	Heavy duty	90.00	40.00	
Porta potties		5.00 (includes pick-up, delivery & fuel)		
	5-gallon containers	5.00 per container (includes delivery)		
Generators	10K	5.00 (includes pick-up, delivery & fuel)		
Portable heaters		5.00 (includes pick-up, delivery & fuel)		
Cooled zone	Portable air condition	50.00 (includes pick-up, delivery & fuel)		
Boats	Boston whaler 16'	50.00		
Canoes	12'	20.00		
Rafts	6'	15.00		
Jet ski/with trailer		40.00	25.00	

APPENDIX F

DELEGATION OF AUTHORITY

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Agency Administrator Briefing

1. Don't get any City employee injured or killed.
2. Evacuate as much of the City as needed.
3. Call back fire, police and public works as necessary; overtime authorized.
4. Keep costs down…I want a preliminary report on hourly costs at your first briefing.
5. Liberty County and Columbia State Emergency Manager are en-route to the EOC.
6. I've authorized opening of the EOC and full disaster level.
7. FBI agent is en-route.
8. Please open M Street in 3 hours.
9. Put the fire out, stop the leak.
10. Don't let the runoff get into the Roaring River.
11. Get industrial sites opened for their next shift.
12. Get railroad right-away opened as soon as possible.
13. Mayor will be here in an hour with members of City Council; they'll want a briefing.
14. Air and water pollution: what do we do?
15. You are authorized to provide press releases as you determine.

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DELEGATION OF AUTHORITY

Fire Name: ____

Start Date: ___________________________ Start Time: ____________________

Legal Description at Origin: ______________________________________

I am delegating my full authority and responsibility to manage this incident within the framework of laws and policies to ________________________, Incident Commander Team. You will assume command of this incident on _____/_____/______ at ________ hours.

You are accountable to me for this delegation, or my designated representative: ___________________________

Your primary responsibility will be to organize and direct your resources toward the safe, efficient, and cost effective suppression of this fire.

Specific directions to you on managing this incident, including elements that you will be evaluated on are contained in "Attachment A" that becomes part of this delegation.

____________________________________	______________	____________
Agency Administrator	Date	Time

Office Phone: ___________________
Cell Phone: _____________________
Home Phone: ___________________

____________________________________	______________	____________
Incident Commander	Date	Time

ICP Phone: _____________________
Cell Phone: _____________________

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DELEGATION OF AUTHORITY

Incident Name: ____

Date: ____/____/____

Safety

- Provide for firefighter and public safety at all times.

- Adhere to a 2:1 work/rest ratio for all fire line personnel. Document any decisions to deviate from this direction.

- Immediately notify the agency administrator and his representative when the health or safety of any incident personnel has been compromised.

Agency Administrator Representative

- ________________________________ will be the agency representative to this fire. He can be reached at the following phone numbers:
  - Office: __________________________
  - Cell: __________________________
  - Home: __________________________
  - Pager: __________________________

The agency representative's responsibilities are:

____

1. Provide incident management team with information on ___________________
2. Point of contact for team or public contact.

Incident Management

- Establish unified command with: _________________________________

- Establish a safe and efficient transition with the current incident management and build upon their accomplishments.

- Coordinate and work through expanded dispatch for all resource needs. The supervisor for expanded dispatch is: _________________________.

- Cooperate with fire districts and local law enforcement in developing structural protection and evacuation plans where needed.

- Coordinate significant communications with the media through the region manager's representative, or through ______________________________.

- Coordinate with the agency administrator or his representative on any interaction with elected officials.

- When possible provide training opportunities for local resources on the fire.

- Use local private and fire district resources when it is safe, cost effective and timely to do so.

- Fire investigation will be conducted by the region, the lead fire investigator0020will be ______________________________. The team is expected to cooperate with this investigation.

- Maintain good relations with the community, private landowners, timber industry representatives, elected officials and other stakeholders.

- A resource advisor ___________________________ has/ has not been assigned.

- A fire prevention team has been assigned to the area to do prevention work during the duration of this incident. The prevention team leader is: ____________________, phone number is _________________________. The team will/will not need to have logistical support provided by your incident management team.

<u>Suppression</u>

- Provide updated copies of maps that show burned areas, structures, rehab issues, ownerships, etc.

- Take all reasonable efforts to limit acreage burned while following safety direction.

- Notify the region manager or his representative as soon as practicable if there is a threat of the loss of structures, or there is a threat to existing containment or control.

- Roads used during suppression operations will be maintained at an appropriate level to avoid damage to the subgrade and significant accumulations of surface dust.

- Provide initial attack response for the following area:

  ____

OR

THE REGION MAY REQUEST THAT THE TEAM PROVIDE INITIAL ATTACK ASSISTANCE IF LOCAL RESOURCE CAPABILITIES ARE EXCEEDED.

INCIDENT BUSINESS MANAGEMENT

- The agency's incident business management representative for this incident is ______________________________ or designee (office phone: ______________________.

- Provide a daily accounting of incident management expenditures to the region manager's representative.

- The team will assist in preparing a cost share agreement between the following agencies:
  ____
  ____ this process should be within 72 hours.

- Incident Close Out Standards

- The IMT will have developed a transition plan and briefed the next level of incident management.

- The incident commander will have conducted a close out briefing with the region manager or his designated representative.

- All incidents within the incident will have been investigated and appropriate documentation will have been completed. This includes accidents, tort claims, etc.

- Expect to have a preliminary team evaluation at the incident close out and may receive a final evaluation at the end of fire when all incident business transactions have been finalized.

Evaluation Criteria

1. Was the delegation of authority and specific direction followed?

2. Was the team professional and cooperative with initial attack personnel or other incident management teams as they assumed command of the incident?

3. Did the team place proper emphasis on safety?

4. Was the team cost effective in management of the incident?

5. Did the team work cooperatively with the hosting agency(s) throughout the incident?

6. Were the team's planning, strategies and implementation effective? (???)

7. Did the team respond effectively to changing conditions or demands?

8. Was the team proactive with public outreach and sensitive to public concerns?

9. Was the IC aggressive in assuming responsibility of the incident and initiating action?

10. Were agency policies and business management practices followed?

APPENDIX G

COMMAND/GENERAL STAFF CHECKLIST AND ICS ORGANIZATION CHART

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INCIDENT COMMANDER

GET BRIEFING FROM OPERATIONS

ESTABLISH INCIDENT COMMAND POST

DISCUSS WITH OPS AND DETERMINE STRATEGY/GOALS

ICS ASSIGNMENTS

CONDUCT PLANNING MEETINGS

IDENTIFY COMMAND AND GENERAL STAFF POSITIONS

APPROVE ACTION PLAN PREPARED BY PLANS

PLANS

SITUATION STATUS CHARTS

RESOURCE STATUS CHARTS

TECHNICAL SPECIALISTS

CURRENT PROBLEMS

WRITE ACTION PLAN

PREDICTED PROBLEMS

ADJUSTED ACTION PLAN TO ADDRESS PREDICTED PROBLEMS

LOGISTICS

FUEL

AIR BOTTLES/AIR UNIT

REHAB

FOAM

LIGHT TRUCK

HEAVY EQUIPMENT

OUTSIDE CONTRACTORS

COMMUNICATIONS EQUIPMENT

EMERGENCY OPERATIONS CENTER

BUSES RELOCATION SITE

LIAISON

CONSIDERATIONS

POLICE

- **TRAFFIC**
- **BUILDING SECURITY**
- **ESTABLISH RELOCATION SITE**

RED CROSS

BUILDING INSPECTOR

COAST GUARD

EPA

PUBLIC WORKS

OUTSIDE CONTRACTORS

FIRE MARSHAL

WATER DEPARTMENT

ELECTRIC COMPANY

GAS COMPANY

HEALTH DEPARTMENT

MEDICAL EXAMINER

RAILROAD

AIR MONITORING

BOMB SQUAD

PLANT PERSONNEL

MAINTAIN A LIST OF ASSISTING AGENCIES

OPERATIONS

STRATEGY	TACTICS	ASSIGNMENTS

SIDE "C"

SIDE "B"

SIDE "D"

SIDE "A"

CONSIDERATIONS

RESCUE/EVAC.	WEATHER	SPRINKLERS	MUTUAL AID
EXPOSURES	WATER SUPPLY	STANDPIPES	SPEC. EQUIP.
VENTILATION	CONSTRUCTION	CONTENTS	EMS/TRIAGE
SALVAGE	COLLAPSE	RESOURCES	MASS CASUALTY
POLICE	STAGING	UTILITIES	ACCOUNTABILITY

PUBLIC INFORMATION OFFICER

TIME ___________

LOCATION ______________________

TYPE OF BUILDING __________________________

NUMBER OF ALARMS ____________

NUMBER OF FIREFIGHTERS THAT RESPONDED ___________

NUMBER OF APPARATUS ON THE SCENE _____

NUMBER OF OCCUPANTS IN THE BUILDING _________

NUMBER OF PEOPLE EVACUATED _________

NUMBER OF CIVILIAN INJURIES ________

TYPE OF CIVILIAN INJURIES ____________________________

NUMBER OF FIREFIGHTER INJURIES _______

TYPE OF FIREFIGHTER INJURIES ________________________

RELOCATION SITE ____________________________________

SELECT SITE FOR MEDIA DEBRIEFING ___________________

WRITE MEDIA RELEASES AND HAVE IC APPROVE SAME

PUBLIC INFORMATION OFFICER (cont'd)

WRITE INITIAL PRESS RELEASE AFTER 15 MINUTES

WRITE UPDATED PRESS RELEASE AFTER 30 MINUTES

SAFETY

REPORT TO THE IC AND LIST THE IC'S SAFETY CONCERNS

____

____

____

RECON THE SITE AND LIST YOUR SAFETY CONCERNS

____

____

____

PARTICIPATE IN PLANNING MEETING

INVESTIGATE ACCIDENTS AND INJURIES AT SCENE

REQUEST ASSISTANTS FROM IC AND ASSIGN THEM DUTIES

CONSIDERATIONS

APPARATUS PLACEMENT	**AIR MONITORING**	**ACCOUNTABILITY**
BLDG/CONTAINER stability	**COLLAPSE ZONES**	**SAFETY ZONES**
ROTATION OF UNITS/ TIME LIMITS	**PPE OF FIREFIGHTERS**	**PROPER LADDER PLACEMENT**

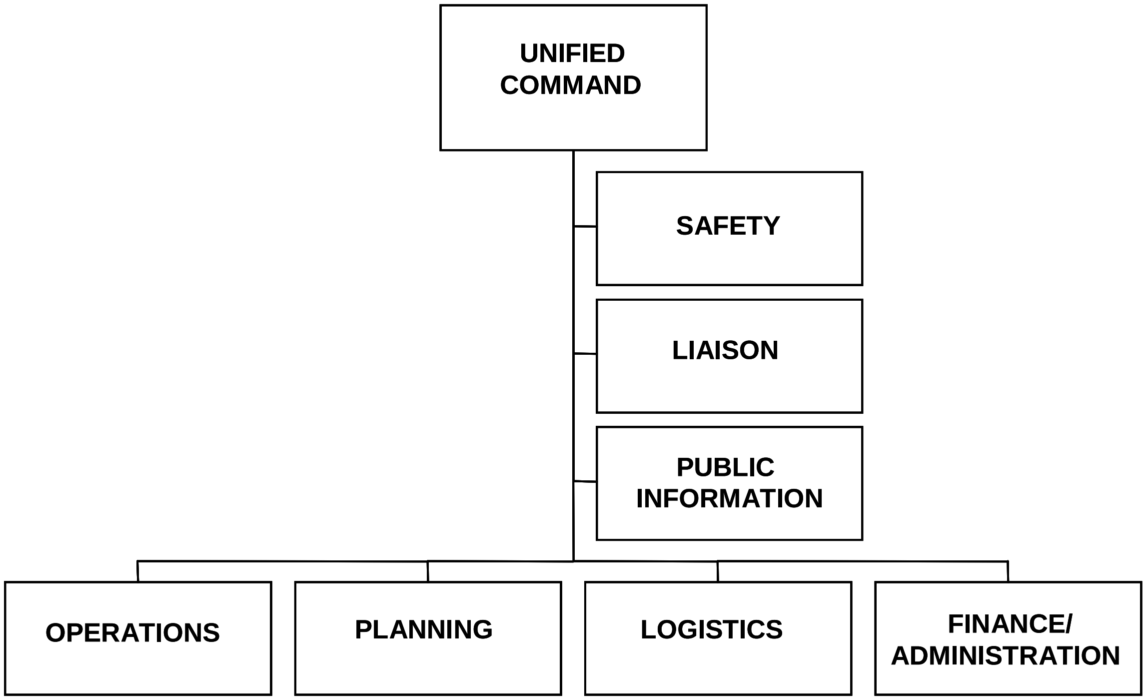
FORMULATE A WRITTEN INCIDENT SAFETY PLAN

____

____

____

INCIDENT COMMAND CHART



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ICS ORGANIZATION GUIDE

COMMAND

1. Incident Commander--one per incident, unless incident is multijurisdictional.
2. Multijurisdictional incidents establish Unified Command, with each jurisdiction supplying individual to represent agency in Unified Command Structure.
3. Incident Commander may have Deputy.
4. Command Staff Officers--one per function per incident.
5. Command Staff may have assistants as needed.
6. Agency Representatives report to Liaison Officer on Command Staff.

INCIDENT BASE RECOMMENDED MINIMUM PERSONNEL REQUIREMENTS
(Per Twelve (12)-Hour Operations Period)

	UNIT POSITION	SIZE OF INCIDENT (NUMBER OF DIVISIONS) 2	5	10	15	25
OPERATIONS	Operations Section Chief	One Per Operational Period				
	Branch Director		2	3	4	6
	Division/Group Supervisor	2	5	10	15	25
	Strike Team Leaders	As Needed				
	Task Force Leaders	As Needed				
	Air Operation Director		1	1	1	1
	Air Attack Group Supervisor	1	1	1	1	1
	Air Tanker Coordinator	As Needed				
	Helicopter Coordinator	As Needed				
	Air Support Group Supervisor	1	1	1	1	1
	Helibase Manager	One Per Helibase				
	Helispot Manager	One Per Helispot				
	Fixed Wing Support Leader	One Per Airport				
	Staging Area Manager	One Per Staging Area				
PLANS	Planning Section Chief	One Per Incident				
	Resources Unit Leader	1	1	1	1	1
	Status Recorders	1	2	3	3	3
	Check-In Recorders	As Needed				
	Technical Specialists	As Needed				
	Situation Unit Leaders	1	1	1	1	1
	Field Observer		1	2	2	3
	Weather Observer	As Needed				
	Aerial/Ortho Photo Analyst	As Needed				
	Display/Report Processor		1	1	1	2
	IR Equipment Operators	Two If Needed				
	Computer Terminal Operator		1	1	1	1
	Photographer			1	1	1
	Documentation Unit Leader		1	1	1	1
	Demobilization Unit Leader			1	1	1
	(Demob. Recorders from Resources)	As Needed				

FINANCE	Finance Section Chief	One Per Incident			
	Time Unit Leader	1	1	1	1
	Time Recorder, Personnel	1	3	3	5
	Procurement Unit Leader	1	1	1	1
	Compensation/Claims Unit Leader	1	1	1	1
	Compensation Specialists	As Needed			
	Claims Specialists	As Needed			
	Cost Unit Leader	1	1	1	1
	Cost Analysts		1	1	1

SIMULATION 12: HIGHRISE

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management tasks at fires involving highrise buildings.*

2. *Apply the knowledge, skills, and abilities discussed to manage a simulated fire situation involving a highrise building.*

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INTRODUCTION

Highrise buildings generally are defined as structures that are over 75 feet in height and are designed for human occupancy.

This unit discusses the unique problems that can be encountered when fighting fires in highrise buildings. It focuses on specific strategies and tactics that are different from those used generally at ground-level fires.

The first part of this unit covers highrise building design, construction, and fire behavior; how these factors create unusual problems; and why they must be considered when developing strategies or selecting tactics to combat fires in these types of structures. The second part of this unit discusses specific strategic considerations and tactical operations for dealing with highrise fires.

OCCUPANCY-SPECIFIC CUES

Building Design and Construction

Most life safety and fire control problems encountered in modern highrise buildings are related directly to design and construction features of the building. Determining the strategies and tactics necessary to solve these problems requires familiarity with the building.

An important point to remember is that all highrise buildings are not the same in terms of how they are designed or constructed, or in the types of fire protection features that they contain. Construction methods and code requirements have changed through the years and can be factors in fire behavior within a building, as can the built-in protection features that help to mitigate or control the situation. Because highrise buildings can be so different, it is critical that firefighting personnel be familiar with each building and the operation of its life safety and fire protection systems.

Although building height often is used as the sole means of determining what constitutes a "highrise" building, it should not be the only criterion used to determine the severity of the problem. While buildings over a certain height will negate the ability to use fire department ladders for exterior access, this is certainly not the only problem.

Large numbers of occupants, difficult emergency egress, and rapid spread of fire products through the building also can be major problems. Often these same characteristics are present in buildings that are just below the height limit that would require them to have the built-in protection features required by code for highrise buildings. Also consider the fact that many older highrise buildings are sadly lacking in adequate fire protection and life safety features because they were not required under the existing codes.

Structural Framing Systems

The structural frame of a highrise building is the skeleton that supports not only the dead load of the building itself, but also the live loads, such as occupants and building contents.

The most common systems for highrise buildings use either concrete or structural steel for the building skeleton. Both types of construction use vertical interior and exterior columns to which lateral girders are attached. The girders span the horizontal distance between the columns and are used to support structural beams. Although there is a difference in the materials used in a concrete or a steel structural frame, they perform the same function.

Construction designs for highrise buildings usually are based on the concept that the building's structural integrity must be sufficiently maintained through any potential fire. For this reason, the principal components of a highrise structural frame are required to have a high degree of heat resistance but, under prolonged exposure to sufficient heat, failure of these components is possible. For example, failure of a floor beam is somewhat serious, but it also is localized. Failure of a girder would be far more critical because it would affect a significantly larger area. The failure of one or two girders could cause instability of a column and the potential of a progressive collapse of the framing system.

A column failure could result in serious structural instability and, depending on the location of the column, conceivably could trigger extensive collapse.

To achieve the fire protection required by building codes for Type I structures, steel-frame members in highrise buildings are fireproofed by encasing them in concrete or sheet rock, or by spraying them with a protective coating. Concrete has the advantage of being the most permanent type of fireproofing, but its use is limited because it adds to a building's deadweight. Improperly applied sprayed-on protective coatings can spall during a fire, leaving the steel structural member exposed and subject to failure from excessive heat.

Concrete-frame structures tend to resist the effects of fire better than steel-frame structures, but are less resistant to the effects of earthquakes. The ability of properly designed and constructed steel-frame highrise buildings to withstand moderate earthquakes has been proved in recent years in many parts of the world.

Exterior Walls

The exterior walls of modern highrise buildings are usually lightweight and prefabricated. They are nonload bearing, and are referred to as "curtain" walls. A complete curtain wall consists of a panel with finished surfaces and a means of attaching it to the building frame. The most common method of attaching curtain walls to the building is by bolting them to clips which are attached to the structural frame or floor slab.

This method of attaching walls often leaves a space of several inches between the end of the floor and the exterior wall. In many cases, existing codes did not require adequate sealing of this space. Unless this space is sealed with an effective fire and smoke barrier, it can provide a path for fire and smoke spread to floors above and allow water to penetrate floors below.

The outside finish of a modern highrise building, often referred to as the "skin," usually consists of decorative material such as aluminum, stainless steel, or lightweight concrete with large window areas. Many office buildings use a skin constructed almost entirely of plain, tempered, or decorative glass which is held in place with metal-alloy frames and backed up with conventional construction.

Ventilation usually will be dependent on the type of windows installed in the building. Windows in highrise apartments or hotels/motels normally can be opened and, in most cases, are made from regular plate glass. In addition, many highrise apartment buildings have large sliding glass doors opening onto balcony areas. Operating windows, in conjunction with normal smoke removal equipment, simplify ventilation.

Windows in highrise office buildings usually cannot be opened. They are also plate glass, except for special tempered glass windows required at certain locations for emergency ventilation. In lieu of tempered glass for emergency ventilation, some buildings may be equipped with special window panels, secured from the inside by a locking device, and operated by a tool or wrench that is required to be kept on the premises.

Nonoperable windows complicate ventilation procedures and create a dangerous situation if the windows must be broken for ventilation purposes.

As a general rule, when tempered glass or operable windows are required for emergency ventilation purposes in sealed buildings, they will be found on every floor, usually in each corner or on the exterior walls and at specific horizontal intervals. Usually these special windows also are required to be aligned vertically throughout the building.

Tempered glass windows normally are marked as such in one of the lower corners or, if the window is obscured by a window covering or draperies, a decal may be placed in a visible place adjacent to the window. When a tempered glass window is broken to provide emergency ventilation, it will shatter into very small pieces, providing a degree of safety which is not offered by plate glass under the same circumstances.

Removal of window glass during a fire, whether it is caused by the fire or done intentionally for ventilation purposes, can create a situation in which fire can lap on the exterior of the building to the floors above. Any time that glass is removed or fails, consider the possibility of exterior lapping.

A discussion of breaking windows for emergency ventilation purposes is included in the Strategy and Tactics section of this unit.

Roofs

Roofs on highrise buildings are required to be at least 2-hour fire resistive and, in most cases, they exceed that because, in almost every case, they are constructed of concrete. Consider the roof configuration carefully during preplan inspections because of stairshaft exits, machinery rooms, and other obstructions that would limit certain types of activities on the roof.

In many cases, not all stairshafts in the building will exit to the roof. Knowing which stairshafts do exit to the roof can be critical for moving occupants to the roof for safe refuge or evacuation and for use of stairshafts to exhaust smoke. It is also important to know if it is possible to land a helicopter on the roof for a top-down approach to firefighting or interior rescue, or to evacuate building occupants from the roof.

In most cases, unless the code under which the building was built required the provision of a helipad, it probably will be impossible to land a helicopter on the roof because of various obstructions such as machinery rooms, antennae, or lack of adequate landing space.

Shaft Enclosures

Shaft enclosures in highrise buildings normally are required to be a minimum of 2-hour fire resistive. Examples of shaft enclosures are stairshafts and elevators shafts.

Since vertical shafts in a highrise building can, under fire conditions, transfer heat and smoke to other parts of the structure, it is critical that their integrity be maintained. These shafts may be escape routes for occupants of the building or the access routes for firefighting personnel, so it is critical that they not be contaminated with fire products. Failure to maintain the integrity of vertical shafts can transfer problems quickly to other remote parts of the building, impede the safe exit of building occupants, and restrict the ability of fire personnel to perform tactical operations.

Floors

Floors in highrise buildings are required to be a minimum of 2-hour fire resistive. Floors normally are concrete poured over a metal deck, which remains in place after the concrete has set.

After the concrete has set, holes are cored in the concrete to allow for the passage of various utility lines or equipment between the floors. The procedure is called "poke-through" construction. Poke-through construction, if not properly sealed around the cored holes, can seriously diminish the 2-hour fire-resistive rating required of the floor.

Although the most recent codes require that poke-through openings be sealed with a material that reestablishes the 2-hour fire resistance, in many cases it is not done properly; in fact, in some cases, it is overlooked. In older buildings, poke-throughs may not be sealed at all because of the lack of sealing requirements in codes that were in effect when the building was erected.

The lack of proper sealing of these poke-through spaces can allow fire and smoke to travel to upper floors and provide a path for water used during extinguishment to travel to floors below.

It is a good practice during a fire to check the floor above and below the fire floor to ensure that poke-throughs are not causing a problem.

Floor Separations

There are two general design concepts for horizontal floor separations in highrise buildings. They are referred to as "compartmentation" and "open space."

Compartmentation in highrise buildings is based on the concept that small, protected areas will allow the fuel within them to burn out and keep the fire from spreading beyond the separated or protected area. An example of this compartmentation would be a typical highrise apartment building.

Compartmentation can be an essential consideration in limiting the size of a highrise fire, but it is not valid unless it is maintained. Compartment separations must offer adequate fire resistance and must divide plenum areas above dropped ceilings. Vertical fire travel must be curtailed by protective construction features around vertical shafts and above windows and by adequate firestopping of all "poke-through" openings between floors.

Examples of the "open space" concept are highrise buildings where floors are virtually wide open. This openness often is desired to allow unrestricted movement of employees throughout the floor. In a fire situation, however, the lack of physical barriers will allow the fire to spread quickly through the entire floor.

In many cases, highrise floors are divided by partitions that extend from the floor to the dropped ceiling. These conditions do not represent true compartmentation. Should the fire reach the open plenum area above the dropped ceiling, it can move unrestricted through the plenum and extend into other areas of the floor.

Dropped Ceiling Assemblies

Ceiling assemblies in highrise buildings usually are suspended from the floor above by steel wires attached to a grid of metal channels which hold acoustical tiles or other ceiling material and, in most cases, the lighting fixtures. The open space between the suspended ceiling and the floor above normally is used for horizontal distribution of utility services (air conditioning ducts, electrical conduits, plumbing lines, etc.), and often serves as a common exhaust plenum for the heating, ventilating, and air conditioning system (HVAC).

Under prolonged exposure to sufficient heat, suspension wires will weaken, often causing ceiling assemblies to fall. When this occurs, it can greatly impede the progress of firefighters.

Stairshaft Systems

If there is one construction component of highrise buildings that firefighters often do not know enough about, it is stairshaft systems.

As a general rule, stairshafts in highrise buildings are built into the center core. These may be supplemented with additional stairshafts on the outer perimeter of the structure, depending on the height and occupancy type of the building.

In addition to conventional return-type stairshafts, other types of special stairshafts often are found in highrise buildings. The building may contain pressurized or smokeproof stairshafts in which activation of special equipment can provide a smoke-free atmosphere. In many cases, however, even though the building has multiple stairshafts, only one stairshaft may be designed to provide this smoke-free environment. Some highrise buildings feature stairshafts that are referred to as "smoke towers"; these are either fully or partially open to the outside atmosphere to prevent smoke from filling the stairshaft.

Many newer highrise buildings are constructed with "scissor" stairshafts that feature two sets of stairs in one common shaft. In some cases, each set of stairs may serve every floor, but entry points at alternate floors are on different sides of the center core. Some others are designed so that one set of stairs serves only the odd-numbered floors while the other serves only the even-numbered floors. While these subtle differences may not seem significant, under fire conditions, they can be responsible for firefighters approaching the fire from a less than desirable location, or going to the wrong floor.

Stairshaft access doors from individual floors are, in many cases, locked from the stairshaft side. This requires that firefighting personnel have a key to provide immediate access to the floors from the stairshaft. Lacking a key, much time can be wasted in forcing entry to the floor, which often is difficult due to the metal construction of the door and jamb.

As a general rule, stairshaft systems in highrise buildings are not designed to handle the total occupant load of the building **simultaneously**. Additionally, the number of usable stairshafts may be reduced by heat, smoke, or fire department operations. This is one of the main reasons why total evacuation of building occupants during a highrise fire often is impractical. In the early stages of a fire that is rapidly spreading fire products to the floors above, it may be best to relocate occupants of upper floors to safe refuge areas below the fire, rather than attempting to evacuate them from the building. When this is done, it is critical that the occupants be placed in areas that will not be subject to smoke or heat from the fire, that they have an escape route from the area they are placed in, and that fire personnel remain with them to prevent panic.

Stairshafts in highrise buildings should be marked with signs at each landing that provide specific information about the stairshaft. The signs should identify the stairshaft (e.g., Stair #1, Stair #2, etc.), specify the floor where the sign is located, list the lower and upper terminal points of the stairshaft (e.g., Basement B-3 to 18), and indicate whether the stairshaft provides access to the roof of the building. This seemingly simple information can be critical to occupants who are using the stairshaft under fire conditions, and can provide necessary information to firefighters who will be working in the building.

Heating, Ventilating, and Air-Conditioning Systems

Air-handling systems in modern highrise buildings are referred to as HVAC systems and are designed to provide conditioned air throughout the structure through a system of ductwork. For reasons of economy and efficiency, these systems operate on the concept of recirculating most of the air within the building.

Under fire conditions, smoke or heat can enter the system at fire floors and, if the system is allowed to continue in operation, it can fill other parts of the building quickly with this contaminated air. When smoke and heat are pumped through the building in this manner, many occupants can be exposed to highly toxic gases and are placed in serious jeopardy, even though they may be on floors remote from the fire. In a highrise building with a recirculating air-handling system, the fire may be small, but the spread of smoke can be a big problem.

The air-handling systems in most newer highrise buildings are required by code to have smoke-activated dampers in the system, which control the spread of fire products from the area of origin to other parts of the building. In many cases, however, the building may not have such dampers, or they may not function properly.

Because the spread of fire products through the HVAC system is so critical in terms of life safety, the best approach to take if there is any doubt or concern that the system is contributing to the spread, is to shut the system down. Once the fire has been controlled and the safety of building occupants has been ensured, the system can be reactivated if it has the capability of exhausting smoke from the building.

The method of shutting the HVAC system down will vary depending on the particular building. In some buildings, especially older ones, it may be necessary to close switches that control system air intake fans. Many times, these switches are located in machinery rooms on upper floors of the building or on the roof of the building. In many newer buildings, and in some older buildings that have been modified, the air-handling system will shut down automatically under fire conditions, and in some cases, will provide exhaust capability on the fire floor and pressurization of the floors above and below the fire floor.

Information about the air-handling system of a highrise building should be a critical part of prefire planning inspections. This includes how the system operates under fire conditions and where and how the system can be deactivated if necessary.

Electrical Systems

Electrical systems in highrise buildings can be extremely complex and very hazardous under fire conditions. The amount of electrical power required and the complex equipment used to distribute it must be considered when fires occur.

In most highrise buildings, main power vaults or rooms are located in the basement where they can be subject to flooding from broken pipes or from water used to control a fire. The danger of working near electrical equipment when water is present is well known and must be remembered when these situations are encountered.

Sending fire personnel into electrical vaults to terminate power to the building usually is not warranted for several reasons. Because of the electrical load being fed into the building, the shutdown procedure usually is complicated and requires specific knowledge of how to perform it safely. Randomly throwing switches in these situations can be extremely dangerous. If power must be terminated on the floor or floors involved in the fire, it usually can be done through subpanels which control the electrical supply to specific floors.

An emergency power supply, usually a motor-driven generator, may be found in many highrise buildings. The systems that are powered by the emergency supply will, however, vary and usually are dependent on the code requirements in effect when the building was constructed. In older buildings the emergency power may supply only exit lighting in the stairshafts, while in the newest buildings it may serve a large number of fire protection or life safety features such as fire pumps, elevators, and smoke-removal systems. Emergency power activation may be automatic whenever normal power is interrupted, or it may require manual activation by switches. During preplanning inspections, be sure to determine if the building has emergency power, what it supplies, and how it is activated.

Elevators

Under normal conditions, elevators are the only practical method of moving between floors in a highrise building. Under fire conditions, however, elevator operations can become very erratic and extremely dangerous. Many of the control components of elevator systems can be affected by smoke, moisture, and heat, all of which can be present during a fire.

Safe use of elevators under fire conditions requires knowledge of how elevators work, an understanding of what malfunctions may occur, and standard operating guidelines (SOGs) for their use under emergency conditions. A department-wide policy regarding the use of elevators during fires should be developed and adhered to by all department personnel.

Hoistways are the vertical shafts in which elevator cars travel. In buildings with multiple elevators, all the elevator cars in a bank are usually in a common hoistway. Some highrise buildings are equipped with "split-bank" elevators that are configured so that some elevators serve only lower floors of the building while others serve the upper floors. It is important to know whether or not the building does have split-bank elevators and, if so, which floors the different banks serve; this information can be critical to making a decision about whether or not it is safe to use the elevator system.

The hoistway is separated from each floor by a hoistway door, which is opened by movement of the elevator car door when the car is level with the floor landing. Smoke and heat under pressure at the fire floor can enter the hoistway, even though the hoistway doors are closed, and travel upward. As heat and smoke rise within the hoistway, pressure will force it out the hoistway doors onto the upper floors. Elevator hoistways are capable of transmitting large amounts of smoke and heat, which can endanger occupants and cause extensive smoke or fire damage.

If the fire should enter directly into the hoistway shaft, or into an elevator car at the fire floor, serious problems can develop. Elevator cars will burn, even to the point where hoisting cables can fail, causing the car to fall within the shaft. If a large volume of fire enters the hoistway shaft, the shaft acts like a chimney and draws the fire upward, where the heat may be sufficient to ignite materials on upper floors adjacent to the hoistway. If fire has penetrated an elevator car or the hoistway, it is important that personnel be assigned to upper floors to check the spread of fire or smoke.

Almost every highrise building is required to be equipped with elevator emergency service features that will move the elevator cars automatically to specific locations under fire conditions and will allow firefighting personnel to place elevator cars in a "Firefighter Service" mode that provides specific safety features. Automatic recalls are initiated whenever an alarm device is activated; manual recall can be accomplished through recall switches located in a lobby control panel or a fire control room.

Automatic or manual recall of elevators is important for several reasons: it prevents smoke from entering the hoistway, should the elevator car be kept at that floor; it reduces the possibility of occupants being trapped in an elevator car; and it provides fire department access to the elevator cars if a decision is made to use them.

The decision as to when it is safe to use elevators during a fire in a highrise building is one that must be tempered with good judgment. While it is true that using the elevators will speed up initial investigation and fire control efforts, it also is true that an elevator malfunction causing response to an unselected floor can result in firefighting personnel losing their lives. The decision to use elevators should be based on assurances that the elevator lobby on any floor involved with fire does not constitute an unsafe environment for firefighting personnel. This will require that the elevator cars used are not physically capable of reaching the fire floor (split bank), or that fire personnel already on the fire floors can confirm that the elevator lobbies at those floors are tenable.

Even when assurances are in place that elevators can be used safely, additional safety features or procedures should be employed. These include the use of split-bank elevators, never going higher than two floors below the lowest fire floor, and using only elevator cars on "Firefighter Service." In addition, all personnel riding in elevator cars should have full protective equipment, a chemical extinguisher should be in the car at all times, and a knowledgeable firefighter should be assigned to operate the elevator car.

All firefighting personnel should be well trained in the operation of firefighter-service controls on elevator cars. The time to conduct this training or to develop department policies regarding emergency use of elevators is not the day of the fire.

Water Supply

A variety of different water supply systems can be found in highrise buildings. They may include

- 1-1/2-inch wet standpipe systems;
- 2-1/2-inch dry standpipe systems;
- 2-1/2-inch wet standpipe systems; and
- sprinkler systems.

The importance of the water supply systems built into highrise buildings demands that we have knowledge of how these systems work and what problems may be expected in emergency situations. The specific types of water supply systems found in highrise buildings will vary with the age of the particular building and the code requirements in effect at the time it was constructed. Preplan information should include specifics on the water supply system, its capacity, and its functional components.

1-1/2-inch wet standpipe systems have been common in highrise buildings for years. Exceptions can be buildings that are fully sprinklered and Federal buildings that are exempt from local building codes. These systems often are supplied by the domestic water system and are intended as a first-aid device for building occupants; they are not adequate for primary fire department attack because of possible limited water volume and pressure, and inferior hoselines and nozzles. If the 1-1/2-inch system is used for initial attack, any attached hose or nozzles should be replaced with standard fire department equipment.

2-1/2-inch dry standpipe systems are used in many older highrise buildings and, in some cases, in newer buildings that do not exceed specific heights. These systems are relatively simple compared to pressurized systems but have some important differences that must be considered. Since they do not have a constant water supply, it is important that they be charged quickly to give firefighters an available water supply for fire attack. The inlet connections on 2-1/2-inch dry systems also typically serve only one standpipe riser, so it is critical that the riser being supplied is the same one that is used for the fire attack lines.

2-1/2-inch wet standpipe systems are required in all newer highrise buildings over certain heights. These systems provide a constant supply of water under pressure that is adequate to produce effective hose streams on each floor of the building. The primary source for these systems is the domestic supply, which may be supplemented by an auxiliary supply kept in a holding tank within the building. These systems vary in design, and may serve both 1-1/2-inch and 2-1/2-inch outlets, as well as the sprinkler system, if the building is so equipped.

The necessary pressure and flow for a 2-1/2-inch wet system usually are provided by one or more electric pumps, which serve as the primary supply. If an emergency or backup pump is required by code, it commonly will be a diesel-driven pump that activates automatically if power to the electric pump(s) fails. Fire pumps for highrise buildings are usually multistage centrifugal pumps designed to produce the required flow requirement at a pressure that is sufficient for working streams at the highest point in the building. In many older highrise buildings, the water flow capacity in gallons per minute (gpm) is inadequate in terms of the fire potential within the building.

Since wet standpipe systems must contain sufficient pressure to produce effective hose streams at the topmost floor of the building, the pressure within the standpipes at lower floors must be reduced. This is accomplished by the use of pressure-reducing valves installed at each outlet, which are preset to provide the proper outlet pressure for that location, or by the use of orifice plates placed in the outlet valve barrel. Pressure-reducing valves have the advantage of being able to supply multiple hoselines (within reason) while maintaining the proper pressure and flow rate. Orifice plates are stainless steel or brass washers with calibrated holes, which control the outlet pressure by reducing the flow from the outlet. They are quite often tack-welded into the standpipe valve outlet barrel. Two drawbacks to the orifice plate approach are that these devices have no effect on static pressure, and they do not allow for multiple hoselines because of the limited flow that comes through the orifice opening. If orifice plates are removed to provide multiple hoselines from an outlet, the pressure to the lines must be controlled at the standpipe valve, and care must be taken when opening or closing nozzles.

Sprinkler systems in highrise buildings now are required by code in virtually every area of the country. There is no doubt that sprinkler systems do provide an added degree of life safety that is sadly lacking in many older highrise buildings. In some cases, retroactive legislation, enacted as the result of tragic highrise fires, has mandated that older highrise buildings be fully sprinklered, but these cases are the exceptions rather than the rule. The majority of highrise buildings in this country today, and perhaps many in your community, are not sprinklered. These are the ones that probably will be involved in the major highrise fires of the future. Preplanning inspections should take particular note of sprinkler systems when they are present, what areas they serve, and how they can be supplemented.

SOGs should be implemented to supplement any built-in water supply system in a highrise building during a fire as insurance against failure of system components. To do this effectively, firefighting personnel must be acquainted with the building, the water supply system, and the location of fire department water supply inlets.

Communication Systems

When discussing problems that occur at emergency incidents, communications seems to be at the top of the list. Highrise fires are no exception and, in fact, communication problems can be much more severe at a highrise fire than one at ground level. In any kind of emergency situation, good communications are vital to effective operations, and perhaps even more so at a highrise emergency.

Portable fire department communication equipment can be ineffective or even completely unusable at a highrise emergency. There are locations inside highrise buildings where it is virtually impossible to transmit or receive messages using handie-talkie radios. In some cases, satisfactory communications will cease if the transmitting location is relocated by only a few feet. There is a definite correlation between portable radio effectiveness and the frequencies they operate on. As a rule, radio frequencies in the VHF range are very ineffective; those in the UHF are fairly effective in most situations; and those in the 800-megahertz range produce the most consistent results, although they are not perfect.

Most newer highrise buildings, and many older ones that have been retrofitted, have built-in emergency communication systems. These hard-wire systems have jacks at specific locations on every floor and, in some cases, even in the elevator cars; this allows fire personnel at different locations within the building to communicate with each other. Using the system requires plugging into it with a handset or headset, a number of which are normally kept on site.

A built-in emergency communication system can be used as a primary communications channel if portable equipment is not functioning properly, or it can be used as a secondary channel to avoid overloading fire department frequencies.

Built-in emergency communication systems are not the same in every highrise building. Effective use of these systems requires preplanning on the part of fire department personnel regarding how the particular system works and how it would be used during an actual emergency situation.

Fire Control Rooms/Stations

Most current codes require that newly constructed highrise buildings contain a fire control room or station within the building that provides, at a minimum, specific information on alarms that have been activated and the status of fire protection systems within the building.

While a lot of information is available from a fire control room or station, it may not be the best place to locate the Incident Commander (IC), for several reasons. If it is in a basement level, which they frequently are, radio communications probably will be difficult. Positioning the IC at the fire control room also may remove that person from any face-to-face contact with other officers, which could be a problem. In all cases, fire department personnel should be sent to monitor the information available at the fire control room or station and relay it to the IC. This relay often can be established by commercial telephone from the fire control room or station to the fire department dispatch office.

Like other systems installed in highrise buildings, fire control rooms or stations are not all the same. Monitoring the information displayed in these locations, or accessing various systems that they contain, requires some prior knowledge that can be gained only by preplanning before the fire occurs.

Fire Behavior

The perception that modern highrise buildings are entirely fireproof or noncombustible has been proved to be incorrect many times. It is true that the main concrete and steel structural elements of a highrise building have a very high degree of fire resistance. But once the building is completed, furnished, and occupied it is more properly termed semicombustible.

Combustible furnishings used in new highrise buildings, and modern furnishings, as a rule, sustain combustion more readily with less oxygen than older style furnishings; they usually generate more heat and much greater quantities of toxic smoke. The extensive use of plastics and other synthetic materials in some structural items and in many furnishings of highrise buildings has a very pronounced effect on fire spread and smoke generation.

In addition to the fire load that can be present in highrise buildings, they also possess features that contribute to unique fire behavior. The fact that the building is sealed often can result in smoldering fires that create tremendous amounts of heat and smoke. This fact also ensures that, in the initial stages of a fire, virtually all the heat generated by the fire is contained within the building. When a fire of this type is vented, it can grow quickly in intensity, thus shortening the time that ceiling assemblies and other building components (wiring, ducts, etc.) will remain intact. Under such intense fire conditions, windows eventually will fail and may allow rapid vertical extension of the fire on the exterior of the building.

Efforts to reach the seat of a fire in a highrise building often are difficult because the flow of heat and fire is usually toward the natural draft in the center-core area where stairs and elevator shafts are located. This natural air movement not only increases the speed at which a fire will spread horizontally, it also can create untenable conditions at the floor access point where the fire attack is made. The amount of heat that can build up inside a highrise building during a fire can be much greater than that encountered in other types of structures.

Regardless of where the fire is located, one of the chief concerns is ensuring that the fire, smoke, and heat do not spread to other parts of the building. This requires that the fire, smoke, and heat be kept away from stairshafts and elevator shafts, and that any unsealed openings between floors do not allow it to spread. If the fire is near the exterior perimeter of the building, special caution should be taken to prevent spread to floors above through the space between the floor and curtain wall or by lapping out of windows that have failed.

Summary

As was stated in the introduction to this section, effective highrise firefighting requires knowledge of highrise buildings. In order to solve problems encountered during highrise fires, fire personnel must be knowledgeable about construction features of highrise buildings and the functions of the life safety and fire control systems they contain. The only way that this knowledge can be developed is by becoming familiar with highrise buildings during their construction phase and by prefire planning at periodic intervals.

To ensure that personnel are trained adequately in highrise operations, and that preplanned operational procedures will work, occasional drills should be conducted at actual building sites.

It also is important that pertinent information developed during inspections or preplanning of highrise buildings be recorded and available at the incident scene.

COMMON PROBLEMS TO IDENTIFY

Life Safety

Because of the number of people that may be in a highrise building and the possible difficulty of exiting the building under fire conditions, the potential for life loss is extremely high.

Based on this potential, life safety considerations for building occupants must be the primary concern of the IC and other Command Officers at any highrise fire. This requires immediate feedback to Command Officers on the status of occupants in areas directly or indirectly affected by the fire. Timely assignment of resources to search and rescue activities whenever it is indicated also is critical.

Any delay in addressing life safety issues during a working highrise fire could result in large numbers of deaths and injuries.

Locating the Fire

Because of building height, construction design, and location of the fire, it is not unusual to have a working fire in a highrise building with nothing visible from the exterior.

In many cases, information given on dispatch of emergency units may not identify the specific location of the emergency.

Most highrise buildings will, however, have alarm systems within the building that are connected to display panels that indicate where alarms have been activated. Alarms may be activated by:

- smoke detector;
- heat detector;
- water flow alarm; or
- alarm pull box.

Regardless of whether fire or smoke are visible from the outside of the building, the alarm panel in the building should be checked to verify the specific floor(s) where alarms have activated. This will provide a more accurate determination of where the problem is, and also can be used to confirm information received on dispatch.

Preplanning of highrise buildings should include information on alarm systems within the building and location of alarm display panels.

Time/Distance Factors

The amount of time required to complete tasks during highrise emergencies can be extensive because of the distances that have to be traveled.

Movement of resources from ground level to the upper floors of the building can be very time consuming in situations where time is critical. Also, operating in the very hot and smoky environment that can be present during a highrise fire tends to slow the movement and progress of fire control personnel.

The impact of time/distance factors at a highrise fire can be minimized by moving resources as quickly as possible to a Staging Area two floors below the fire. The goal is to turn the incident into a two-story fire by placing needed resources in a position where they can reach the problem areas quickly.

The Staging Area also can be immediate sources of fresh or rested personnel required for sustained tactical operations.

Ventilation

Ventilation can be a very time-consuming and dangerous activity at a highrise fire.

Because of the design and construction of highrise buildings, the options for removing smoke and heat from them often are limited. This is especially true in sealed buildings that have no operating windows.

Breaking window glass as a means of removing heat and smoke from fire floors requires coordination with other tactical operations and a high level of safety awareness. For example, charged hoselines should be positioned on the floor where windows are being broken and on the floor(s) above to prevent vertical extension. A safety zone also must be established at ground level to prevent injuries from falling glass.

Using stairshafts to channel heat and smoke from the building is an option, but it requires a very high level of coordination to be safe and effective. The stairshaft used for this purpose must provide an unrestricted path of travel for heat and smoke to leave the building. It is critical that civilians and fire personnel not enter this stairshaft while a ventilation operation of this type is in progress.

CUE-BASED PREDICTIONS

Evaluating the information that has been discussed to this point and adding a fire situation, we can make predictions of what may happen during a working fire in a highrise building.

- Life hazards during a highrise fire can be extremely serious. This requires that immediate attention be given to the life safety problem.

- Fires in highrise buildings, even though comparatively small, can cause major problems.

- Working fires in highrise buildings will require resource commitments that are greater than required for the same size fire at ground level.

- Extension of fire and smoke from the fire floor(s) to other parts of the building can occur rapidly.

- The time/distance factors associated with conducting tactical operations in highrise buildings will require that sufficient resources be deployed as quickly as possible to a Staging Area located (preferably) two floors below the fire.

- The physical efforts associated with fighting highrise fires will require frequent relief of personnel.

- Sustained operation of hoselines during a highrise fire will require a rotation system to maintain a constant application of water on the fire.

- Time limitations imposed by breathing apparatus capacity will have an effect on many tactical operations.

- Many buildings have vanity addresses (World Trade Center (WTC)).

STRATEGY AND TACTICS

Occupancy-Specific Strategies

Access methods and routes used to reach a reported fire area in a highrise building must be selected with care to avoid placing members in unnecessary danger. Departmental SOGs should address the use of elevators and stairshafts during highrise fire operations.

Strategies for search and rescue operations must be based on cues associated with the large life load within the building, limited means of rapid egress for occupants, and the environment within the building in terms of heat and smoke.

Strategies for controlling the fire must be based on the construction features of the building, the built-in fire protection systems, and the location and extent of the fire.

Strategies for ventilation of affected floors must be based on smoke conditions, the status of the HVAC system, the location of occupants, and the location of the fire.

Tactical Considerations

Any fire in a highrise building may require **search and rescue operations**. Normally, the scope of these operations will be determined by fire and smoke conditions within the building, and the occupant load.

Search and rescue operations should begin at the area most affected, normally the fire floor. The primary/secondary search method should be used to cover affected areas as soon as possible, with an initial search and a followup search that is more detailed. Floors above the fire floor that are contaminated with smoke or heat at a level that would endanger occupants also should be searched.

Before search and rescue operations begin, escape routes for personnel performing these operations should be identified and made known to all members. All members must be aware of the time limitations imposed by the self-contained breathing apparatus (SCBA) they are wearing, and that supervisory personnel must be kept informed of their status.

Consider evacuation routes for building occupants. Stairshafts used for evacuation should be free of smoke and heat and lead occupants either to a safe refuge area within the building or to a location from which they can exit the building safely.

Fire attack activities in highrise buildings can be complex compared to fires in ground-level structures.

One of the first decisions that must be made is from which stairshaft the fire will be attacked. If there are any indications that fire is present, load hoseline(s) before the door is opened. If possible, attack the fire from a direction that will not drive it into uninvolved areas. A sufficient number of hoselines should be positioned as quickly as possible to confine and extinguish the fire. Take care to prevent driving the fire around or through the core area of the floor, where it may cut off stairshaft escape routes or cause fire and smoke to enter the elevator hoistways.

Immediately upon entering the floor, if active fire is present, check the plenum area above for fire extension. Fire can enter the plenum area and drop down, cutting off escape routes for firefighters. A backup or safety hoseline should be positioned behind each fire attack line as soon as possible, positioned to protect stairshafts and elevator lobbies. If there is a potential for vertical extension of the fire, hoselines also should be positioned above the fire.

All members involved in fire attack must be aware of time limitations imposed by SCBA capacity. Allowing for the time required to enter the floor and exit safely, the amount of time actually spent fighting fire can be relatively short. A rotation system of fire attack personnel will be necessary to keep hoselines in operation.

Ventilation activities during a highrise fire can be critical to other tactical operations, such as search and rescue and fire attack. Floors should be ventilated as necessary to support those operations.

Make a determination regarding the most effective way to ventilate the affected floors. If the HVAC system in the building has smoke removal capability, it should be used. If the smoke removal feature of the system is not activated automatically, personnel who are familiar with the required procedures must activate the system manually.

If the building has windows that open, they should be used for horizontal ventilation, assisted by placement of smoke ejectors. Breaking of glass in highrise buildings to ventilate can be done if no other practical means are available. As stated earlier, this is an extremely dangerous operation that must be done with specific safety concerns.

Pressurization of stairshafts to assist ventilation through a selected stairshaft, or to maintain smoke-free conditions in stairshafts used for other tactical operations, should be considered. Pressurization can be accomplished, in most cases, by placing several large-capacity smoke ejectors at the ground-level stairshaft exit door. If this procedure is being used to create a positive pressure in the stairshaft to maintain a smoke-free atmosphere, it is critical that a minimal number of stairshaft doors be opened.

Salvage activities performed in a timely manner can reduce dramatically the overall damage caused by a fire in a highrise building.

Limiting smoke spread to other parts of the building can be important in minimizing the monetary loss of a highrise fire. Placing salvage covers on floors below the fire to protect contents can reduce water damage significantly.

Water runoff to floors below can be controlled, to some degree, by using sawdust dikes and channeling water into drains in toilets or utility rooms.

If possible, keep water from draining down elevators or stairshafts.

INCIDENT MANAGEMENT CUES

The expansion of the Incident Command System (ICS) at a highrise fire should be based on incident needs and conditions. Because of the complexity of these types of fires, establishing General Staff and Command Staff functions frequently is required. In many cases, the organization of tactical resources under the Operations Section may be extensive.

Departmental SOGs should provide for a systems approach to fighting highrise fires. The system should include timely assignment of personnel to the following critical functions:

- fire attack/investigation;
- Lobby Control;
- Systems;
- Base;
- Staging; and
- Operations.

In addition, assignment of supervisory personnel (such as Divisions and Groups) to areas and functional activities within the building is recommended.

Safety of incident control personnel at a highrise fire must be a priority concern. This concern can be addressed by the assignment of Safety Officers outside the building to control perimeter access and ground-level operations, and one or more within the building to focus on tactical operations.

There is a critical need to coordinate all tactical activities at a highrise fire to ensure safe and effective operations. Timely implementation of tactical activities in the areas of the fire attack--search, rescue, and ventilation--is crucial to a successful outcome. Sustaining these operations for prolonged periods of time under very difficult conditions requires teamwork, cooperation, and coordination.

It also is critical to coordinate support activities with tactical operations. Without proper support through functions such as Base, Lobby Control, Ground Support (stairwell support), and Staging, the entire operation may be placed in jeopardy.

HIGHRISE SIMULATION

Incident Description

Saturday afternoon at 4 p.m. citizens have reported a fire in a highrise office building at 20th and Z Streets in Downtown Central City. The building is 20 stories high, 150 feet in width by 150 feet in length, with center core construction. The building, constructed with noncombustible materials is occupied by private businesses. The offices in the building are not occupied at this time, but there is a company party in progress on the 20th floor with approximately 60 people present. The first-alarm assignment has been dispatched and the initial-arriving units have reported heavy smoke showing from the address side (front) of the building and request that the second- and third-alarm assignments be dispatched.

The walkaround slides show

Side A
Side C
Roof
Lobby
Elevator lobby
Interior hall
Floor plan
Floor plan

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Quick Access Prefire Plan

Building Address:
1700 20th Street (at Z Street)

Building Description:
150' x 150', 20-story, fire-resistive construction, center-core highrise

Roof Construction:
Poured reinforced concrete over metal decking

Floor Construction:
Poured reinforced concrete over metal decking

Occupancy Type:
Office and banquet

Initial Resources Required:
4 E, 2T, 1 BC, 1 PM, 1 Safety Officer

Hazards to Personnel:
Electrical control room in basement

Location of Water Supply:
One hydrant 200' east and one hydrant 200' west

Available Flow:
8,500 gpm

	Estimated Fire Flow*			
Level of Involvement	*5%*	*10%*	*25%*	*50%*
Estimated Fire Flow	800	1,600	4,000	8,000

**Based on 1st floor with 5 exposure floors (100% = 16,000 gpm rounded).*

Fire Behavior Prediction:
Fast horizontal and possible vertical spread.

Predicted Strategies:
Rescue, Confinement, Ventilation, Extinguishment.

Problems Anticipated:
Major rescue problem, 60 to 100 personnel on scene at a working fire, developing the needed fire flow, vertical lapping, smoke in stair and elevator shafts.

[X] **Standpipe:** *Yes (wet)*	[ ] **Sprinklers:** *No*	[ ] **Fire Detection:** *No*

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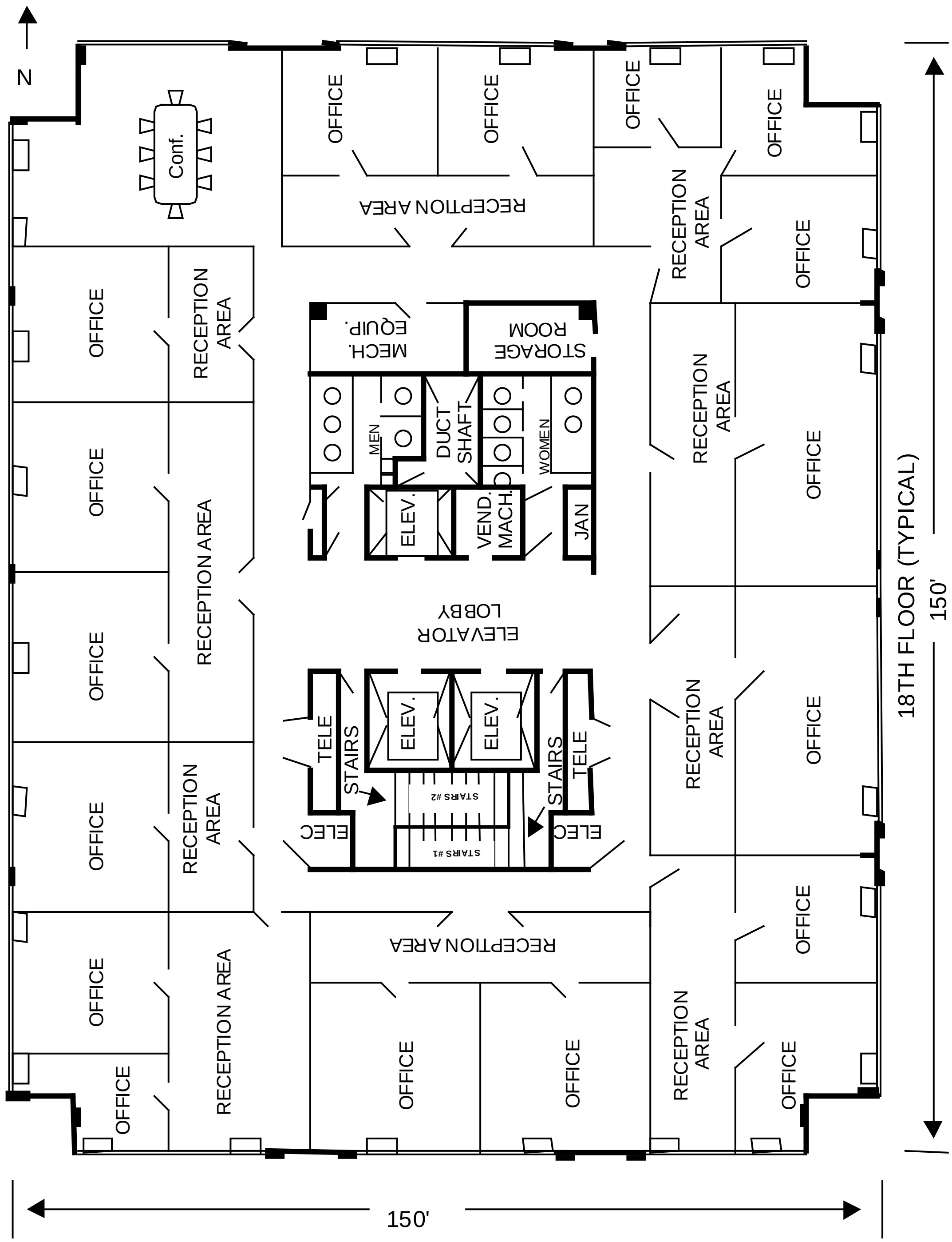
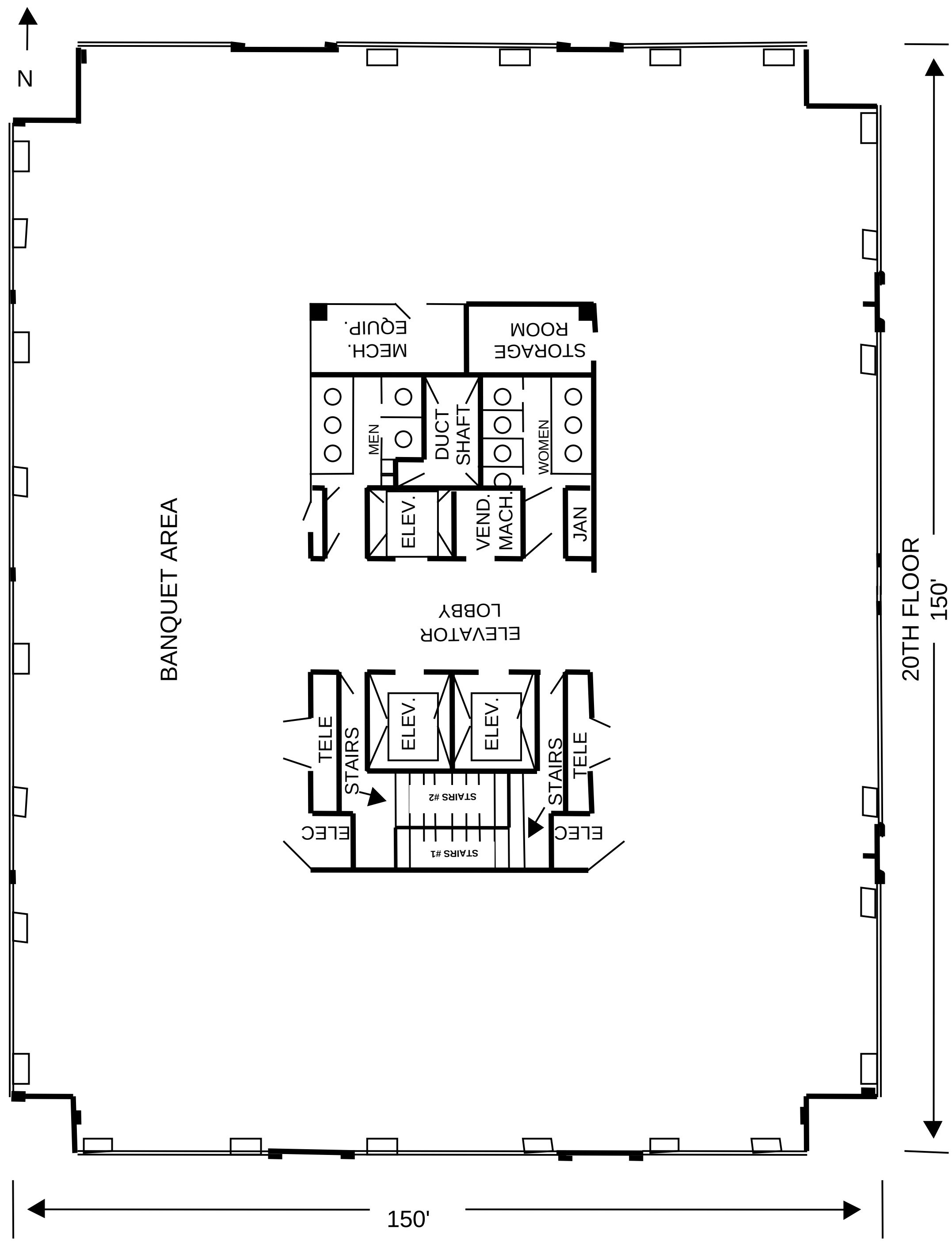
Floor Plan


N
Conf.
OFFICE
RECEPTION AREA
MECH. EQUIP.
STORAGE ROOM
MEN
WOMEN
DUCT SHAFT
ELEV.
VEND. MACH.
JAN
ELEVATOR LOBBY
TELE
STAIRS
ELEC
STAIRS #2
STAIRS #1
18TH FLOOR (TYPICAL)
150'
150'

Floor Plan (cont'd)



SIMULATION 13: INDUSTRIAL BUILDING

(OPTIONAL)

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management tasks at fires involving industrial buildings.*

2. *Perform the management functions required of the assigned Incident Command System (ICS) positions at fires in industrial buildings.*

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INTRODUCTION

For the purposes of this course, an **industrial building** is defined as a building used to develop, fabricate, and/or produce a product for commercial purposes.

OCCUPANCY-SPECIFIC CUES

Construction Factors

The construction of industrial buildings will vary to some degree with age, geographical location, type of product, and the building codes that were in force at the time of construction. For example, high-tech industrial buildings in the western United States usually are noncombustible concrete tilt-up or concrete block, while buildings occupied by the garment industry in the eastern United States are often multistory ordinary or heavy timber construction. Agricultural buildings often are metal clad or wood frame, while heavy-timber buildings may be found in the food processing industry (e.g., canneries, packing plants, etc.).

It is important to remember that these are just some common associations, and that there is no correlation between the product/process and the exterior construction.

Incident Commanders (IC's) must be careful not to be fooled by exterior appearances. Changes in occupancy, which may change processes, configuration of floor space, and degree of product hazard, may alter strategies. These issues and other points that will be discussed in this unit make effective building inspection and preplan programs of paramount importance.

The configuration of the interiors will vary greatly, depending on the needs of the particular operation. Production areas may be large and clean as in the semiconductor industry, yet contain hazardous materials, while production areas in the furniture manufacturing industry are cluttered, dusty, and contain a large amount of combustibles. Offices, storage rooms, mechanical rooms, loading docks, product storage, and research labs are all common in industrial facilities. In addition, different processes can involve conveyors, heavy machinery, high-temperature ovens, or hazardous materials, all of which can have an impact on firefighting operations.

Resource Considerations

Water supply is always a major consideration in an industrial area. The fire loading and potential for fire spread in this type of occupancy are considerable. Preplanning can help Command Officers determine available water supply, estimated fire flow requirements, and alternate strategies such as equipping first-responding engines with large-diameter hose.

Of course, built-in fire protection systems and the proper support of these systems by the fire department may contribute significantly to suppression efforts. However, in many cases, sprinkler systems are not installed, either because they weren't required at the time of construction, or because water is not the appropriate extinguishing agent. In cases where water cannot be used (computer centers, water-reactive products, etc.), the IC must consider alternative resources.

Industrial companies should have an internal emergency procedure/plan that would include evacuation and accounting for employees, among other things. However, the fire department cannot depend on such procedures being in place and must plan its resources accordingly. Evacuation in this type of incident can be very labor-intensive due to the size and complexity of the interior. In addition, often in industrial fires, buildings that are adjacent and downwind must be evacuated due to toxic smoke/vapors.

Consider outside agencies when projecting resource needs. How will they be integrated into the overall strategy? Do we have the ability to communicate with other agencies? Some agencies to be considered are mutual-aid fire departments, police, industrial emergency response teams, environmental protection agencies, and technical specialists.

Structural Deterioration and Collapse Potential

Due to the general nature of these occupancies, there are many voids, pipe chases, areas of duct work, dropped ceilings, and unprotected openings that will allow fire to extend and burn undetected. This often allows fire to impinge on roof structures, increasing the potential for collapse. Lightweight roofs are another concern. Lightweight truss construction tends to collapse after less than five minutes of direct fire impingement. Panelized roofs are very common in industrial buildings; they tend to burn away from the underside, appearing to be intact on the exterior. Untrained or unaware firefighters can fall through these roofs and be injured or killed. Even heavy glue-lam or metal "I" beams will give way if the concrete supports spall or metal support posts twist and fail.

Ordinary construction presents the most potential for wall collapse, especially brick construction. However, concrete tilt-up buildings can come apart at the corners where the walls are joined, allowing the walls to collapse outward. It is important that ICs recognize the collapse potential and dangers presented by the different types of construction. The time to develop the necessary skills and knowledge to do this is **before** the incident occurs.

In most cases, with prompt notification and adequate response, industrial fires can be handled with an aggressive interior attack using large handlines.

Haz Mat Operations and Organization

Industrial buildings often contain hazardous materials in quantity. These materials may range from low to extreme severity for life, fire, and reactivity. This usually calls for the dispatch of a Haz Mat Response Team to incidents involving industrial buildings.

The haz mat team operates directly for the IC or the Operations Chief (when established). Haz mat is either a Group or a Branch, depending on the severity and risk of the situation.

Haz mat may have the following subunits:

- Entry Team;
- Backup Team;
- Research;
- Decontamination;
- Perimeter;
- Haz Mat Safety.

Haz Mat Safety reports directly to the scene Safety Officer, but works with and advises the Haz Mat Group/Branch Officer.

CUE-BASED PREDICTIONS

Well-trained ICs are aware of and make use of incident-specific cues to assist them in developing appropriate strategies for incident mitigation. Earlier we discussed the cues of various construction types. Additionally, the type of industry/production will give us cues relating to fire load, presence of hazardous materials, method of attack, and required resources.

During the hours of operation (in some cases, 24 hours a day), rescue and evacuation are critical. This problem is compounded because in this type of occupancy, employees often work in small groups in many locations (labs, offices, production, etc.). This makes it difficult to notify and locate everyone. Generally speaking, most employees are adults and mobile, able to self-evacuate. However, physically challenged individuals are employed in many industries. Consider putting this information on preplans and dispatch cards.

For all the reasons already discussed, it is imperative that fire be located and confined early. This will require multiple large handlines, placing an even greater demand on personnel.

Almost as important as fire control in these buildings is ventilation. Rapid, effective ventilation will assist greatly with primary search and evacuation. It will reduce toxic levels and aid in suppression efforts. In many cases, it even will reduce dollar losses. For example, in the high-tech industries a "ten-cent" trash fire can cause millions of dollars in fire losses by damaging computers, chips, etc., if it is not vented and controlled quickly.

STRATEGY AND TACTICS

If we are going to prevent serious life and property losses in industrial fires, preincident preparation (PIP) is a must. The resource demands of industrial fires will not allow us to wait until the incident occurs to begin planning.

Due to the potential for rapid escalation, consideration should be given to increasing the first-alarm assignment to industrial areas on complexes that present special problems.

Another consideration is for the fire department to work with industry to develop onsite emergency response teams. These would be comprised of trained employees familiar with the processes and equipment. They could assist with evacuation and provide fire department personnel with technical advice and support.

First-alarm companies should be committed to those actions that will have the greatest impact on the overall outcome. These assignments could vary with the nature of the business and the specific problem (i.e., fire, spill, smoke, etc.). During hours of operation, evacuation and accounting for employees must be started immediately. This should be coupled with aggressive fire control and ventilation. Depending on the incident, ventilation efforts may include adjacent buildings.

It is important to confine the fire early. Otherwise, your actions quickly will become defensive.

This requires enough personnel to check all the possible avenues of extension, in addition to personnel operating handlines.

Handlines used to suppress the fire should be adequate to overwhelm the fire. Considering the potential in this type of fire, you can't afford to take a chance with "just enough."

This type of operation can be very labor-intensive and has a significant potential for both firefighter and civilian injuries.

Properly equipped and staffed rehab areas and medical areas should be considerations of the IC.

Simulation 13

Homework Assignment

Industrial Building Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on industrial buildings the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the same groups established for classroom activities. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation. At the conclusion of the presentation, the instructor will collect the worksheets from the students and retain them.

2. After reading the SM, your group will answer the questions pertaining to different situations or problems at industrial building fires.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems that were not discussed.

Scenario 1

At 2130 hours Saturday, a fire is reported at a large one-story industrial building. On arrival, you, acting as the Battalion Chief, see a National Fire Protection Association (NFPA) 704M, *Guide to Fire Hazards of Materials* placard on the structure. The placard shows a Blue 4, a Red 4, and a Yellow 3. Research and define each of these severity numbers, and define your actions based on this placard.

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Scenario 2

A gas leak is reported at an industrial building in an industrial area of your community. On arrival, the first engine company reports a very strong odor of propane gas one block from the reported incident site. What actions are you going to take as the Battalion Chief, and what orders are you going to issue to the responding companies? (Your group should review the propane gas incident case study for Buffalo, NY, in the Appendix of this unit.)

Simulation 13 Homework Assignment (cont'd)

NFPA 704M Identification of Hazards of Materials					
Identification of Health Hazard Color Code: BLUE		Identification of Flammability Color Code: RED		Identification of Reactivity (Stability) Color Code: YELLOW	
Type of Possible Injury		Susceptibility of Materials to Burning		Susceptibility to Release of Energy	
Signal		Signal		Signal	
4	Materials that on very short exposure could cause death or major residual injury.	**4**	Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or that are readily dispersed in air and that will burn readily.	**4**	Materials that in themselves are readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.
3	Materials that on short exposure could cause serious temporary or residual injury.	**3**	Liquids and solids that can be ignited under almost all ambient temperature conditions.	**3**	Materials that in themselves are capable of detonation or explosive decomposition or reaction but require a strong initiating source or which must be heated under confinement before initiation or which react explosively with water.
2	Materials that on intense or continued but not chronic exposure could cause temporary incapacitation or possible residual injury.	**2**	Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.	**2**	Materials that readily undergo violent chemical change at elevated temperatures and pressures or which react violently with water or which may form explosive mixtures with water.
1	Materials that on exposure would cause irritation but only minor residual injury.	**1**	Materials that must be preheated before ignition can occur.	**1**	Materials that in themselves are normally stable, but which can become unstable at elevated temperatures and pressures.
0	Materials that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.	**0**	Materials that will not burn.	**0**	Materials that in themselves are normally stable, even under fire exposure conditions and which are not reactive with water.

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In Class
Activity 13.1

Incident Command System Organization

Purpose

You will complete a Strategy Prompter for an industrial building scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the worksheet for the activity.

3. The class will be shown a slide of an industrial building. The building has an NFPA 704M designation of 4-4-3. Everyone will review the scenario description and the plot/floor plan.

4. Your group will write its strategies on the Strategy Prompter and convert those strategies into an Incident Command System (ICS) organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident. Also, be prepared to describe what actions you will take before entering the structure due to the NFPA classification. Five minutes after arrival you determine that the fire involves a lab that has nitrogen gas as its only hazardous material**. Now do the Strategy Prompter worksheet.**

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 15 minutes total. Be brief, but to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, you must identify which Division or Group is performing that task.

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In Class
Activity 13.1 (cont'd)

Scenario Description

Construction

120' x 120', industrial building--testing lab.
Noncombustible construction.
Walls--concrete block.
Roof--steel bar-joist, metal deck sheathing with paper, tar, and stone.

Fire Location

Reported in a lab area.

Time and Day

1000 hours, Thursday.

Water Supply

4,000 gpm total system flow.

Resources (1st alarm)

4 engines
1 truck
1 Haz Mat Response Unit
1 PM Unit
1 B/C

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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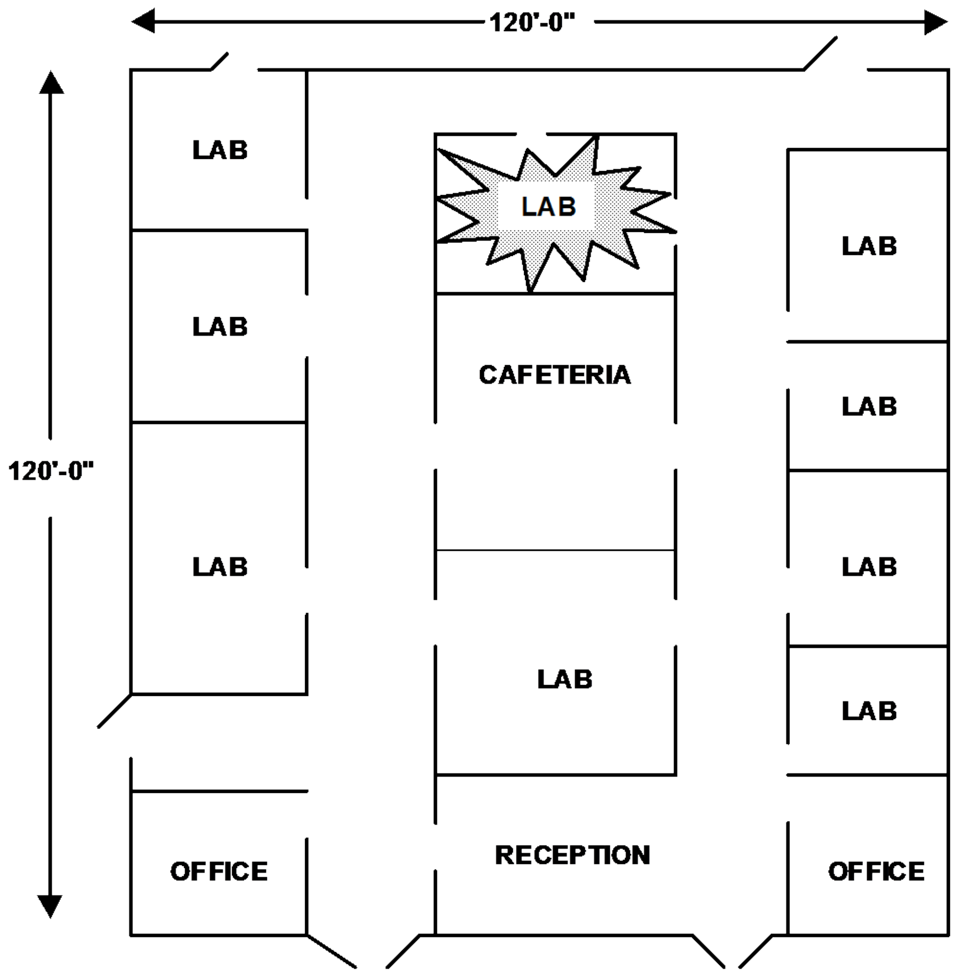
In Class
Activity 13.1 (cont'd)

Plot/Floor Plan



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Simulation 13

INDUSTRIAL BUILDING SIMULATION

Incident Description

A large two-story, high-tech industrial manufacturing and testing facility.

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Simulation 13
Quick Access Prefire Plan

Building Address:
2297 7th Street

Building Construction:
Two-story, noncombustible concrete and glass, 100' x 150'

Roof Construction:
Panelized roof, covered with tarpaper and rolled roofing

Floor Construction:
Poured concrete

Occupancy Type:
Semiconductor, Manufacturing/ Research and Development

Initial Resources Required:
4 Engines, 1 B/C, 1 Truck, 1 PM, 1 Haz Mat Unit, 1 Safety Officer

Hazards to Personnel:
High-temperature ovens, various chemicals used in process and labs, liquid nitrogen storage outside on Side B

Location of Water Supply:
One hydrant in front, one hydrant 200' north; one hydrant 200' west

Available Flow:
All 1,500-gpm hydrants, total flow 4,500 gpm

	Estimated Fire Flow*			
Level of Involvement	*10%*	*25%*	*50%*	*100%*
Estimated Fire Flow	625	1,550	3,100	6,200

**Fire flow based on first floor plus second-floor exposure (rounded).*

Fire Behavior Prediction:
Horizontal extension if it gets into dropped ceilings or pipe chases; accelerated fire if it gets into haz mat storage.

Predicted Strategies:
Evacuation and primary search; ventilation; aggressive interior attack and confinement.

Problems Anticipated:
Dense smoke; long hose lays; accountability of employees; ventilation difficult due to type of building.

☐ **Standpipe:** *No*

☐ **Sprinklers:** *No*

☒ **Fire Detection:** *Heat and Smoke*

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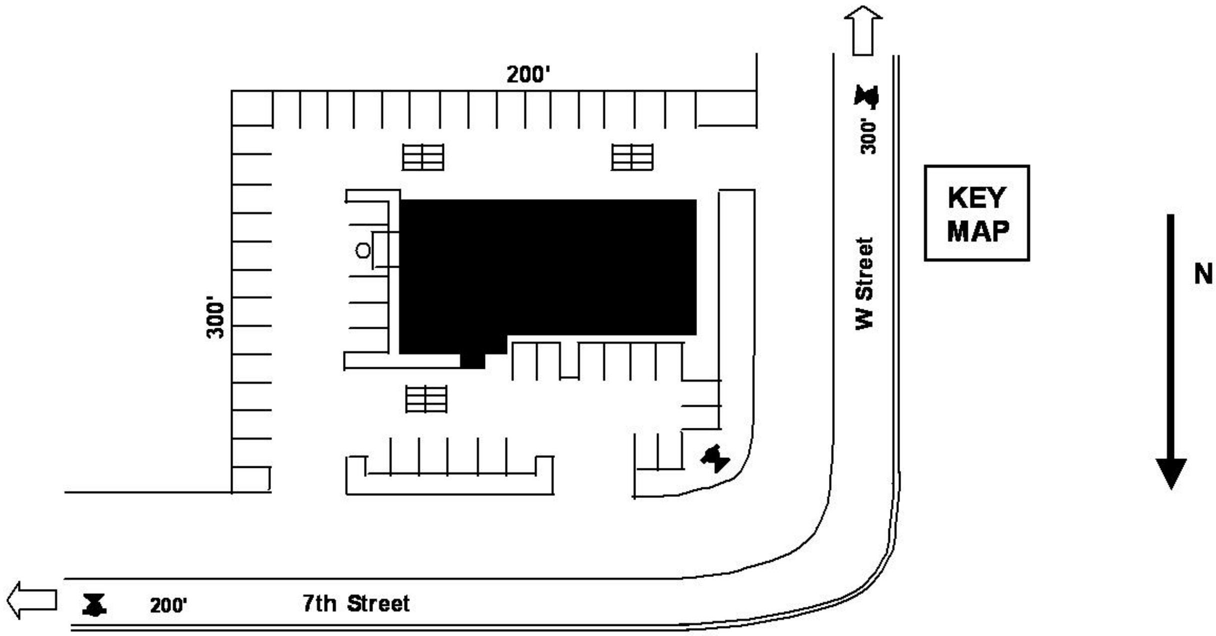
Simulation 13

Plot/Floor Plan



2297 7th Street

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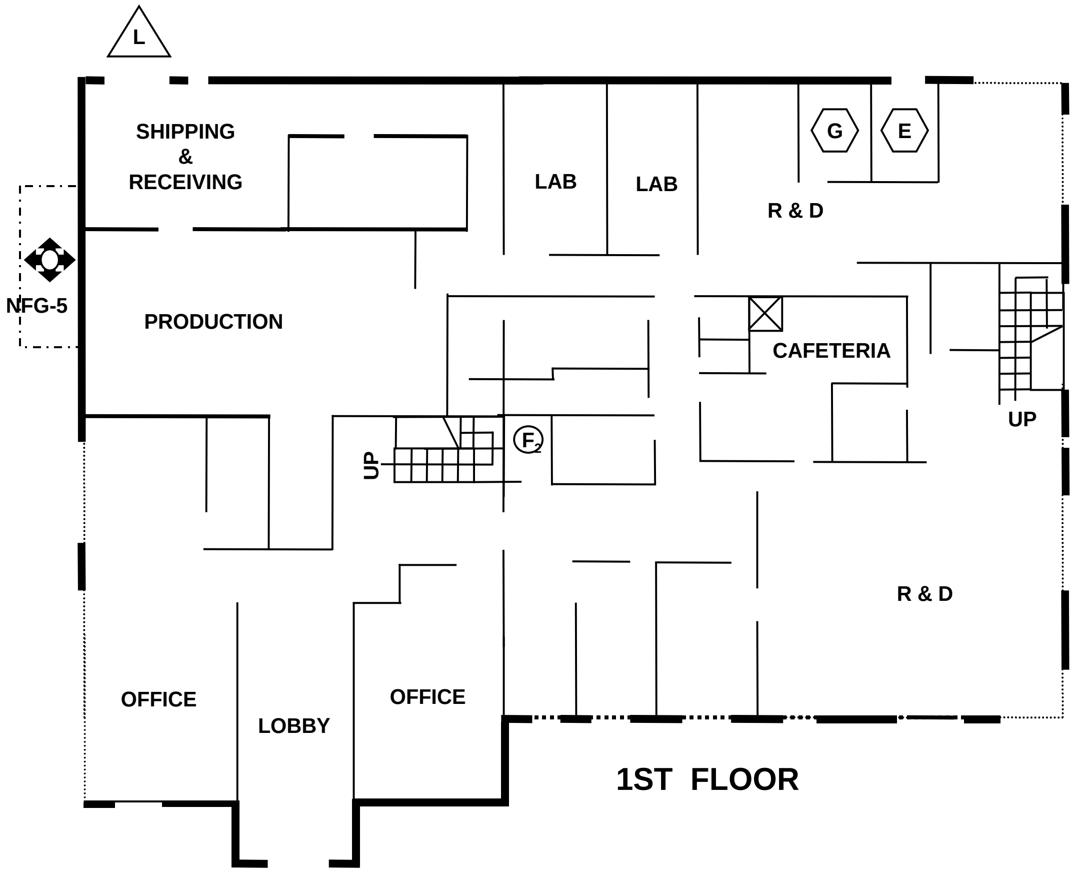
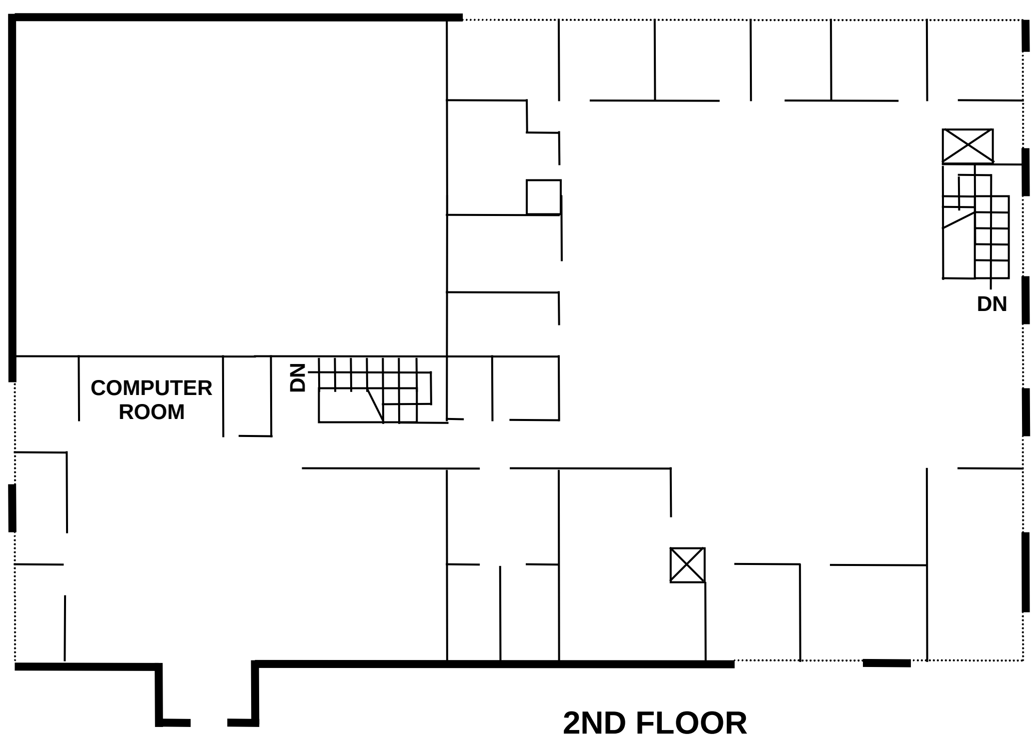
Simulation 13

Plot/Floor Plan (cont'd)





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APPENDIX

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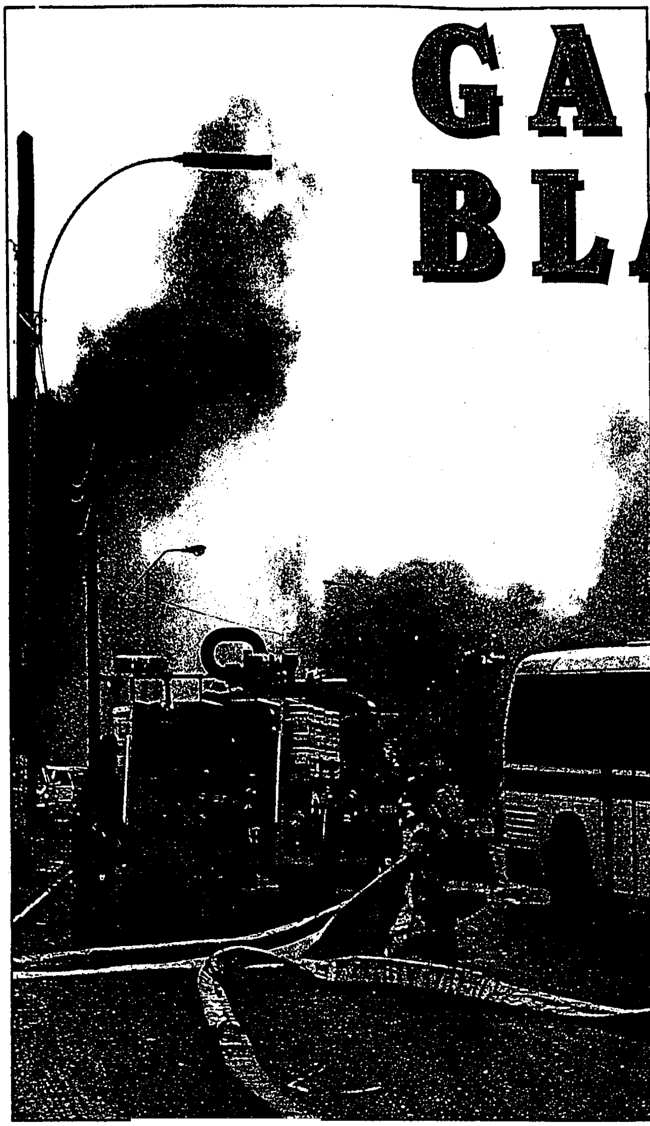
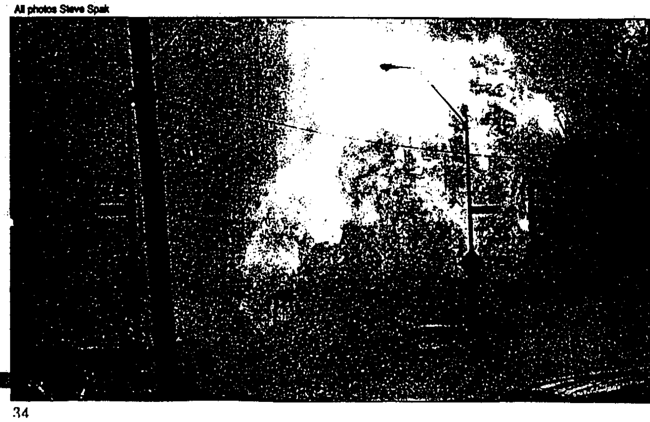


GAS BLAST

A violent gas explosion and fire ripped through a South Bronx, New York, industrial area on December 29, 1989, killing two men and injuring at least 36 people, including 21 firefighters. Work was underway to clear an obstruction in a Con Edison electrical duct adjacent to a 26-inch gas main. An explosion occurred outside the utility gas plant and power substation, resulting in a fireball that was visible for miles. Five alarms were transmitted in rapid succession, bringing 400 firefighters and 101 pieces of apparatus. The fire extended to the electrical substation, causing widespread power outages in Manhattan and The Bronx. The fireball, which burned for nearly an hour, created intense radiated heat that kept firefighters at a distance. Eventually, the flow of gas was stemmed by closing two valves in The Bronx and one in Queens.

(Counterclockwise from left) *Satellite 4 member stretches four-inch hose to supply truck-mounted master stream device. Backhoe is visible where explosion took place. Fire roars skyward and threatens the Con Edison structure, eventually extending to the building on several floors.*

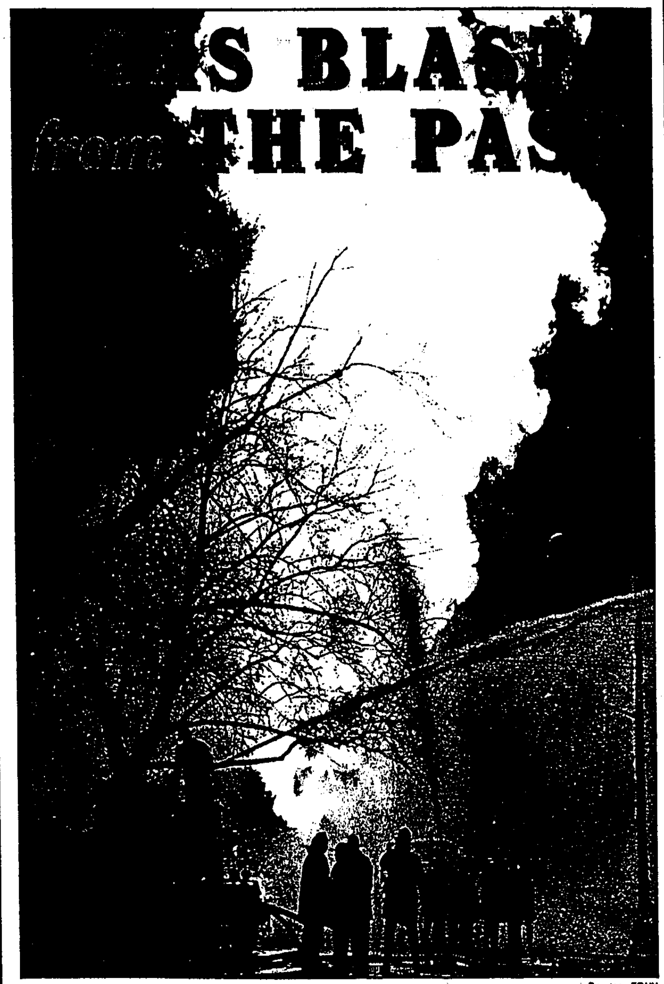
All photos Steve Spak



34 Firehouse/March 1990

By HARVEY EISNER

(Clockwise from above) *Firefighters from Satellite 4 await water as fire continues to explode from the ruptured pipeline. Fire extends to the Con Edison building on the left. Electrical wires from this substation were damaged and a recycling plant was destroyed. Firefighter stretches supply-line to protect exposures. Because of the intense heat, no operations could be conducted close to the blast site.*



Courtesy FDNY

During the early-morning hours on January 13, 1967, FDNY units located in the Jamaica section of Queens, New York, responded to a report of a gas leak in a residential neighborhood. Residents were evacuated because of the heavy concentration of gas in the area. Engine 298 and Ladder 127 stalled because of the gas concentrations, were abandoned and destroyed when a spark ignited the leaking gas. The resultant fireball and radiant heat destroyed or damaged 17 residential structures. Thirteen alarms were transmitted with companies from Queens, Brooklyn and Manhattan responding to quell the blaze.

Firehouse/March

Jamaica Natural Gas Leak

MILTON BRODEY
Battalion Chief
46th Batt.

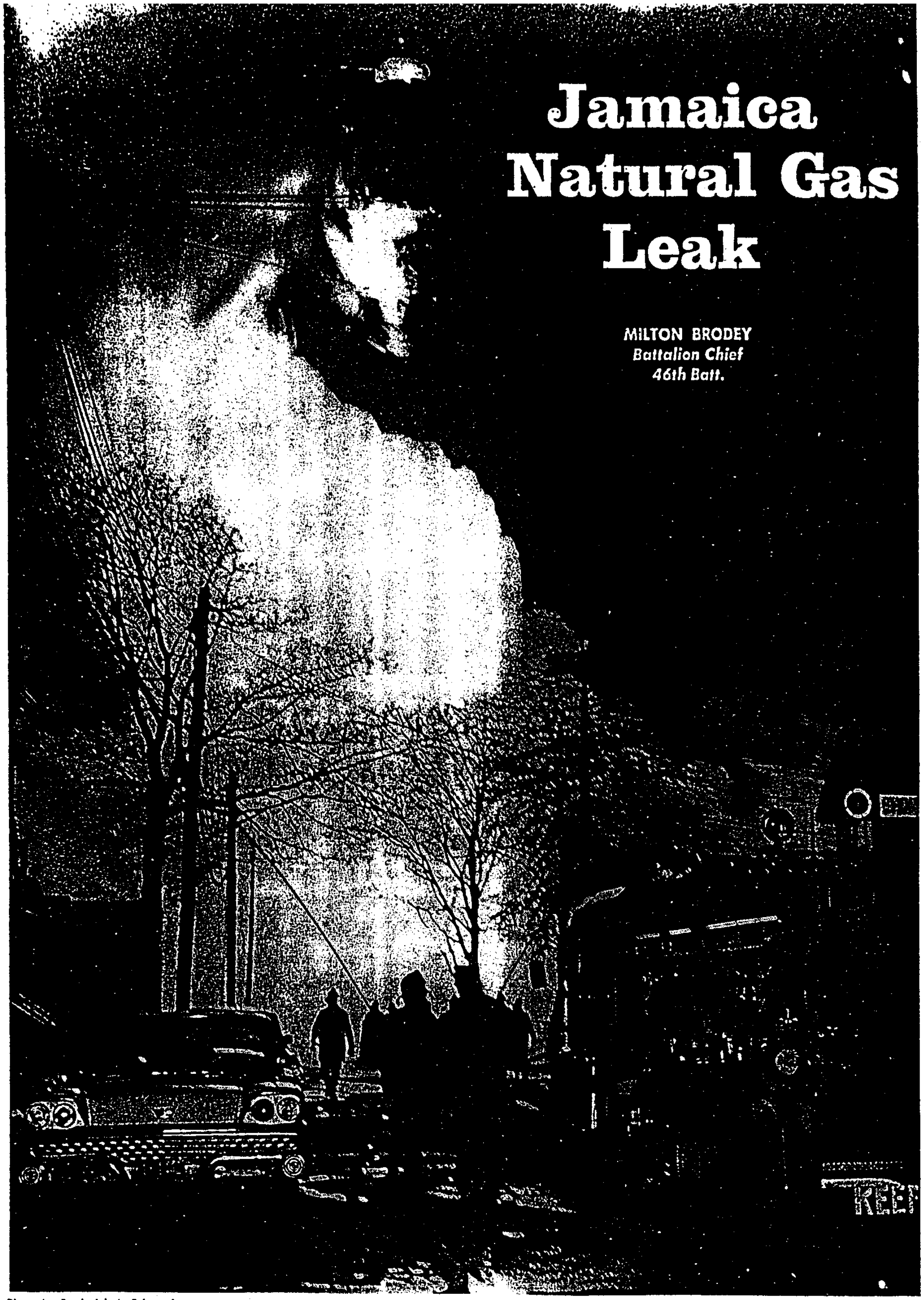
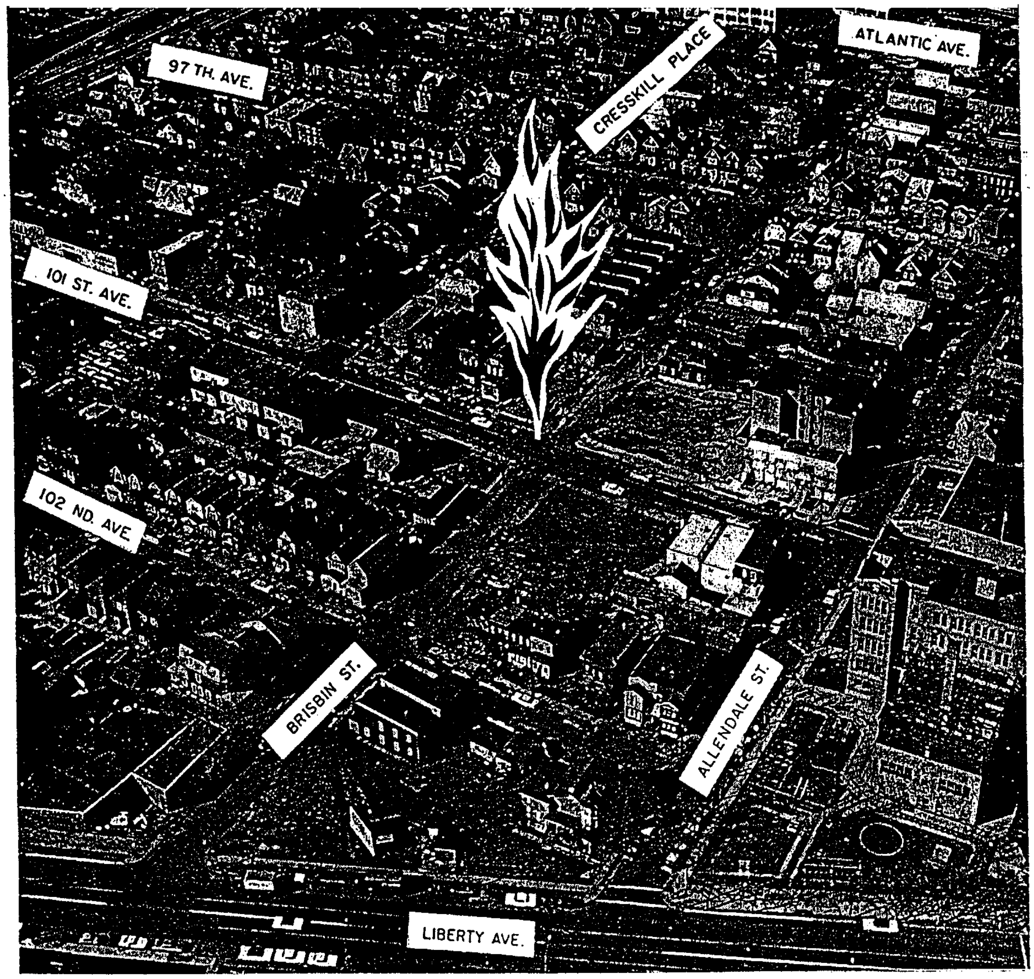


Photo by Frederick A. Schroeder

...a 13 alarm blaze



Aerial photo taken after fire shows scene of gas leak and fire and surrounding areas. Debris has been removed and area cleaned.

The neighborhood in the vicinity of Box 4758, located at 101st Avenue and Cresskill Place, Jamaica, Queens, is a quiet residential area that has seen little change through the years. The possibility of it attracting national attention seemed rather remote. But, at 5:19 a.m., on January 13, 1967, an unidentified civilian sent an alarm from that street box. Since there was no fire, as yet, the box must have been sent because of the strong odor of natural gas. This was the beginning of a story that made national headlines.

The alarm was received by the Fire Department and available units responded. The First Due Engine, Ladder and Battalion Chief were out on a response to Box 8803 which had come in at 5:17 a.m. This box was about ¾ of a mile removed from Box 4758, and turned out to be a Malicious False Alarm. Engine 298 (3rd Due) was the first unit to arrive at the scene and as it entered 101st Avenue it stalled about 3 feet from the gas leak, directly in back of a stalled commercial truck. Ladder 127 (2nd Due) stalled in front of a paint factory at 143-01 101st Avenue, and behind Eng. 298. Neither apparatus could be started up again. It was later determined that the heavy volume of escaping [illegible] the oxygen content of the air in the immediate area to a concentration below that essential for proper carburetor operation and caused both apparatus to stall.

CONDITIONS ON ARRIVAL

At first, it was believed that the heavy volume of escaping natural gas was due to a break in the 24" gas main running under the street. After the fire it was found that the cover of a drip pot (used to collect moisture and condensate in the main) had become tilted and partially dislodged. This had created openings for the escape of huge volumes of natural gas. The immediate and primary concern of fire department units was the heavy life hazard that existed in the vicinity of the leak. The imminent possibility of the gas leak worsening or being ignited by some source made evacuation of residents in the area imperative.

The noise created by the escaping gas created a sound comparable to a stationary jet engine. It was both a help and a hindrance. It helped by awakening people in their homes and alerting them to the fact that something was amiss. This in turn made evacuation faster since the people were in a sense prepared. It hindered by making [illegible]cation difficult in the immediate area of the leak.

W. N. Y. F.

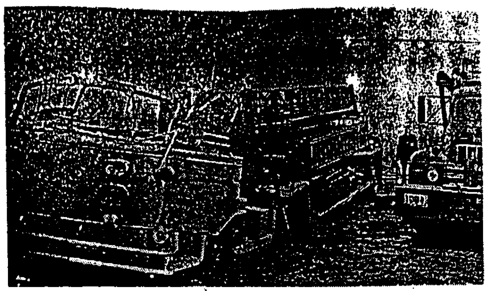


Photo by J. Lynch

Photo taken immediately after fire shows remains of aerial ladder belonging to L. 127. It was considered total loss.

seemed to cause much confusion in some of the older residents of the area.

NOISE PROBLEMS ENCOUNTERED

Noise is generally thought of as unpleasant, loud, or unwanted sound. Loud noise is an annoyance which requires an extra effort to concentrate, on the part of the person hearing it. Its principal undesirable effect in Fire Department operations is interference with speech communications. At this incident, the noise created the following problems:

1. It eliminated voice communication between F.D. supervisory levels close to the leak.
2. It created communication problems for Company Officers in supervision of members evacuating buildings. In some instances, Officers had to move up and down a street checking their men visually.
3. Residents were extremely disturbed and disoriented by the high noise level. Members who took part in the evacuation operation reported that most people acted as if in a state of shock. Older persons seemed most affected by the noise and had to be forcibly lead from their homes.
4. In many cases, the extreme noise seemed to prevent normal thought processes by residents. They seemed stunned and did not leave the area of their own accord, but waited around. Members found that when they carried the children outside, the adults quickly followed. Literature on noise is definite in stating that sudden loud noise carries about the same reaction as does a great fright. Once outside, many of these people had to be led to a safe place.

INITIAL F. D. ACTION

The 51st Battalion (Batt. Chief Fay) was special called on the initial transmittal of Box 4758 due to the earlier response to the MFA by the 50th Battalion. When appraised of conditions, on his arrival, Chief Fay immediately ordered evacuation of all residents from buildings on 101st Avenue and from all buildings on Cresskill, Brisbin and Allendale Streets. To effect this large scale evacuation as quickly as possible, a 2nd Alarm assignment was ordered to provide the necessary manpower and assistance was requested from the Police Department. At the same time, a call was made to the Brooklyn Union Gas Co. for emergency crews to assist in shutting down the gas supply.

WIND CONDITIONS

The escaping natural gas spread laterally downwind (in a northeasterly direction) for an estimated distance of about 125 feet from the leak. Normally, wind currents will carry gas clouds along the ground with a rolling motion since the wind velocity near the ground is almost zero, but increases rapidly with a rise in height. This rolling motion causes the gas cloud to stretch out in length. Convection currents would then normally cause a more or less rapid mixing of the gas cloud with the overlying air and its rapid diffusion upward. At night or in the early morning, as in this case, the ground surface was cooler than the surrounding air and there were no convection currents, so that the cloud of gas remained near the ground.

The direction of travel for the gas cloud is confirmed by the fact that the odor was not noticeable to incoming personnel at the street box, approximately 200 feet upwind, while members of the first arriving companies detected the odor while still about 5 blocks away and downwind.

WIND CHART

The U.S. Weather Bureau report for Jan. 17, 1967 gives the following data:

Time	*Wind Direction*	*Force*	*Temperature*	*Humidity*
5 A.M.	SW	4 mph	32°	58%
6 A.M.	SW	5 mph	32°	58%
7 A.M.	SW	3 mph	33°	56%
8 A.M.	S	5 mph	34°	56%

GAS IGNITES

The time of ignition of the escaping gas (from an undetermined source) is fixed at 5:36 a.m. Deputy Chief Weinhofer of the 13th Division, while responding and still about 500 feet from the box, saw the gas cloud ignite and immediately requested a 3rd Alarm assignment. Ignition of the gas cloud was not followed by any violent explosion. Rather, there was a loud boom reported which could be attributed to the characteristic sound produced by the very rapid rise in the pressure of air as it is rapidly heated. The resulting flame is estimated to have been from 75 to 85 feet in height and about 15 feet in diameter.

On ignition, it is reported that the flame shot under the stalled commercial vehicle, then under the apparatus of Engine 298 where it ignited the natural gas under the truck, and then to Ladder 127 where the natural gas under the stalled apparatus also was set afire. Immediately following ignition of the gas, it was noticed that the wooden overhead door on the 101st Avenue side of the paint factory was ablaze. As the escaping gas continued to burn, overhead wires began falling into the intersection of Brisbin Street and 101st Avenue and created an additional hazard for F.D. personnel and residents who were still being evacuated from the area.

NUMEROUS EXPOSURES

The greatest direct exposure at the fire was the rear of a NFP 4 story, 50 x 100 multiple dwelling, at 97-34 Allendale Street. This building was directly exposed to the fully involved paint factory 100 x 100, at 143-01 101st Avenue. The windows of the multiple dwelling were plain glass in wood framing. A heavy concentration of hand lines and multiversal nozzles were placed in position on the roof of 1 story garages north of the factory, and from rear yards and directed as a water curtain between the involved factory and the exposed building. Lines were also operated from the roof and upper floors of the multiple dwelling. This operation was successful and only minor damage to the wood framing on the 2nd, 3rd and 4th floors of one row of windows was suffered by the multiple dwelling.

The wooden window frames on the front of 139-19 101st Avenue appear to have been ignited at once by direct flame from the burning gas column. Very shortly thereafter, the wooden window frames of 139-17 101st Avenue were ignited.

Radiation from the burning column set fire to the building fronts (wood framing and dark red asphalt siding. of 143-08 and 143-10 101st Avenue. The siding is reported to have burned and fallen off, following which the wood framing of both buildings seemed to ignite and become completely involved almost at once.

Radiation also ignited the front of 143-04 101st Avenue. This building also had wood framing and dark red asphalt siding. The paint factory at 143-01 and the adjacent private dwelling at 143-07 101st Avenue were now also involved. Thus, within minutes following ignition, seven buildings were involved by fire.

Most of the exposed dwellings had asphalt siding and roofing. It was observed that the more volatile constituents of the asphalt covering ignited and flashed over the asphaltic surface. In cases where the radiant heat exposure continued, the asphaltic material melted off or dripped down the side of the buildings. Of five (5) buildings exposed on 102nd Avenue, 138-71, closest to the heat source, had white aluminum siding, 138-69 and 138-65 had dark red asphalt siding, 138-63 had white asbestos siding and the farthest away, 138-61 had dark red asphalt siding. The two buildings with white siding showed no signs of exposure to heat. The three buildings with the dark red siding all suffered damage to the siding on the exposed side, with blackening and dripping decreasing as their distance from the heat source increased.

A two story building at 143-14 101st Ave. had aluminum siding, white at the 2nd story and dark green on the 1st story. This building was directly exposed across a 15′ alley to a two story frame (asphalt siding) that was completely burned down by fire. The upper portion of 143-14 was only slightly discolored, while the dark green portion was discolored along the entire length of the bldg. (Greater absorption of heat by dark surfaces.) The electric wires in the service conduit on the exposed wall (north west corner) were burned out along with electric meters at the same location.

A 2½ story building at 139-12 101st Ave. had stucco on the 1st story and dark green aluminum siding on the second floor. This building was ignited at about 6 A.M. at the peak from downward radiation and the roof and eaves were heavily damaged. During overhauling it was observed that the wood trim and studs in the walls close to the outside on the second floor were more heavily burned than normal, apparently due to the transmission of heat through the metallic siding.

RADIATION EFFECTS FOUGHT

The heat radiation from the column of burning natural gas was very intense and had an immediate effect on buildings in close proximity to the leak. As described in the previous paragraphs, many were set afire. On buildings outside the immediate area of the first (about a 150′ diameter circle), the radiant heat effect was from the downward radiation of heat from the column of superheated gases.

Some idea of the radiant energy of the burning gas column can be gained from the fact that the highest temperature noted at the recent McCormick Place fire in Chicago was 1650°F. The burning gas column, with a temperature of 3,562°F. had a radiant heat output approximately 16 times greater.

To combat this high temperature, heavy caliber streams were used to wet down all exposed structures, break up the radiant heat, slowly move closer to the fire, prevent the ignition of exposed buildings and finally were replaced with handlines to extinguish the building fires.

At the outer perimeter of the fire area, hand lines were found effective, as they could be moved into the back yards, alleys and to the roofs of the numerous one story frame garages throughout the neighborhood, to wet down the exposed buildings and break up the radiant heat.

Heavy caliber streams were also set up on the roof and top floor of a Public School at the S/W corner of Allendale St. and 101st Ave. and on the roof of a building on the N/W corner. These lines were used to break up the radiant heat on the windward side of the fire.

Before discussing the fire operations, let us ascertain what had brought about this potential catastrophe.

Photo by W. Johnstone

Scene during last stages of the fire shows smoldering ruin of paint factory which ignited in early stages of the fire.

GAS SYSTEM

The Brooklyn Union Gas Company supplies natural gas for domestic and commercial use in the Boroughs of Richmond, Brooklyn and in the Borough of Queens excluding the Flushing, Bayside, Rockaway and Long Island City areas. The natural gas is received from three natural gas companies. They feed a 350 p.s.i. design system, which supplies Consolidated Edison, Long Island Lighting Co., and the Brooklyn Union Gas Co. The natural gas comes from wells in Louisiana and Texas.

The pipelines feed a network of high pressure distribution mains that run through all of the Brooklyn Union Gas Company's territory. These mains vary from 30″ to 12″ in diameter and operate at pressures of 200-250 psi.

The high pressure mains are connected to a medium pressure system at gate stations. There are seven (7) gate stations in Brooklyn and Queens and three (3) in Richmond. At the gate stations, an oil fog and an odorant is added. This odorant is in addition to that added by the pipeline companies. At two of the gate stations, moisture, is also added. The oil fogging and moisture are required to keep the interior of the mains wetted. This prevents the drying out of deposits on the inside of the mains that might otherwise be carried along by the flow of gas and interfere with the operation of pilot lights on customer appliances. About 0.1% of Brooklyn Union Gas Co. customers (very large users of natural gas) are supplied from the medium pressure system. The medium pressure main on 101st Avenue was 24″ in diameter, with a pressure at the time of about 11 psi. There were no buildings in the area of the fire that were connected to this main. The medium pressure system feeds a low pressure system through regulator stations. At these stations, the pressure is reduced to about 4 ounces. The low pressure system is a gridiron of mains that supplies the remainder of the gas users in the system.

DRIP POTS

In the normal operation of supplying gas to its customers, the Brooklyn Union Gas Co. has always found it necessary to make provisions for the removal of condensate from its street mains. This is accomplished by the use of drip pots (See Photos & Drawing) at low points on the medium and low pressure mains. When manufactured gas was used, tar and oily deposits had to be periodically removed from the drip pots. They are still required with natural gas to permit

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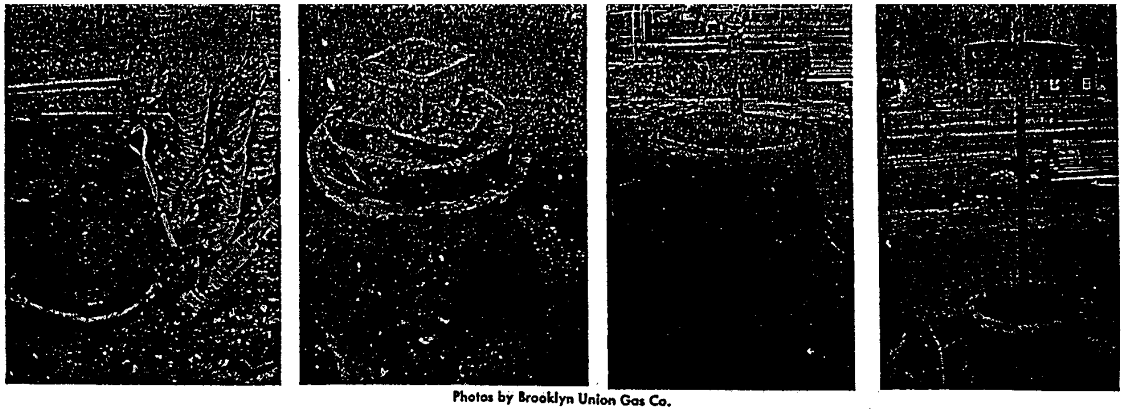


Photos by Brooklyn Union Gas Co.

Series of photos above shows removal of defective drip pot. In first photo workman digs around drip pot cover. Next photo shows drip pot after removal with valve cover box on top. Third photo shows drip pot cover at start of removal. This was the portion that leaked. Last photo shows drip pot cover removed and siphoning rod for moisture removal exposed.

the removal of moisture and natural gas components that are carried along in the transcontinental pipe lines and finally condense out in the medium pressure gas mains.

As of January 13, 1967, there were 498 drip pots in the medium pressure gas distribution system. As of this date, 399 remain in use. It is interesting that some time prior to the leak and fire, the Brooklyn Union Gas Co. had begun to strap down the drip pot covers (plugs) of the drip pots. At the time of the leak, 169 had been finished. The New York State Public Service Commission has ordered that this work be completed by the end of 1967. Strapping consists of placing two "I" beams on the plug with another "I" beam on top. Heavy rods go through the end of the top "I" beam and through lugs on a steel band fastened to the bottom of the drip pot. Either 2 or 4 rods are used depending on the size and design of the drip pot. Drip pots in the vicinity of gate stations are checked on a regular basis. If these are found to require pumping, then drip pots further away are checked out.

NATURAL GAS

The composition of natural gas furnished by the Brooklyn Union Gas Co. (as well as Consolidated Edison and the Long Island Lighting Co.) is as follows:

	Average Range in %		
Methane	93.99	to	94.92
Carbon Dioxide	0.72	to	1.02
Nitrogen	0.34	to	0.58
Ethane	3.25	to	3.62
Propane	0.39	to	0.47
Pentane	0.04	to	0.13
Hexanes	0.03	to	0.12
Butane	0.14	to	0.24
Specific Gravity (Air = 1)	0.59	to	0.599
B.T.U./cu. ft.	1.025	to	1.029

Methane (Marsh Gas) the principle component of natural gas is a colorless, odorless gas with a specific gravity of 0.6. The lower and upper flammable limits of methane are 5.0% and 15.0% respectively in admixture with air. The auto ignition temperature is 999°F. Methane is classed as a simple asphyxiant. This means it will produce asphyxia (suffocation) only if present in sufficient amounts to exclude oxygen. Under ordinary conditions, 87% (in air) is necessary to produce and maintain anesthesia, but 90% will cause irregularities of the respiration and respiratory arrest.

The lower and upper flammable limits of natural gas are considered to be identical with methane. The ignition temperature of natural gas is 1301°F. The flame temperature of methane is 3,484°F, and that of natural gas is 3,562°F. With both, this applies to combustion in an adequate supply of air. The combustion of 1 cu. ft. of natural gas requires 9.5 cu. ft. of air.

As natural gas is odorless, chemical compounds, known as mercaptans, are added in measured quantities to give natural gas its characteristic odor. The Brooklyn Union Gas Co. adds mercaptans to its natural gas at the gate stations. This is in addition to mercaptans added by the pipe line companies.

This results in the natural gas used having a least detectable odor of about 0.2%. This is 1/25th of the lower flammable limit and serves as an adequate warning of the presence of natural gas.

RESPONSE AND ACTION TAKEN

To combat this fire and its great potential for destruction, the equivalent of 13 alarms were ultimately sent. The sequence of alarms are as follows:

Alarms	*Time*	*Eng. Co.*	*Lad. Co.*
1st	5:19 a.m.	3	2
2nd	5:31 "	3	1
3rd	5:36 "	3	1
4th	5:39 "	4	1
5th	5:47 "	4	1
Simult.	6:01 "	10	
Simult.	6:07 "	8	
Simult.	6:57 "	11	
13	Totals	46	6

In addition to the above units, there were 11 units Special Called. This made a total response of 63 units for this fire.

Prior to its ignition, in addition to posing a fire and explosion hazard, the escaping gas made the street intersection at Brisbin Street and 101st Avenue impassable for vehicles and left many stalled vehicles, including fire apparatus, in positions where they were subsequently destroyed by fire.

The burning gas column which suddenly came into existence, following ignition, acted as a massive heat radiation source. The effects of this radiant heat kept Fire Dept. personnel at a distance and prevented the effective deploy-

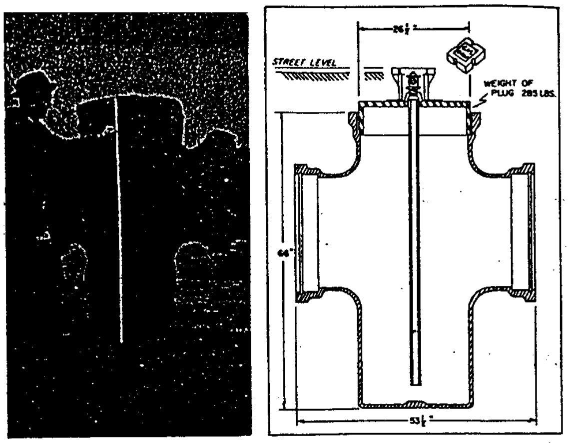


Photo and diagram of drip pot showing dimensions of same. When installed, cover is sealed with both oakum and lead.

ment of hose streams close to the burning buildings. In the absence of any appreciable wind, the downward radiation of heat from the burning gas column acted on exposed roof tops of buildings beyond the immediate fire area in all directions. Thus the entire perimeter of the fire had to be considered in any planned attack.

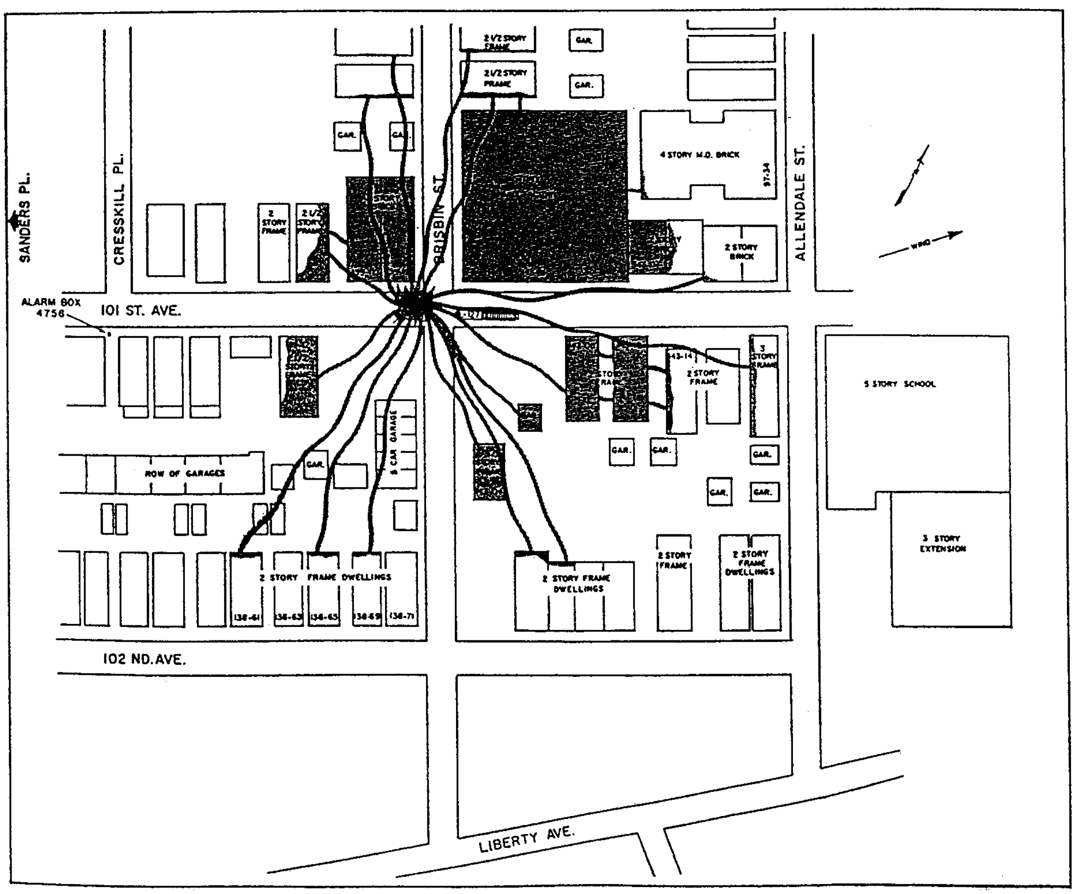
With exposures on all sides of the fire, from the beginning of fire operations it was recognized that an unusual degree of supervision would be required. Accordingly, at 5:43 a.m. two additional Battalion Chiefs were Special Called to supervise exposures 1 and 2.

This operation brought together, in a relatively short time and into preselected staging areas, a large number of units. Only Staff Officers had the necessary experience and knowledge to properly deploy these units over a four square block area.

The fourth alarm assignment was ordered, by radio, to respond to the North and West sides and take defensive positions. The fifth alarm assignment was similarly ordered to come in on the east side of the fire.

COMMAND PROCEDURES

Asst. Chief Francis Love, arrived at the scene at 5:51 A.M. After surveying the fire conditions he reported approximately six buildings involved, with entry into the fire area practically impossible. He also recommended to Chief O'Hagan, who was enroute, that a 3rd alarm Simultaneous Call be transmitted. After further consultation, an additional 2 alarms for the same distant box was transmitted. These additional alarms were necessary to provide manpower for the stretching of additional lines and for the setting up of relay operations to augment the water supply of the fire area. It was also decided that as Staff Officers arrived at the scene, they be assigned to each of the exposures.



Above plan view shows entire area involved. Black tinted areas are buildings completely destroyed by fire. Wavy red tinted lines indicates travel of heat radiation with the resultant spread of fire to the red tinted buildings.

At 6:05 a.m., after consulting maps available in his car, Chief O'Hagan ordered a defensive perimeter set up with the center of the fire incident taken as 101st Ave. & Brisbin St. The East front was Allendale Street, with Chief O'Hagan in command; the North front was Atlantic Ave., with Chief McKeogh in command; the West front was Sanders Place, with Chief Hartnett in command; the South front was Liberty Ave., with Chief F. Love in command.

This procedure proved extremely effective in:

1. Directing the movement of arriving groups of companies to areas where their services could be best utilized.
2. Setting up of master streams for use as water curtains to break up radiant heat and for protecting exposures.
3. Positioning and supplying the three Satellites to make maximum use of their heavy streams.
4. Coordinating the advance of all lines toward the nucleus of the fire.
5. Diverting units to protect badly exposed buildings.

After the fire had been divided into 4 quadrants, the East quadrant (Exposure 1) became the Command post for the coordination of:

1. Activities of all Fire Dept. units operating at the scene.
2. Calls for utility units, and their operations.
3. Other City agencies.
4. Work of Brooklyn Union Gas Co. employees.
5. Handling communications and receiving progress reports from quadrant commanders.
6. Handling calls for special units.
7. Assisting in the handling of the large number of evacuees from the area.

FIRE TACTICS

Streams were deployed to break up the radiant heat and wet down distantly exposed buildings. Hand lines were moved in to prevent the extension of fire to buildings close to the gas column. Units operating close to the burning gas found it was possible to advance hose lines by using shields. Accordingly, doors and kitchen tables, etc. were used to stop the heat radiation from hitting the men and thus permit units to protect badly exposed buildings. In this manner they were able to work in what would have otherwise been untenable positions.

As additional assignments reported in, hand lines were diverted for use with multiversals and deck pipes so as to make maximum use of heavy streams. Three Satellite units were strategically placed to take greatest advantage of their heavy streams of water. Additional assignments of men were used in relay operations supplying additional hand lines to be used in alleys, rear yards and on roofs of garages and one story extensions scattered throughout the area being exposed to the tremendous amounts of heat radiation.

The Jamaica Water Supply service in this area is normally adequate, but in this instance where 76 lines were being used, it was greatly overtaxed. To augment the water supply, the Superpumper Tender stretched two 4½" lines approximately 1000 feet in length, from a 48" city main located at Liberty Avenue and Sutphin Boulevard. Hydrant pressure on these lines was about 100 psi. These lines were then connected to two pumpers which were hooked up to hydrants of the Jamaica Water Supply system. In the absence of available 4½" hydrant outlets in the area, they served as a water source for additional lines. The water supply was further augmented by the use of considerable portions of the Simultaneous Alarm engine companies for relay operations.

Shortly before 8:00 a.m., the burning gas column had been sufficiently reduced in size to permit F.D. personnel to move in with handlines on buildings adjacent to the leak site and complete fire extinguishment and necessary overhaul.

At 8:11 a.m., the incoming platoons for all companies up to and including the 5th Alarm were ordered to report to 101st Avenue and Allendale Street to relieve the members who had been working at the fire. Relief for the Simultaneous Call units were ordered to remain in quarters and shortly thereafter these units were placed in service and ordered back to quarters.

FIRE UNDER CONTROL

By 9:51 a.m., the structural fires were declared under control and attention was focused on the complete shutting off of the greatly diminished burning gas column, and determination of the cause for the leak. At this time, the Greater Alarm companies were put back in service.

It was not until 3:21 p.m. that the gas leakage was completely stopped, the defective drip pot was removed, and the gas main properly sealed off.

Approximately 15 hours after the start of the fire, Engine 303 and Ladder 126 returned to quarters and were put in service. Watch lines were left manned at the fire site.

OBSERVATIONS

In retrospect, the successful containment of this fire was helped by several favorable conditions, namely:

1. Open lots on two corners adjacent to the gas leak.
2. Sufficient time elapsed between discovery of the leak and ignition to permit evacuation of all residents in immediate vicinity.
3. Wind velocity of only 4 to 5 m.p.h. did not contribute to a possible rapid spread of fire.
4. Weather and time favorable for response and placement of companies and apparatus.
5. Early warning and rapid transmission of alarms made it possible to have 2nd alarm units at the scene within moments of ignition.
6. In spite of the difficulty of communication, due to the high noise level, maximum effectiveness was maintained by the setting up of Command Procedures and coordinating F.D. actions.
7. The fact that the area was predominantly residential with mostly 1-family homes, and therefore had much less fireload than a commercial or apartment house area, made it easier to control.

In closing, it should be noted that this is a unique instance in the department's history where a Greater Alarm was transmitted in a situation where there was no fire or extensive building collapse. But then, nothing about this incident *was* ordinary.

In spite of the fact that 9 homes, a paint factory and a garage were destroyed, and 8 other buildings were damaged in varying degrees, not a single resident of the area was even slightly injured. Though two fire apparatus were completely demolished, only six minor injuries were reported by department members. In fact, when one considers the tremendous potential for catastrophe that existed at the inception of this fire, and the subsequent accomplishments in controlling it, the term *unique* seems to be an understatement!

The author wishes to express his appreciation to: *Chiefs O'Hagan, Hartnett, McKeogh and F. Love; the officers and members of the 1st Alarm assignment, Chiefs Weinhofer and Fay, and the Brooklyn Union Gas Company.*

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MORGAN ANNEX FIRE

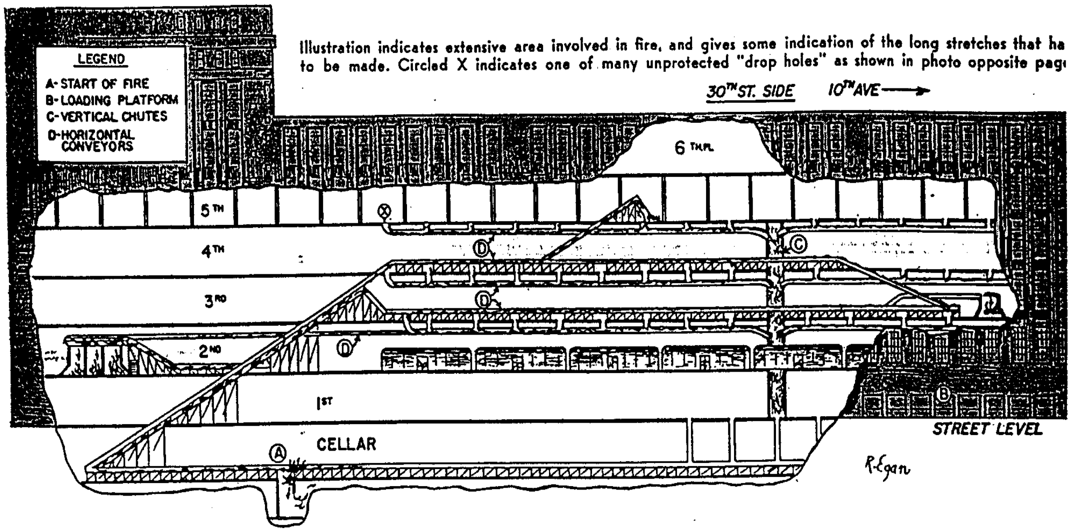


Illustration indicates extensive area involved in fire, and gives some indication of the long stretches that ha to be made. Circled X indicates one of many unprotected "drop holes" as shown in photo opposite pag

. . . . post office fire – difficult problem

WILLIAM MISCHKE
Deputy Chief
1st Div.

and

JAMES D. JOYCE
Deputy Chief
3rd Div.

During the height of the Christmas Season on December 15th, 1967, the Morgan Annex Post Office Building was struck with a devastating fire that required the use of 40 Engine Companies, 15 Ladder Companies (including 2 Tower Ladders), Superpumper System and 14 other units of the New York Fire Department to bring under control. This fire resulted in an estimated financial loss of over 10 million dollars.

The fire building, erected in 1935 and located at 341 9th Avenue, occupies a full New York City block. It is a Class 1, fireproof construction, one-third of which is 10 stories in height and the other two-thirds 6 stories in height.

Picture if you will, five floors, including cellar and sub-cellar, of this building involved in fire. Each floor measures 200′ wide, 800′ long and 20′ high and is equal to over four acres of floor space, undivided except for small areas for office space. Multiply the 3 million cubic feet on each floor by 5 and become aware of the vast area of fire that spread by UNPROTECTED VERTICAL OPENINGS consisting of conveyor belt systems, spiral mail chutes, duct systems and flush floor openings.

Examine also the occupancies which existed under one roof not separated from each other: CELLAR AND SUB-CELLAR—old mail bag storage, paper baling, incinerator and storage of Civil Defense materials, in addition to large quantities of mail; FIRST FLOOR—housing a truck terminal which was heavily stocked with mail; SECOND FLOOR—a railroad freight yard which could accommodate over 30 freight cars on its six tracks and was occupied with 12 cars fully loaded at the time of the fire; THIRD, FOURTH AND FIFTH FLOORS—used for sorting mail, and in accord with the season, were piled ceiling high with Christmas mail. These floors were each equivalent to a large paper warehouse. The sixth floor was used for maintenance, repair and storage materials such as battery recharging, welding shop, electric motor repair, print shop, mail bag repair (comparable to a large rag shop), lumber storage, paints and other flammable liquid storage. The other floors which suffered only smoke damage were used as office space.

A conventional 6″ riser standpipe system was in each of the 8 stairways serving this complex. In addition, there also was a 1¼″ system in each of the stairways, without hose outlets at each floor but with 1¼″ hose preconnected at each floor. The cellar and sub-cellar had a sub-standard 1½″ standpipe system which could not be converted to New York Fire Department use.

There was no sprinkler protection in any portion of this building, although it had been recommended at various times throughout the years. The first such recommendation was made by Peter C. Spence, Chief of the Bureau of Fire Prevention, on April 8th, 1932, while the building was still under construction.

This then was the building that would require 11 greater alarms to control and 39 hours operational time before the last units left the scene.

WEATHER CONDITIONS:

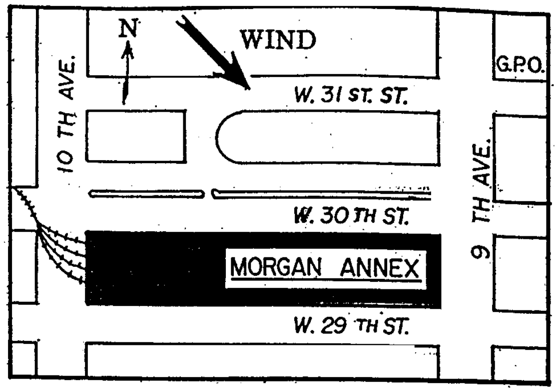
The New York Weather Bureau report for the night of December 15th, 1967, when Box 676 was struck at 2107 hours was Temperature 31 degrees and Wind North-West at 13 miles per hour, with gusts up to 28 miles per hour. Although the temperature was just below freezing, taking into consideration the wind chill factor, the true temperature can be considered as being between 12 and 0 degrees Fahrenheit.

THE FIRE:

Units arriving on the initial alarm noted heavy smoke issuing from cellar vents and mail chutes on the loading platform at the 30th Street side. Being aware that the standpipe in the cellar was incompatible with New York Fire Department fittings, hand lines were stretched into the cellar. Engines 1 and 26 each stretched approximately 1,000 feet of hose to reach the conveyor tunnel in the cellar where the fire was reported. These long stretches added to the delay in getting water on the fire. Ladders 24 and 21 proceeded to the cellar for examination, searching and assisting the Engine Companies in advancing and stretching of lines. All units initially operated with masks in the cellar area until conditions cleared sufficiently to allow forces to remove them.

Battalion 6, special called, noted heavy smoke conditions on the 29th Street side and proceeded to that location. Battalion Chief White set up his Command Post and proceeded to the point of operations in the cellar. After he surveyed conditions, he ordered Engine 34 via Walkie-Talkie to stretch additional hose to fill out the line of Engine 1 and to assist on the line of Engine 26. The filling out of Engine 1's hand line was necessary due to the complexity of the tunnel arrangements for the conveyor system.

Division 1 was notified to cover for Division 3 which was operating at Box 33-591, which was transmitted at 2107 hours, the same time as the initial alarm for Box 676. After surveying the situation and receiving reports from the 6th Battalion that the large room at the base of the conveyor shaft was completely involved with fire, a 2nd Alarm was ordered. Ladder 21 and additional Ladder Units arriving on the 2nd Alarm were dispatched to assure complete evacuation of the builing. Six persons were removed on



Plan view above indicates street location of Morgan Annex P.O. fire. Also indicated are wind direction and location of railroad spurs entering building from 10th Ave. Concrete construction and floor openings finally necessitated 11 alarms to be transmitted.

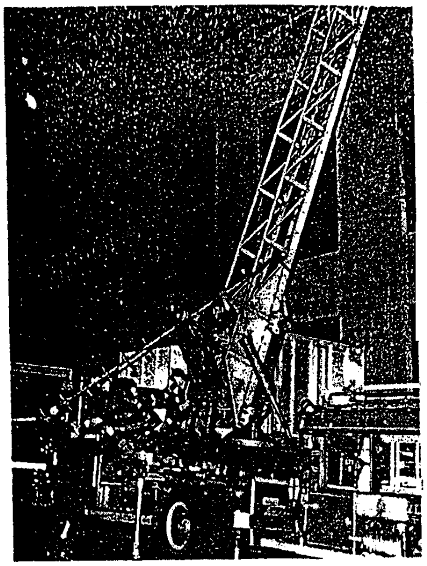
ladders. Three were removed from the 2nd floor and three were removed from the 10th floor. There was no count on the number of persons physically assisted. However, at the time of the fire, there were over 2,000 people working throughout the building, and all were evacuated safely.

The three persons who were rescued from the 10th floor had delayed leaving the building until the stairs were impassable. They were saved by the excellent team work of Fr. 1st Gr. Donald A. Pizzuto, Clyde W. Williams and Gene P. Dowling, all of Ladder 25, a 2nd Alarm Unit. These brave men, under direction of Lt. Paul G. Donat, realized that the aerial ladder, even though fully extended, would not reach the 10th floor. A scaling ladder was taken up the aerial and upon reaching the top was raised to the 10th floor windowsill. In spite of the severely cold weather and high winds which buffetted them, Fr. Dowling climbed the scaling ladder and stood on the 10th floor sill. He assisted the civilians on to the scaling ladder where they were aided and encouraged in their descent by Fr. Williams. Fr. Pizzuto helped the persons negotiate the transfer from the scaling ladder to the tip of the aerial and then guided them to the street level. This procedure was repeated until

Above: Typical "drop hole." Mail bags are passed through opening, into a chute, dropping it on conveyor belt on floor below. These metal plate covers normally open upwards, but buckled by intense heat.

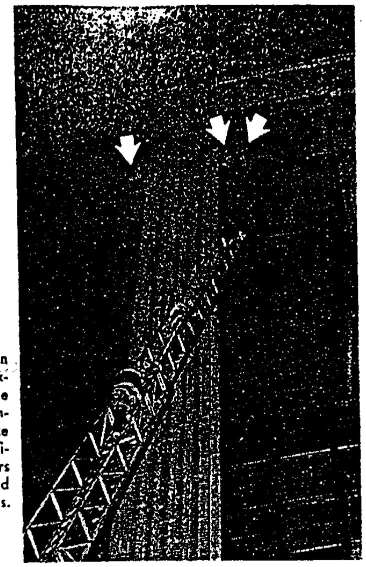
Above: Shown here are two typical conveyor belts. Conveyor belt on right, coming from basement, automatically dumped mail bags onto conveyor belt on left. All rubber belts on conveyors were burned away.

W. N. Y. F. 5



Left: Members of Ladder Co. 25 realizing that their aerial ladder will not be able to reach the persons trapped on the upper floors of the post office building, prepare to make ascent with a scaling ladder.

Right: Camera catches members in their arduous climb up the fully extended aerial ladder towards three persons (arrows) leaning out of windows. Extreme cold and wind make completion of rescue extremely difficult and dangerous. Three members participating in this rescue received Fire Department commendations.



the three persons had been safely removed to the street. All three men were recommended for the highest honor of the Fire Department of the City of New York. *(Editors note: see Pages 16 and 17, this issue of W.N.Y.F.)*

Due to the numerous floor openings, especially the conveyor belt system, the fire quickly involved five floors. The absence of horizontal sub-divisions, the heavy fire loading and the high ceilings, contributed to an unusually rapid horizontal spread.

When the Department's Staff Officers, Assistant Chief Henry C. Junge and Chief of Department John T. O'Hagan arrived, the fire had increased in magnitude and severity necessitating the transmission of additional alarms for a total of 11 alarms.

It was decided to use a combination exterior attack coordinated with an interior one. To accomplish this, additional Deputy Chiefs and Battalion Chiefs were ordered to the fire scene. The strategy employed was directed towards limiting the horizontal spread on each floor through the use of large calibre streams from the Satellite Monitors of the Superpumper System and elevated streams from the Tower Ladders and Aerial Ladder Pipes. The superior scrub surface of the Tower Ladders in conjunction with the strength of the 1,500 g.p.m. streams from the monitors were chiefly responsible for the success in limiting the extension of the fire.

Once this objective had been achieved, interior penetration with hand lines was attempted. A Chief Officer was placed in command of each of the stairs, with orders to effect control of each floor in succession as rapidly as possible. The concrete construction which retained the heat in spite of extensive ventilation, the width of the floors and the high piling of mail which limited exterior stream penetration, delayed final control of the fire.

All commands moved under the control of the Primary Command Post with Chief O'Hagan directing the attack. The fire was battled floor by floor. Due to extreme heat conditions, interior attacks were suspended. When necessary, outside heavy streams were used to reduce the high temperatures on each floor and then all commands re-

Heavy calibre streams were used to reduce high temperatures on all floors. This allowed all commands to press a successful interior attack.

A double decker conveyor belt is shown here. These conveyor belts passed from one floor to another through unprotected openings.

Thousands of parcels lie in ruins at the foot of this conveyor belt. During overhauling of a pile of charred mail such as this, Fire Dept. members found a charred package containing $44,000 in bills of varying denominations and immediately turned it over to the Postal Authorities.

turned to press a determined interior assault to take advantage of gains made by the heavy stream tactic. As each floor was placed under control, the next floor was controlled in the same manner until fire was contained on all floors. This strategy proved to be a most efficient and effective method of controlling and finally extinguishing the fire.

One sidelight of the operations was that the intense heat and fire on the 2nd floor railroad siding spread to containerized truck vans on railroad flat cars. The aluminum sides of the vans offered no resistance and the vans and their contents were reduced to ashes and molten metal.

Paramount to the success of the strategy was the efficient and controlled use of the Walkie-Talkie communications between Sub and Primary Command Posts. Without the use of such effective communication, the plan for extinguishment would have been in doubt from its outset.

After nine hours of arduous duty and dogged determination by the first line troops, the fire was declared under control at 0607 hours.

Below: One of the railroad sidings on the second floor. These containerized truck vans are on railroad flat cars. Complete destruction of these vans are mute testimony to the intense heat of fire in this area.

There still remained many more hours of mopping up and overhauling. During the overhauling one parcel was found with the covering charred. When it was moved, the wrapping disintegrated and $44,000.00 in bills of varying denominations was revealed. The precious package was immediately turned over to the Postal Authorities. The last unit left the scene at 1545 hours on December 17th, at which time, a watch line was established.

Of the 96 line of duty injuries that occurred at this fire, only three were of a serious nature. With over 350 personnel being used to bring the fire under control, the low rate of serious injuries can be attributed to the excellent control and supervision of personnel by all lines of command.

LESSONS LEARNED:

1. When fire loading is heavy and areas are excessive, fireproof buildings are vulnerable to High Fire Loss unless established fire protection practices are recognized and complied with.
2. Unprotected vertical openings between floors or areas must be protected. Where normal fireproof enclosures can't be provided for vertical openings because of the flow requirements of an operation, substitute protection must be provided. The use of sprinkler protection at points of vertical spread would have reduced the loss considerably.
3. Detection systems in large open areas where heavy fire loading exists are of limited value.
4. In fires of large magnitude and long duration, efficient communications is a must for a coordinated and controlled attack on the fire.
5. Command Procedures at large fires must provide positive control of all operating units at the scene to keep to a minimum injuries to personnel and to efficiently utilize all manpower and equipment.
6. In large building complexes, the need for immediate notification of the Fire Department whenever there is an indication of fire, is necessary to prevent delayed alarm and gain in headway of a real reported fire. (Post Office procedures for reporting fires require the person who discovers the fire to sound a pre-alarm. This is a buzzer to summon a member of Engineers Staff. If Staff member decides to summon the Fire Department, he inserts a key in the alarm box to activate alarm).
7. Limitation of masks in fires including extreme heat conditions. Smoke was of moderate intensity. Bulk and weight of masks, reduced visibility with masks on and the concern for floor openings made operations without masks advisable in many situations.
8. The necessity for high pressure pumping equipment and large diameter hose to develop master streams capable of penetrating to the seat of the fire and controlling the burning rate.

In conclusion, the Fire Department looks with pride on their success in handling this particular fire. Over 10 million pieces of mail out of 14 million were salvaged. This fire came as no surprise. A detailed recommendation submitted to the Postal Authorities in 1965 predicted its development. As a result, the Postal Deparment is making an entire re-evaluation of fire protection in similar installations throughout the United States and if it results in an upgrading and an avoidance of fires of this type, the efforts expended in controlling this fire will not have been in vain. ▲

A report of the
NFPA Fire Investigations and Applied Research Division

A combustion explosion in a 70-year-old four-story building devastated an east Buffalo, New York, neighborhood on December 27, 1983, resulting in the deaths of two civilians and five fire fighters. Twenty-six fire fighters and approximately 50 to 70 civilians were injured. The explosion resulted when an unauthorized 500-gallon tank of propane was dropped from an industrial lift truck on the third floor, breaking off a valve on the tank. The ignition source was believed to be a wood stove on the first floor of the building. The explosion occurred shortly after fire department apparatus had reached the scene.

The building at 60 Grosvenor Street was built in 1904 of heavy timber construction with pilastered brick walls, approximately 12-by-12-inch wood posts and beams, and wood plank flooring. The building had housed the Manhattan Silk Company, then was used as a manufacturing plant and later as a paper warehouse. It was abandoned in 1953. The Buffalo Fire Department had no information prior to the December 27 incident that would indicate the building was occupied once again.

A radiator repair business was operating in the property at the time of the explosion. The extent of operations was not known initially, but it appears that radiator repair operations and radiator storage occupied the entire building.

The building was protected by an automatic sprinkler system. The operational status of the system at the time of the incident was not determined.

The Incident

One of three employees working in the Grosvenor building on Tuesday evening, December 27, was moving a 500-gallon ASME Code tank of propane with an industrial lift truck on the third floor. The tank, reportedly to be used for building heat, was secured on the truck with a length of 2-by-4-inch wood being used as a block or wedge. The tank was not secured by chains or ropes. It fell from the truck, which caused a valve to break off, allowing liquid propane or propane gas to leak from the tank. The position of the tank when it came to rest and was leaking is not yet known. The opening was 11/16-inch in diameter.

See NFPA report, page 30

THE FATAL EXPLOSION

Notes from the scene

JAY BRADISH

Caller: *"We have a propane tank leaking in the building."*
Dispatcher: *"How big is the tank?"*
Caller: *"It's probably a 100- to 500-gallon tank."*
Dispatcher: *"An alarm of fire, North Division and Grosvenor. Engines 32, 3, 1; Ladders 5, 2; Rescue 1 and B-43. Box 191 — Time 2023."*

At Engine 1's and Ladder 5's station, fire fighters were having a retirement dinner for Engine 1 Captain Larry Sullivan. This was his final shift. Just finishing his coffee, Sullivan joked, "We'll be back in 10 minutes."

Battalion Chief Harvey Supple lies injured with a 5-inch wood splinter in his neck, while fire rages in the background. (Photo by Gail M. McGee, *The Buffalo News)*

IN BUFFALO

Dispatcher: *"A ruptured large LP tank in a building."*
B-43: *"What kind of tank?"* (Battalion Chief Harvey Supple)
Dispatcher: *"LP-Gas."*
B-43: *"Roger."*

Supple, who always is smoking a cigar, later recalled, "I threw my cigar out the window."

Engine 32, under the command of Captain Edmund Courtney, was first on the scene and was positioned at the northeast corner near the warehouse. Ladder 5 was next in and parked along the front of the warehouse. Chief Supple arrived and positioned his vehicle near the intersection. Engine 1 was the second-due pumper and was positioned on N. Division near the corner. First arriving crews found no outside evidence of a fire or a propane leak.

Buffalo was experiencing severe winter weather conditions at the time of the incident. On the way to the scene, third-due Engine 3 and Rescue 1 both skidded on ice and missed the intersection to turn toward the warehouse and had to proceed one block out of the way. Second-due Ladder 2 was stuck in a snow bank about one block away. These weather-related difficulties caused these three units to be away from the immediate area at the time of the explosion.

Continued on next page

Reportedly, the fire crews had just arrived on the scene and Battalion Chief Supple was just beginning to get information on the situation, when a violent explosion disintegrated the building. The force of the explosion threw the ladder truck across the street. . . .

NFPA report continued

The worker attempted without success to replace the broken valve to plug the tank. He then went downstairs to alert the other two workers. An attempt was made to shut off the electrical service in the building. The three workers then left the building and departed from the area in a truck. They telephoned the fire department from a mobile telephone in the truck.

The Buffalo Fire Department received the alarm at 8:23 p.m. The report was that a tank of propane had burst in the building. Three engine and two ladder companies responded, along with a heavy duty rescue and Battalion Chief Harvey Supple. Ladder Truck 5 had arrived in front of the building on North Division Avenue, Engines 1 and 32 were parked on North Division and Grosvenor, and Battalion Chief Supple was on the scene when the explosion occurred. Reportedly, the fire crews had just arrived on the scene and Battalion Chief Supple was just beginning to get information on the situation, when a violent combustion explosion disintegrated the building. The force of the explosion threw the ladder truck across the street, moved both engines, and caused severe blast and missile damage to the buildings in the immediate vicinity.

All five crew members on Ladder 5 were killed. Two civilians also were killed. Nine fire personnel were injured, three critically, and 50 to 70 civilians were injured. Eight crew members from the two engines were among the injured, along with Battalion Chief Supple. Sixteen additional fire fighters and a fire investigator were injured during the fire suppression operations that followed the explosion.

A major fire followed the explosion and involved the debris that had been 60 Grosvenor Street and other buildings in and around a one-block area. Second and third alarms were ordered immediately, a fourth alarm one minute later, at 8:25 p.m., and a fifth alarm was ordered at 8:37 p.m. Additional companies were requested by special call. The fire was brought under control at about 1 a.m. the following morning.

Damage

The damage resulting from the combustion explosion was severe within a 200-to-300-yard radius of the Grosvenor Street plant. Additional damage, mostly broken glass, extended hundreds of yards beyond the severe explosion and fire damage areas. A commercial building across Grosvenor Street was destroyed, as was a church north of the explosion site. Most other buildings

See NFPA report, page 32

Notes from the scene

continued

Supple, Courtney and Fire Fighter Ken Fisher of Engine 32 were talking to three workmen who had left the building safely. Other fire fighters were waiting for orders. As Sullivan started to get out of Engine 1, Driver Bobby Cole said, "It's your last run and it's a false alarm. Relax." Supple indicated that the crew of Ladder 5 was to ventilate the warehouse.

Within a few seconds, a huge explosion occurred, sending tons of brick and debris showering down on the fire fighters and apparatus. A huge fireball totally engulfed the leveled brick warehouse and ignited several nearby structures.

Ladder 2: *"We've had an explosion — send all the help you can."*
Dispatcher: *"A second alarm, North Division and Grosvenor. Engines 13, 21, 35; Ladders 11, 1; Rescue 2; B-56 respond."*

* * *

Sullivan and Cole were trapped inside the cab of Engine 1. Sullivan remembers Cole saying, "We're going to burn alive in here," and Sullivan recalls, "That's when I got scared."

Fire Fighters Harry Laube and Paul Meegan from Engine 1 were talking to Matthew Colpoys of Ladder 5 when the warehouse exploded. Lauber and Meegan were thrown through the air about 30 feet, landing in a field, but Colpoys was buried beneath the rubble. Meegan

A crumpled Ladder 5, after being blown 35 feet across the street. All five members of this unit were killed. (Photo by Jay Bradish)

and Lauber suffered first and second degree burns to the face, head and upper body and lacerations and bruises.

Supple and Courtney were blown up against the chief's vehicle. Recalls Courtney: "We crawled around with the flames licking over us . . . You knew guys had been killed, because bricks were piled all over where they had been." Courtney suffered cuts, bruises and burns.

Supple suffered shrapnel wounds, a broken collarbone, ruptured eardrum and burns. The explosion embedded a 5-by-2-inch wood splinter in his throat, and his portable radio was blown away. Making his way to his truck radio, he reported an explosion and fire and requested a third alarm, speaking as if nothing had happened.

* * *

A fire fighter on incoming Engine 3 said, "All I saw was a big ball of fire. In my 25 years of fire fighting, I've never seen anything this bad."

Within two minutes, Ladder 2 fire fighters were using crowbars to pry the two trapped men from Engine 1, which had been moved about two feet south of its original position. Ladder 5 took the full force of the explosion and was moved 35 feet across the street up against a house. The aerial ladder was blown out of the bed. Engine 32 was blown 15 feet east of its original position up against the wall of the Twin Bakery Supply Company.

Division Chief Jack Supple (brother of Chief Harvey Supple) arrived and found that all 14 fire fighters on the scene at the time of the explosion were either seriously injured or missing in the rubble.

* * *

B-56: *"Give us a fourth alarm."* (Division Chief Jack Supple)

Dispatcher: *"A fourth alarm, North Division and Grosvenor. Engines 28, 30, 33 respond, 2036 hours."*

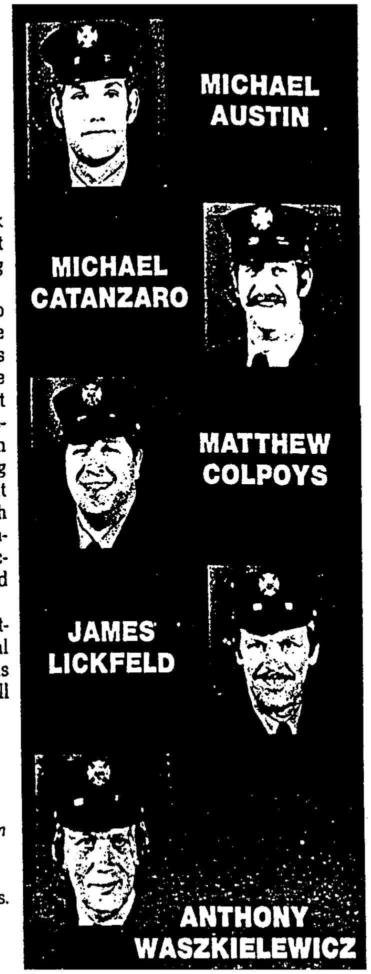
B-56: *"Call a fifth alarm. We have an explosion of a large building. We have men trapped. We have people trapped in houses. Fire spreading all over."*

Dispatcher: *"A fifth alarm, North Division and Grosvenor, Engine 2, Engine 10 and Engine 16 respond, 2037 hours."*

Dispatcher: *"All companies responding on the multiple alarms*

Continued on next page

Even with preliminary information, it can be determined that the combustion explosion could not have occurred if NFPA's LP-Gas standard had been adhered to.



NFPA report continued

damaged in the incident were wood frame dwellings on all sides of the Grosvenor location. The preliminary estimate of damage ranges from $10 million to $20 million.

Discussion

The cause of the explosion is still under investigation by the Buffalo Fire Department and other agencies. Preliminary findings indicate that gas released from the tank resulted in a major accumulation of a flammable gas/air mixture within the structure and that it was ignited by the wood stove on the first floor.

The existence of a 500-gallon propane tank in a structure was not authorized by the Buffalo Bureau of Fire Prevention. There was no request for a license for propane storage, according to the fire prevention chief, and no license had been issued. A tank of propane larger than 75 gallons in that class of occupancy is not allowed by the City of Buffalo Flammable Liquid Code nor by the Fire Prevention Code.

NFPA's liquefied petroleum gases standard (*Standard for the Storage and Handling of Liquefied Petroleum Gases).* Except for those installed on vehicles such as industrial trucks or being filled in a proper filling facility such as a bulk plant, NFPA 58-1983 does not permit ASME Code containers inside a building for any purpose.

Additional data are necessary to properly analyze the explosion and the time sequence from when the tank was dropped until ignition occurred. The amount of product in the tank was not known initially, nor were details regarding building openings, ventilation in the structure, or whether the leaking gas was in the liquid or gas phase. It can be determined, however, even with preliminary information, that the combustion explosion could not have occurred if NFPA's LP-Gas standard had been adhered to.

The condition of the three fire department personnel who were in critical condition following the explosion has improved slightly since the incident; all three are expected to recover.

FOR MORE INFORMATION
- NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases.* Available from NFPA.
- *Fire Protection Handbook,* 15th Edition, Section 3, Chapter 2, Explosions. Available from NFPA.

Notes from the scene

continued

lay in lines. The first alarm assignment is involved in attempted rescues of people trapped in buildings."

* * *

Burning structures included the warehouse, the bakery supply company, a church and three nearby houses along with other smaller fires in the area.

* * *

Dispatcher: *"Fourth Battalion and Ladder 10, respond North Division and Grosvenor, 2038."*
B-56: *"We have an explosion of a large building"* (unintelligible) *"We have numerous men with injuries, we're not sure but there are some buried"* (unintelligible) *"We need all the manpower help you can give us. Can you give us two more engines, two more trucks?"*

* * *

Fire fighters from Engine 3 and Rescue 1 (what was left of the first-alarm assignment) were digging through the debris with bare hands searching for trapped comrades.

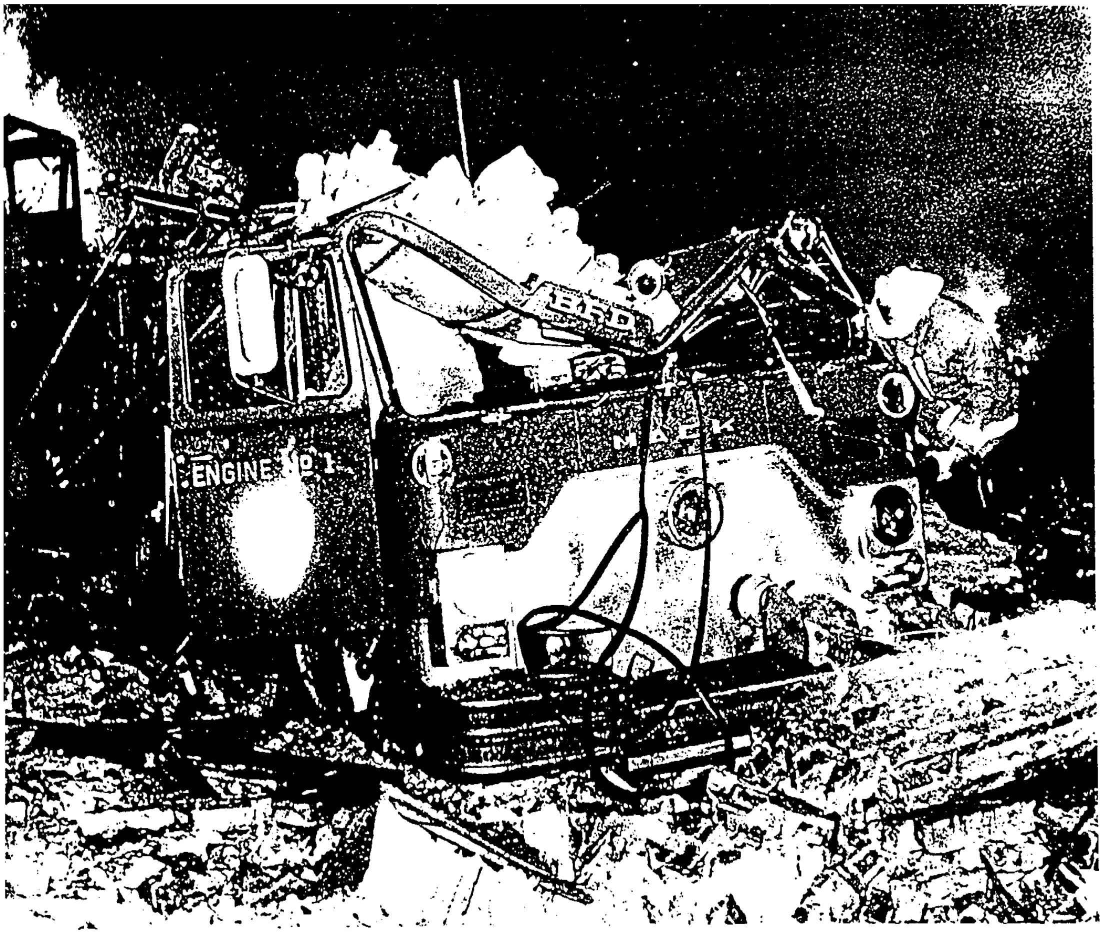
"I'll never forget pulling up on the scene and seeing all those fire fighters digging through the ruins, looking for the bodies of the men they knew. There were helmets lying all over the place," said veteran fire investigator Jack Pascall. Fire fighters could move the smaller pieces of debris but had to wait for heavy equipment from the streets department to move pieces of wall weighing up to five tons.

* * *

With a total of 150 fire fighters and 28 engine and ladder companies at the scene, suburban volunteer departments were requested to provide mutual aid standby and to supply additional lighting equipment at the scene. Rescue operations were very confusing because it was difficult to determine who was at the scene at the time of the explosion, who was injured, which of three hospitals they were taken to and exactly how many fire fighters were missing.

The fire was brought under control by midnight, and it was determined that all fire fighters were accounted for, but men remained on the scene throughout the next day searching through the rubble for any additional civilian casualties and wetting down hot spots.

* * *



Engine 1, where soon-to-be-retiring Captain Larry Sullivan and Driver Bobby Cole were trapped. "We're going to burn alive in here," Cole said. Recalled Sullivan: "That's when I got scared." (Photo by Gail M. McGee, *The Buffalo News*)

A resident of 612 N. Division, Alfred Arnold, 34, was killed while trying to warn his mother to leave the house.

More than 75 civilians were injured. Nine fire fighters from the first alarm assignment were hospitalized. Numerous other fire fighters suffered strained backs, frostbite, puncture wounds, burns and smoke inhalation but remained on duty.

* * *

The Buffalo Fire Prevention Bureau has been deluged with phone call tips to investigate possible illegal storage of propane. "People are just terrified that it will happen in their neighborhood next," Chief Fred Larson said. "It's kind of a pain, but we don't want to take any chances." Fire officials are planning to strengthen city ordinances dealing with the storage of LPG.

* * *

More than 90 fire fighters have been killed in the line of duty since the Buffalo Fire Department was organized in 1880, but this was the largest single loss.

Battalion Chief Harvey Supple, a 35-year veteran, commenting while recovering at home said, "I know it was a miracle, just pure luck that I survived. I know that when I go back to work, the same thing could happen again a week later, or it could never happen again."

* * *

The Buffalo Fire Department

The Buffalo Fire Department is made up of more than 1000 men and women with 970 line fire fighters operating out of 32 stations. There are 25 engine companies, 13 ladders, 2 rescues and 1 service. The department had 26,000 runs last year. The population of Buffalo is 357,000.

Jay Bradish has been a fire fighter for 12 years, and is currently a captain with the Bradford Township Volunteer Fire Department, Pennsylvania, where he is also a fire investigator and fire photographer. He is a member of IFPA and NYSAFC. He has written 25 articles for various fire magazines.

Fire Command acknowledges with grateful appreciation the assistance of the following individuals: Buffalo Fire Commissioner Fred Langdon, Deputy Commissioner Albert Duke, Deputy Chief Richard Sikora of the Buffalo Auxiliary Fire Corps, and Leo Duliba of Jamestown, N.Y.

SIMULATION 14: DINNER CLUB

(OPTIONAL)

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management tasks at fires involving dinner clubs.*
2. *Perform the management functions required of the Command Officer at fires in dinner clubs.*

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INTRODUCTION

A **dinner club**, for the purposes of this course, is a place of public assembly that usually offers dining, drinking, live entertainment, and banquet facilities.

These occupancies are usually one or two stories. Many dinner clubs have undergone extensive remodeling and/or renovations.

INCIDENT-SPECIFIC CUES

Construction Features

The construction of dinner clubs varies to some degree with age and the building codes that were in force at the time of construction. Most dinner clubs are of ordinary construction. Some are in renovated factories, and may be of heavy timber construction. A few may have concrete block exteriors. Incident Commanders (ICs) must be careful not to be fooled by exterior appearances. Due to extensive and continual remodeling, the interior may bear little resemblance to the outside construction type.

The interiors are comprised of several large public areas used for dining, dancing, and entertainment. However, most of the partitions are movable and nonrated to allow for expansion and contraction based on need. In addition, there are several lounges, cloak rooms, bathrooms, etc., for customer use. To support the operations, there are numerous service areas, dressing rooms, kitchens, and mechanical areas, many of which have no rated fire separations.

This type of occupancy generally has a heavy fire load. In addition to combustible structural members, there are drapes, carpets, plastics, furniture, and an array of decorations. All of these combined generate volumes of dense, toxic smoke under fire conditions. Coupled with the lack of rated separations and the high occupancy load during business hours, this creates a severe rescue problem.

Resource Considerations

Water supply is a major consideration with the potential for fire spread in this type of occupancy. Dinner clubs often are built in remote areas with less than adequate water pressure. Available water supply, alternate water sources, permission to use a particular water supply, all-weather access, and projected delivery rates can be determined through preplanning.
Hose lays could be long because of the maze-like interiors and hydrant spacing. Large-diameter hose should be a consideration.

Built-in fire protection systems such as sprinkler systems or house lines would be ideal to support fire department operations. However, the most serious problem and the one requiring the most resources will be rescue and evacuation.

The number of personnel required to do an adequate search and evacuation for maximum occupancy load should be projected and considered when developing response procedures.

Outside agencies should be considered when projecting resource needs. These might include police departments, morgue, hospitals, Red Cross, bus companies, and mutual-aid fire departments.

Structural Deterioration and Collapse Potential

Due to the nature of their business and continual remodeling, dinner clubs have many voids where fire can burn undetected, contributing to structural collapse. In addition to stage access, duct work, false ceilings, and service corridors, modern dinner clubs may have lightweight truss roofs, which may collapse after only a few minutes of fire impingement. Older masonry structures also will give way under fire conditions. Be aware of these cues; however, in most cases rescue is the big concern, not collapse.

If the fire becomes so intense and so large that collapse is likely, successful rescue efforts will be almost impossible.

With adequate notification and response, most fires can be handled with an aggressive interior attack.

CUE-BASED PREDICTIONS

Efficient ICs are aware of and make use of cues in developing necessary strategies for incident mitigation. The type of occupancy gives several cues. Large open areas, open stairways, nonrated separations, and a heavy interior fire load all promote rapid fire and smoke spread.

During hours of operation, the rescue problem is extreme. While all the occupants are adults, they will vary in age and mobility. You may find occupants with physical disabilities that hamper mobility. Some occupants may be under the influence of alcohol. Almost all occupants will exhibit some degree of panic. Under the best of conditions, rescue operations will be very labor intensive, and also can be emotionally and physically draining for firefighters.

The location of the fire is critical. For all the reasons already discussed, it is imperative that the fire be confined early. This will require multiple lines, which places a further demand on personnel.

Almost as important to the rescue effort as fire control is ventilation. The earlier effective ventilation can be started, the greater the chances of successful rescue operations.

STRATEGY AND TACTICS

The strategies developed for dinner club fires, like other incidents, should be based on incident priorities:

- life safety;
- incident stabilization; and
- property conservation.

If we are going to prevent serious life loss in these types of fires, Preincident Preparation (PIP) is a must. The resource demands of public assembly-type fires will not allow us to wait for the incident to occur to begin planning. Not only must we plan for resources, we must understand their capability and availability.

First-alarm companies should be committed to actions that will have the greatest impact on the overall outcome. During hours of occupation, evacuation must be started immediately, ventilation started, and lines placed to check the fire and protect the exits.

Be careful not to spread the fire into uninvolved areas during fire attack. Place lines above the fire to prevent vertical extension.

Hose lines of 1-3/4 inches probably will be adequate for initial attack, but should be backed up with 2-1/2-inch lines as personnel allows. A coordinated ventilation effort is essential for successful fire attack and evacuation.

Firefighter fatigue and rehab must be a consideration. The operations involved are very labor intensive. If there are deaths and injuries, consider emotional support for the firefighters; contact a Critical Incident Stress Debriefing (CISD) team or other appropriate resource.

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Simulation 14

Homework Assignment

Dinner Club Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on dinner clubs the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the groups established for classroom activities. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation.

2. After reading the SM, your group will determine a number of the problems facing the IC, based on the limited incident information given. For each problem, you must provide both an assignment solution and a management solution.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems or solutions that were not discussed.

Scenario 1

At 2130 hours Saturday, a fire is reported at a large one-story dinner club. A dinner show is being presented, and the building capacity is 400 people. The club is located in a rural area with no hydrant water supply. There is a pond 2 miles away, from which the fire department can draft. Describe, in detail, the water supply operation that would be established to bring 750 gpm to the scene for a continuous period. Use whatever apparatus are required to establish the supply. (Water tenders carry 3,000 gallons for this exercise.)

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Scenario 2

At 2130 hours Saturday, a fire is reported at a large one-story dinner club. A dinner show is being presented, and the building capacity is 400 people. There are 600 people in the dinner theater. The club is located in a rural area with no hydrant water supply. Due to poor codes when the establishment was built, there are insufficient exits for a capacity of 400, let alone the 600 who are there on the night of the fire.

What **rescue** problems are created, and what tactical rescue and ICS solutions must be applied?

Rescue Problem: ______________________________

____

____

Tactical Rescue Solution: ______________________________

____

____

ICS Solution: ______________________________

____

____

What cues led you to this solution? ______________________________

____

____

Rescue Problem: ______________________________

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Tactical Rescue Solution: ______________________________

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ICS Solution: ____

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What cues led you to this solution? ____

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Rescue Problem: ____

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Tactical Rescue Solution: ____

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ICS Solution: ____

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____

What cues led you to this solution? ____

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In Class
Activity 14.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a dinner club scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the worksheet for the activity.

3. The class will be shown a slide of a dinner club. Everyone will review the scenario description and the plot/floor plan.

4. Your group will write its strategies on the Strategy Prompter and convert those goals into an ICS organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident.

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 15 minutes total. Be brief, but to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, you must identify which Division or Group is performing that task.

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In Class
Activity 14.1 (cont'd)

Scenario Description

Construction

100' x 100' dinner club.
Ordinary construction (masonry wood-joist).
Walls--concrete block.
Roof--beam and rafter, plywood sheathing, with paper, tar, and stone.
200 people attending the show.

Fire Location

Fire in the kitchen area pushing smoke into the club area.

Time and Day

2200 hours, Saturday.

Water Supply

2,000 gpm total system flow.

Resources (1st alarm)

4 engines
1 truck
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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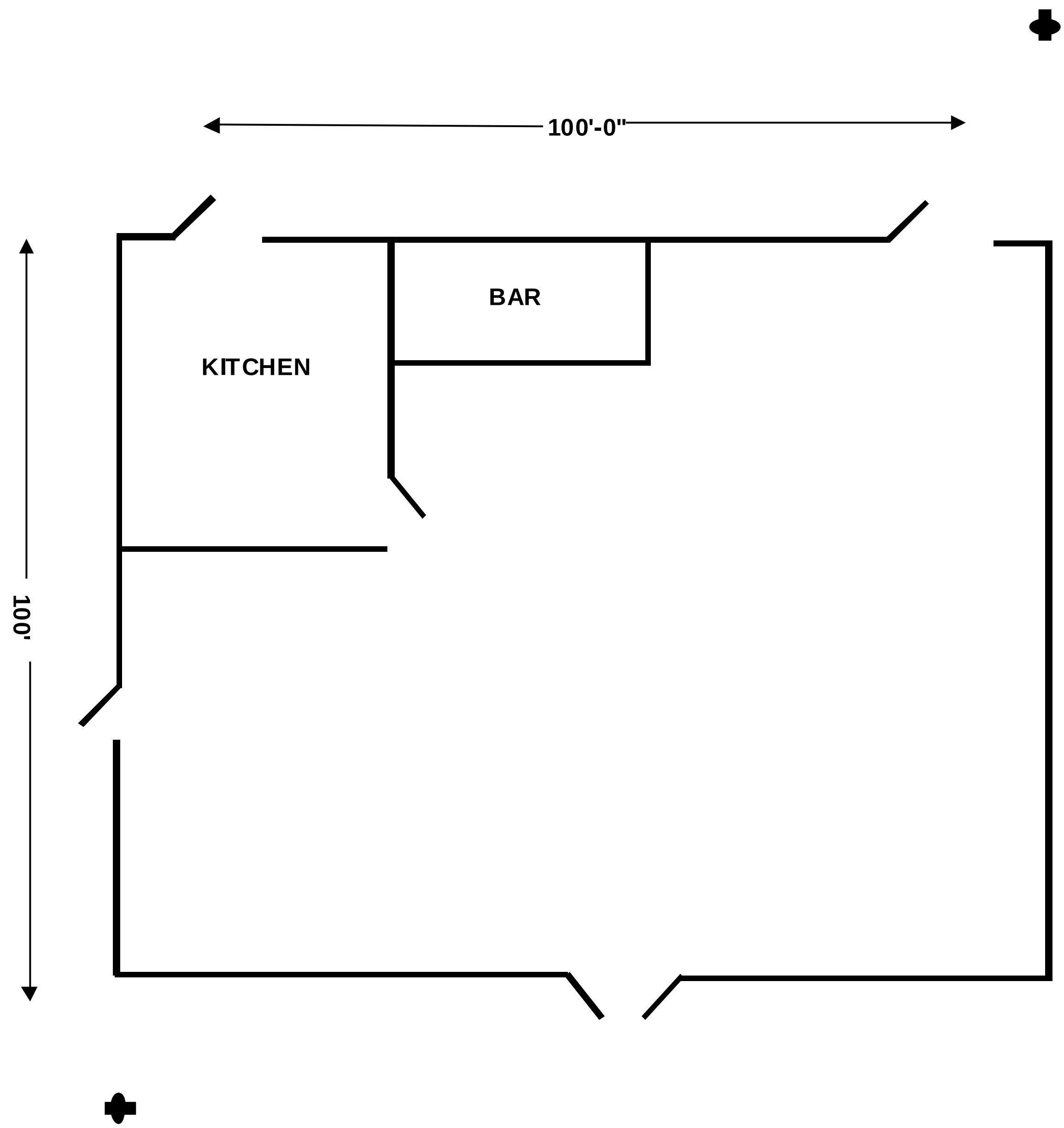
In Class
Activity 14.1 (cont'd)

Plot/Floor Plan



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Simulation 14

DINNER CLUB SIMULATION

Incident Description

A large dinner club with multiple rooms on two floors.

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Simulation 14
Quick Access Prefire Plan

Building Address:
1840 B Street (North of 1st Street)

Building Description:
150' x 100'--balloon-frame construction

Roof Construction:
Ridgepole and rafter, 1" x 6" sheathing, asphalt composition shingles

Floor Construction:
First floor poured concrete--upper floors wood joist, sheathed with 1" X 6", covered with hardwood

Occupancy Type:
Restaurant/Night Club/Motel
Occupancy load--700

Initial Resources Required:
4 Engines, 1 B/C, 1 Truck,
1 PM, 1 Safety Officer

Hazards to Personnel:
Roof and floor collapse, maze-like interior, overhead electric wires

Location of Water Supply:
One hydrant in front; one hydrant on Robles Rd.;
Two hydrants--1,000' to either side

Available Flow:
Total area flow 2,000 gpm

	Estimated Fire Flow*			
Level of Involvement	*25%*	*50%*	*75%*	*100%*
Estimated Fire Flow	250	500	750	1,000

**Fire flow based on common area (lobby and hallways) of 1,500 sq. ft. with 4 exposures.*

Fire Behavior Prediction:
Rapid extension through common attic, and large open areas.

Predicted Strategies:
Rapid interior attack and confinement to protect egress, search and rescue, and ventilation.

Problems Anticipated:
Adequate personnel for search and rescue, limited water supply and access, panic, incapacitated occupants.

☐ **Standpipe:** *No*	☒ **Sprinklers:** *Basement only*	☒ **Fire Detection:** *Yes*

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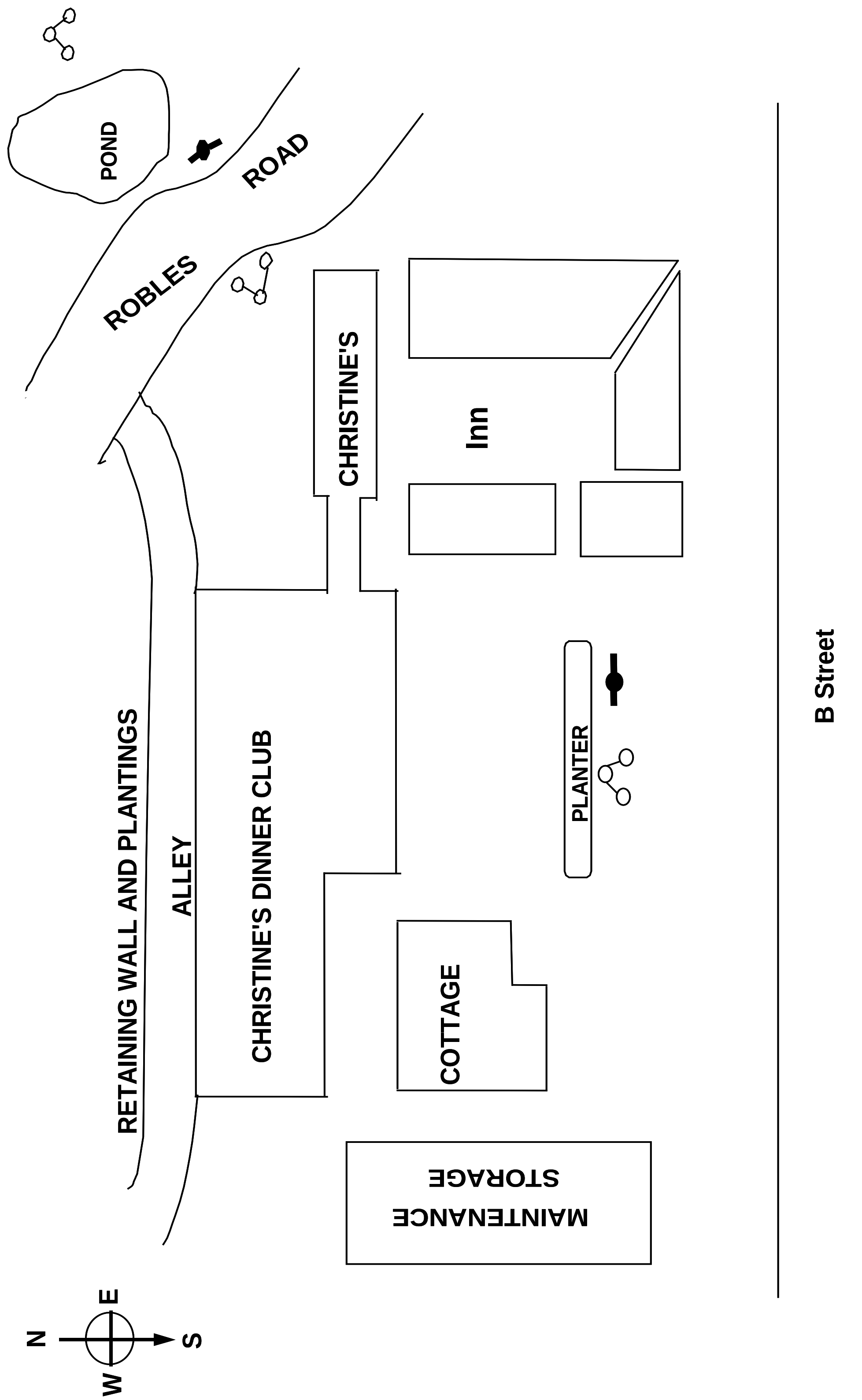
Simulation 14

Plot/Floor Plan



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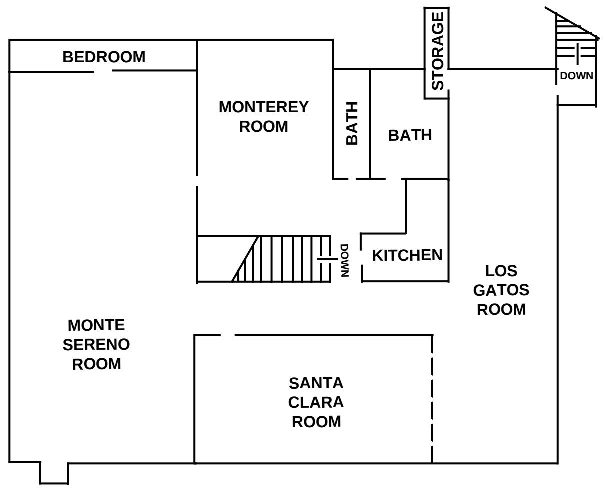
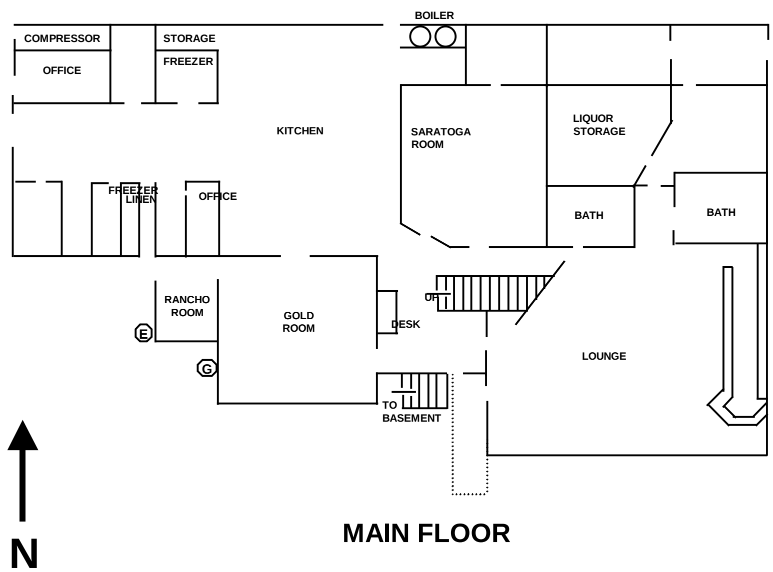
Simulation 14

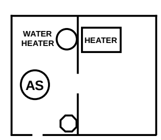
Plot/Floor Plan (cont'd)



SECOND FLOOR



MAIN FLOOR



BASEMENT

CHRISTINE'S DINNER CLUB

SIMULATION 15: WAREHOUSE

(OPTIONAL)

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management functions at warehouse fires.*

2. *Apply the knowledge, skills, and abilities discussed to manage a simulated warehouse fire.*

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INTRODUCTION

A **warehouse** usually is defined as a facility that is used for storing materials and products used in a manufacturing process or for distribution to manufacturers, wholesale establishments, or retail stores.

In some cases, the amount and type of warehouse storage can create fires that can be extremely difficult to control. Also the warehouse structure itself, depending on its age, can make a fire extremely dangerous to battle.

Other stored products such as flammable and combustible liquids, other miscellaneous combustibles, and toxic materials increase the severity of the situation.

OCCUPANCY-SPECIFIC CUES

Construction and Content Factors

Warehouses may contain any type of material. Hazardous materials (haz mat) may be present in quantity. In many cases they may only contain everyday household goods, clothing, furniture, and small quantities of haz mat.

These structures are typically Type III--ordinary or Type II--noncombustible construction. Ordinary construction will contribute to the fire load.

Stability of noncombustible construction may be questionable under fire conditions. Collapse of noncombustible construction may be rapid.

Metal buildings may be used for semiprotected storage. Early structural failure can be expected.

Structures may contain equipment for maintenance on the facility. Buildings or facilities within 100 feet should be considered exposures.

The value of contents within warehouses must be considered. Such contents include products stored, machinery, vehicles, and chemicals.

Built-in fire protection is not usually present in warehouse occupancies. However, some buildings have alarm systems, sprinkler systems, etc. Often the reporting of fires in warehouse buildings is delayed.

COMMON PROBLEMS TO IDENTIFY

Access to warehouse facilities may be difficult, especially in terms of reaching the area where the fire is located. Approach to the fire area with apparatus may not be possible, resulting in long stretches of hoselines to reach the fire. Access points into and around the facility should be preplanned.

Water supply for fires in warehouses usually is not considered a problem because hydrants almost always are available in the areas where they are located. However, consideration must be given to the total fire flow required for a large fire in the facility. The water supply from area hydrants may not be sufficient to support the heavy streams required for the fire potential.

Rapid fire spread is common in warehouse fires if they are not reported quickly and suppressed in their early stages. It must be remembered that warehouse fires can grow rapidly; requiring major changes in strategy and increased resource commitments.

The **type and amount of material** burning and the manner in which it is stored will be factors in fire growth and the ability to extinguish it.

The amount of **heat radiation and convection** produced by the burning material must be considered. Large, free-burning fires will have a greater potential for exposing adjacent structures and will require additional hoselines for exposure protection. These types of fires also will make it more difficult to approach the fire area to apply water in the most effective manner.

Stream penetration will require straight-tip streams and may require long hoseline stretches. In some cases, elevated streams may be required to place the water on the burning material. You also may need to employ master stream nozzles on the interior as well as the exterior.

Apparatus placement must be considered. It may not be possible to set up close to the facility. You must consider where you initially place apparatus should the fire go from offensive to defensive.

Fires in warehouse facilities have the **potential for becoming long-term incidents.** The size of the fire, the amount of material burned, and mop-up operations can require extended onscene commitments of resources. **Fatigue of personnel** also can be a factor due to the amount of work required and the possibly hostile operating environment. For this reason, **rehab needs should be considered** along with the use of relief personnel.

Large, long-duration fires in warehouses usually will require **extensive resource commitments.** When the potential exists for this type of fire, early consideration of resource needs must be made. Requesting additional alarms or mutual aid must be done in a timely manner. Also give consideration to specialized resources that may be needed, such as elevated stream apparatus or lighting equipment for nighttime operations.

Interagency support also should be evaluated early and requested as needed. Law enforcement personnel to deal with traffic problems in the area and utility service companies to terminate or control affected utilities probably will be required. Consideration also should be given to establishing **emergency medical services** (EMS) capability at the scene to treat any injured firefighters.

Overhaul of warehouse fires can be extensive and difficult. The large amounts of tightly stacked, burned, and charred material present, and the difficulty in reaching deep-seated fires for final extinguishment make overhaul time-consuming and labor-intensive. The instability of stacked lumber also may be a problem. **Wetting agents** such as "light water" can speed this process up considerably. In some cases heavy equipment is required to move material for the overhaul. A consideration for solving these problems is not to conduct an overhaul of the burned material, but to post a fire watch until certain that the fire is completely out.

CUE-BASED PREDICTIONS

When the fire is of significant proportions, the defensive mode will be applicable from the arrival of the first apparatus. Protect exposures and establish a high-volume water supply.

Intense radiant heat may prevent firefighters and apparatus from approaching the fire area to place effective streams on the burning area.

Long supply lines often require significant numbers of pumping apparatus to deliver water to the scene.

Warehouse fires can turn into conflagrations quickly if large streams are not used or if sufficient resources are not called early. Flying brands are a problem downwind.

Master streams and large handlines are required to knock down the fire.

INCIDENT MANAGEMENT CUES

Fires in warehouse facilities often require that multiple tactical operations take place. Fire attack, forcible entry, exposure protection, primary search and rescue, and ventilation are just a few of the activities that must be coordinated during the incident. Failure to coordinate tactical operations can result not only in very ineffective fire control, but also can cause serious injury to firefighting personnel.

Command Officers must ensure that tactical operations are performed in a timely manner and do not conflict with each other. Opposing hoselines and premature or delayed ventilation are examples of problems that can develop if tactical operations are not controlled and coordinated.

STRATEGY AND TACTICS

Warehouse Fires

Fires in warehouse storage can grow rapidly and spread quickly. The type of material and method of storage are factors in fire intensity. These fires can generate enormous amounts of heat. Should the roof assembly fail, flying brands could be spread over a large area.

Basic strategy depends on several factors, the size of the fire, access to the fire, and the proximity of exposures to the fire building. The typical strategy for small fires is small handlines with a direct attack on the fire. Some ventilation may be required.

For larger fires, large handlines (2-1/2") and master streams will have to be used. These lines and nozzles provide reach, penetration, absorb large quantities of heat, and produce volumes of steam. Elevated streams may be necessary to reach into tall buildings or to attack fires where the roof has failed.

If conditions permit, the fire should be attacked from a direction that will not move it toward uninvolved material or toward adjacent structures. If structures are threatened by heat radiation or convection from the fire, initial hoselines or appliances should be placed in positions to protect them.

Safety must be a prime consideration when selecting strategies or tactics to combat fires in warehouses. This is especially true in larger fires.

Fires Inside Structures

Fires that occur inside warehouse facilities present different problems than those involving only outside storage.

If the fire occurs in the facility during normal business hours, life safety of employees and customers must be a primary consideration.

The amount and type of fire load must be taken into consideration. Attempt to find a warehouse management employee who can give you information on the materials in the building and where different types are located. Remember to consider tools, vehicles, and equipment that may contribute to the fire.

Many warehouse occupancies have an office area. Attempt to retrieve the records from the office if they are threatened by the fire.

Fire behavior is different than in many typical fires. The warehouse occupancy normally involves very large floor areas that can lead to rapid spread and early collapse. There may be large amounts of flammables and combustibles on each floor. The structure itself may contribute fuel to the fire.

Unusual fire behavior is possible. Be on constant guard for flashover, backdraft, and explosions.

As with any interior fire, the best approach usually will be a quick, aggressive attack on the seat of the fire. This must be tempered with concern for conditions within the building, the amount of fire, and the risks involved in entering the building. Hoseline and nozzle size for fire attack and extension control must be based on fire conditions.

Ventilation of the structure also should be considered as a means of providing a safe operating environment within the building and limiting the direction and amount of fire spread. Ventilation must be coordinated with fire attack and exposure protection.

Internal exposures also must be considered, especially the extension of fire to other combustibles, combustible liquids, or products considered to be hazardous materials.

Salvage becomes a strategic consideration at fires involving structures in warehouse facilities. Protection of building materials, hardware items, and tools from water and smoke damage can do much to limit the overall amount of fire loss.

Safety considerations when fighting fires involving structures at warehouse facilities are important. Structural stability must be evaluated before firefighters enter the structure and monitored constantly if the fire is not extinguished quickly.

Changes In Strategic Mode

Fires in warehouse facilities can develop rapidly and change quickly. Because of this, Command Officers should have alternate strategies in place to deal with changing conditions.

Initial placement of apparatus can be critical if the fire does grow, and a switch must be made from an offensive attack with handlines to a defensive operation with heavy streams. There can be damage to apparatus from an exposure fire. Operations requiring master streams and elevated streams require proper apparatus placement.

When a switch in operational mode is made, it is critical that all involved in the incident are made aware of the change and modify their operational status accordingly. Acknowledgment from officers directing tactical operations should be obtained to prevent injuries or noncompatible activities.

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Simulation 15

Homework Assignment

Warehouse Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on warehouses the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the same groups established for classroom activities. You will provide written answers on the worksheet and bring the worksheets to class to use during the presentation. At the conclusion of the presentation, the instructor will collect the worksheets and retain them.

2. After reading the SM, your group will answer the questions pertaining to different situations or problems at warehouse fires.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems that were not discussed.

Scenario 1

A five-story warehouse is experiencing a major fire on the third floor in a large quantity of Class "A" combustible materials in cardboard boxes.

What problems are created, and what tactical and Incident Command System (ICS) solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____________________

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Scenario 2

A large, one-story warehouse (300' x 400') of noncombustible construction is well over 50 percent involved in fire. This is obviously a master stream-type fire. There are sufficient windows and doors on both Side A and Side C.

For the size of the building and the magnitude of the fire, does the National Fire Academy (NFA) fire flow formula apply? Determine how many master streams you would attempt to employ to keep this fire from extending to exposed structures on Side A and Side C.

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In Class
Activity 15.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a warehouse scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the activity worksheet.

3. The class will be shown a slide of a warehouse. Everyone will review the scenario description and the plot/floor plan.

4. Your group will write its overall goals (strategies) on the Strategy Prompter and convert those goals into an ICS organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident.

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 15 minutes total. Be brief, but to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, you must identify which Division or Group is performing that task.

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In Class
Activity 15.1 (cont'd)

Scenario Description

Construction

75' x 50', three-story, connected warehouse.
Type IV--heavy timber construction.
Walls--brick.
Wood columns and beams support the roof assembly.
Roof--flat beam and rafter, 2" decking, with paper and tar.

Fire Location

25-percent involvement of the second floor.

Time and Day

1930 hours, Wednesday.

Water Supply

5,000 gpm total system flow.

Resources (1st alarm)

4 engines
1 truck
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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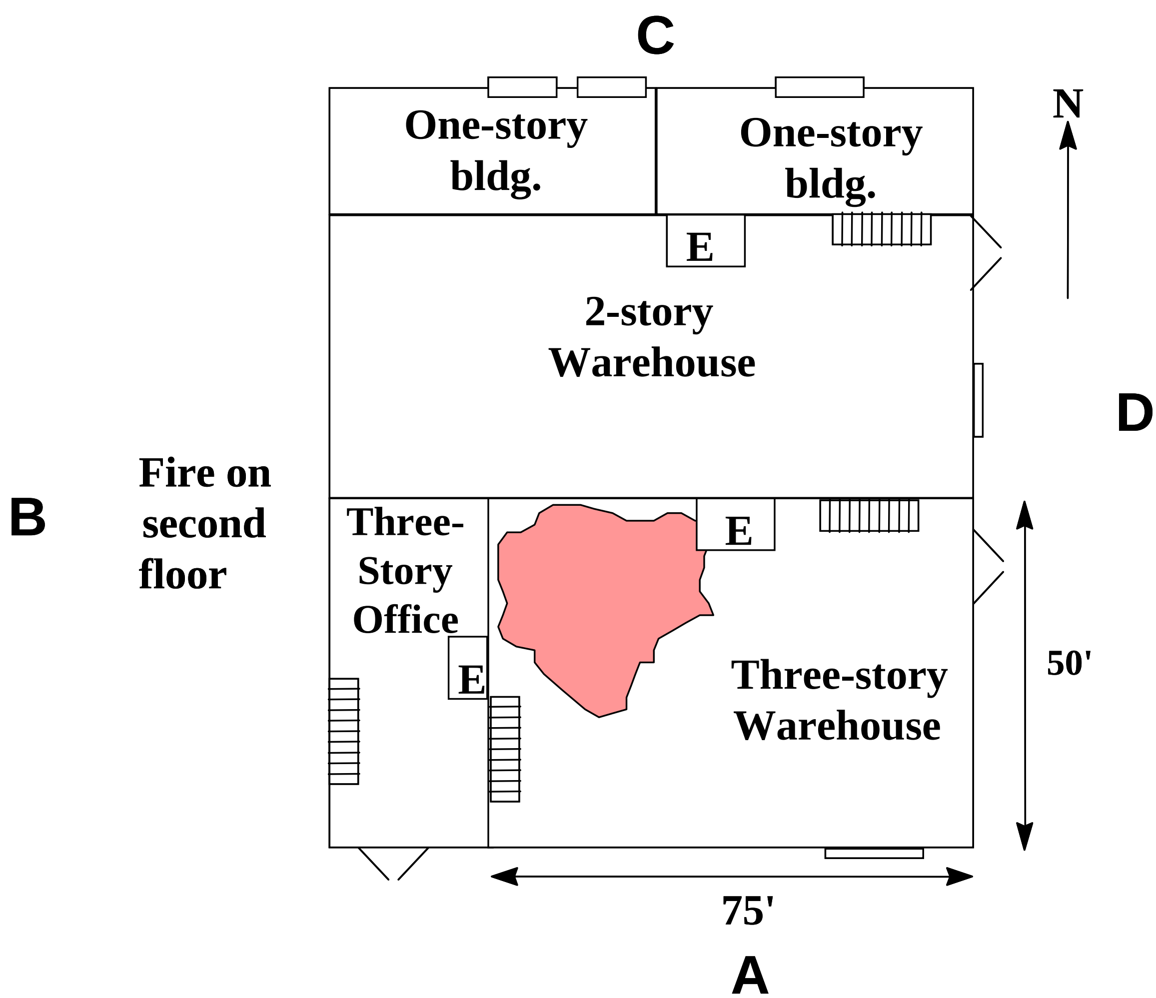
In Class
Activity 15.1 (cont'd)

Plot/Floor Plan



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Simulation 15

WAREHOUSE SIMULATION

Incident Description

A six-story, 120' x 120', heavy-timber warehouse. Floors 1, 2, and 3 have storage on them. Floors 4, 5, and 6 contain no storage. One stair shaft exits at the roof level.

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Simulation 15

Quick Access Prefire Plan

Building Address:
22nd and L Streets

Building Description:
120' x 120', six-story, heavy timber construction

Roof Construction:
Beam-and-rafter, 2" wood decking, paper, and tar
Beam-and-joist, 2" x 10", 2" wood decking

Occupancy Type:
Warehouse

Initial Resources Required:
4 Engines, 1 Truck, 1 Chief, 1 PM, 1 Safety Officer

Hazards to Personnel:
Large amounts of combustibles, Class 'A' and small amount of Class 'B'

Location of Water Supply:
Hydrants--at A/D corner and 200' west of A/B corner--other hydrants at adjacent corners

Available Flow:
2,500 gpm each hydrant

	Estimated Fire Flow*			
Level of Involvement	*5%*	*10%*	*25%*	*100%*
Estimated Fire Flow	500	1,000	2,500	10,000

**Basic fire flow--First floor and five exposure floors (rounded).*

Fire Behavior Prediction:
Rapid horizontal fire spread on any floor. Vertical fire spread through floors is likely.

Predicted Strategies:
Rescue, exposures, confinement, ventilation.

Problems Anticipated:
Rapid fire growth, long hose lays, dry standpipe.

[X] **Standpipe:** *Yes (Dry)*	[X] **Sprinklers:** *Partial-in office*	[ ] **Fire Detection:** *No*

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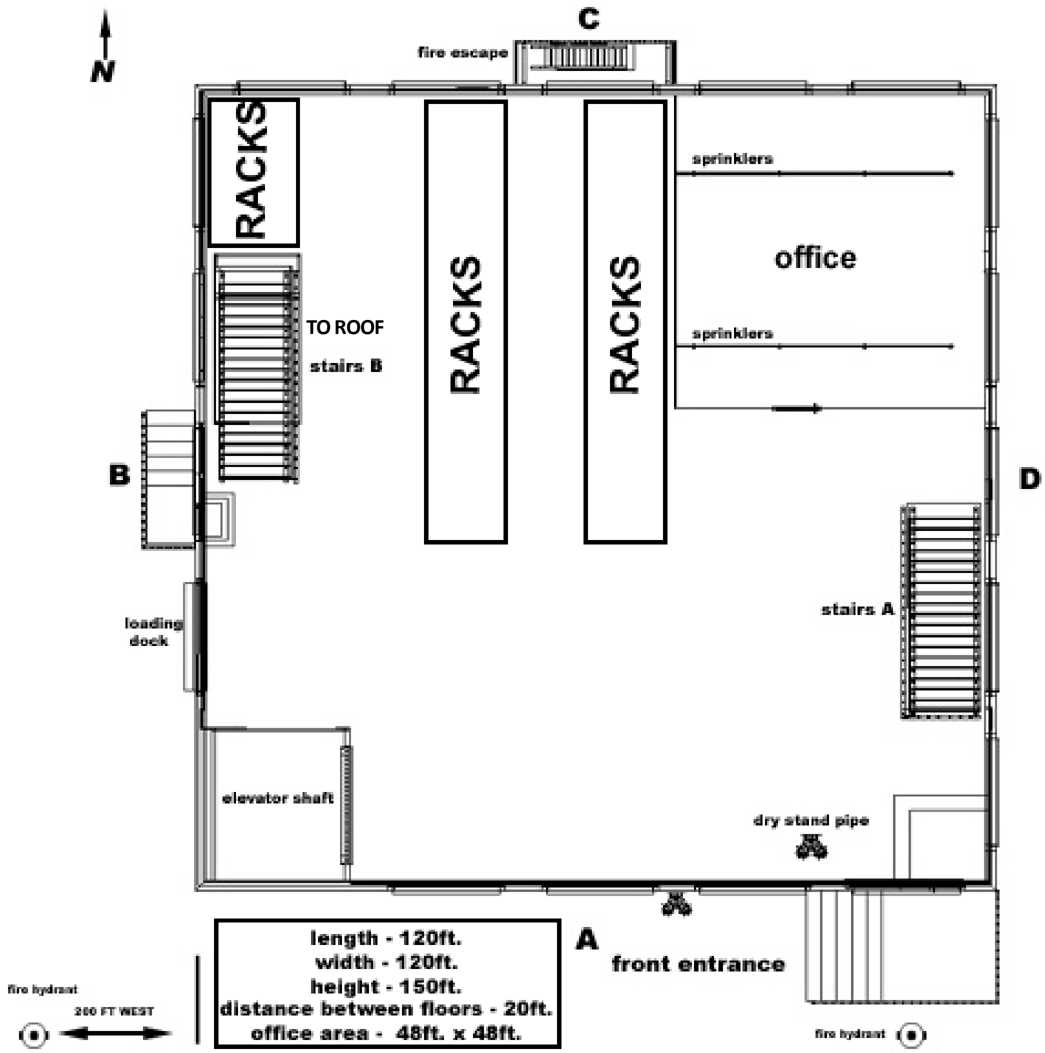
Simulation 15

Plot/Floor Plan

First Floor



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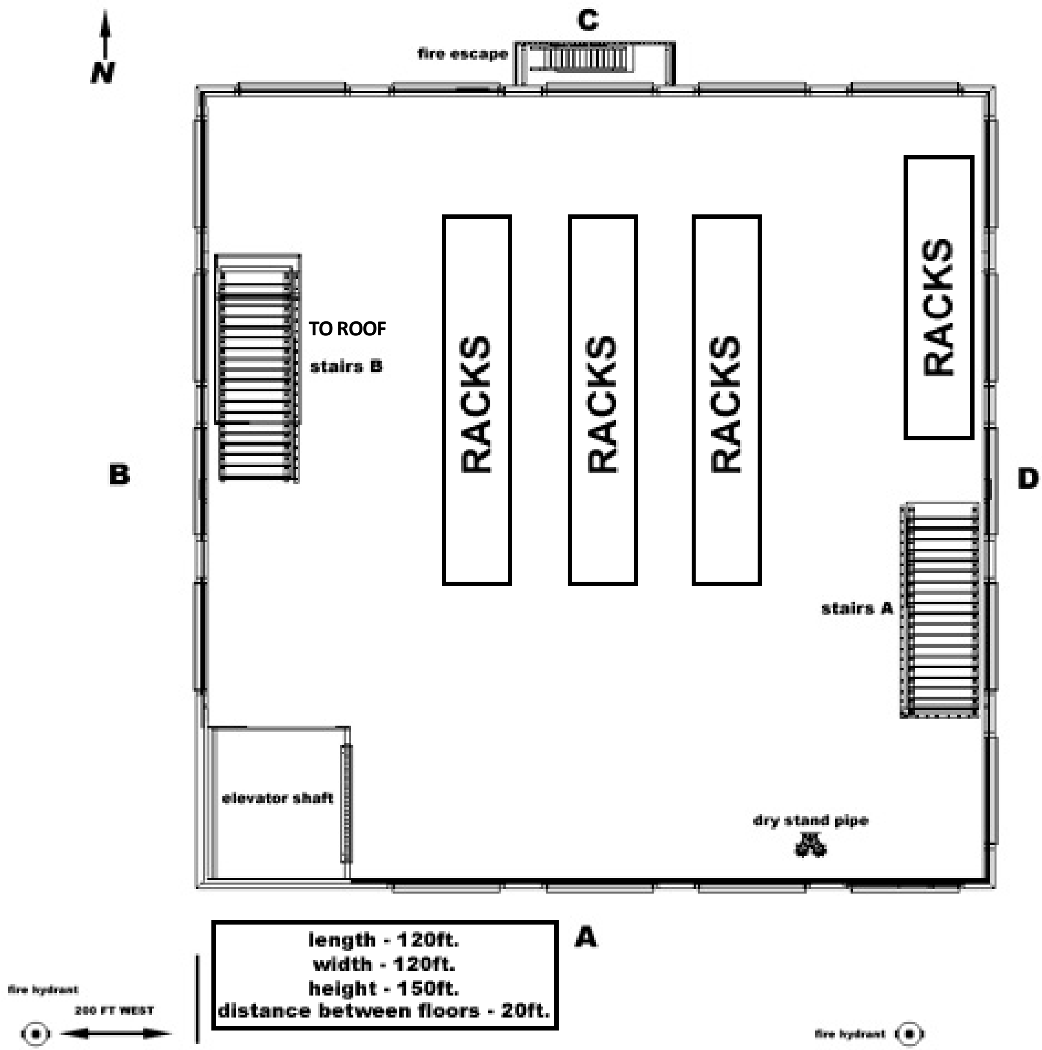
Simulation 15

Plot/Floor Plan (cont'd)

Floors 2 - 3



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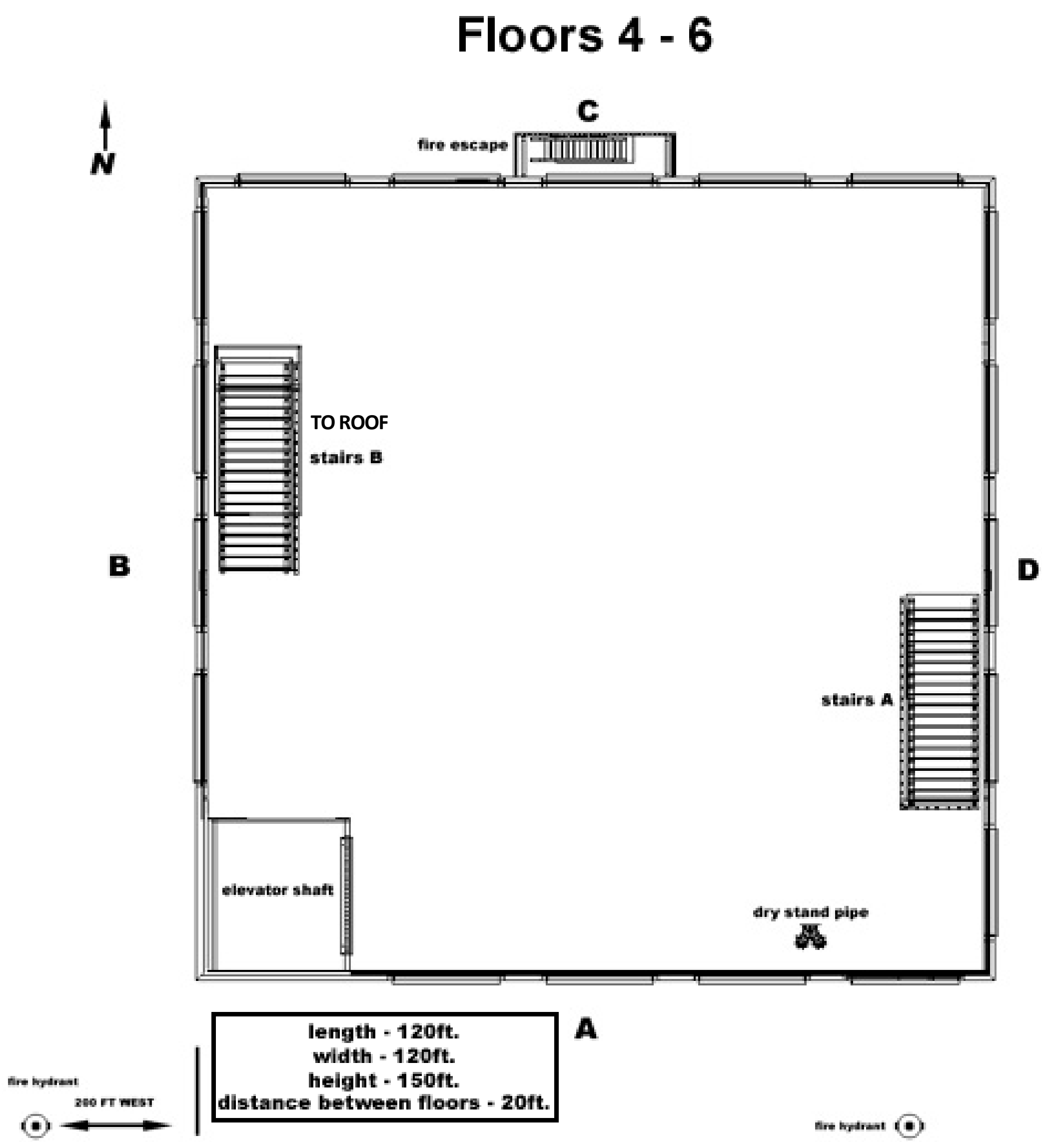
Simulation 15

Plot/Floor Plan (cont'd)



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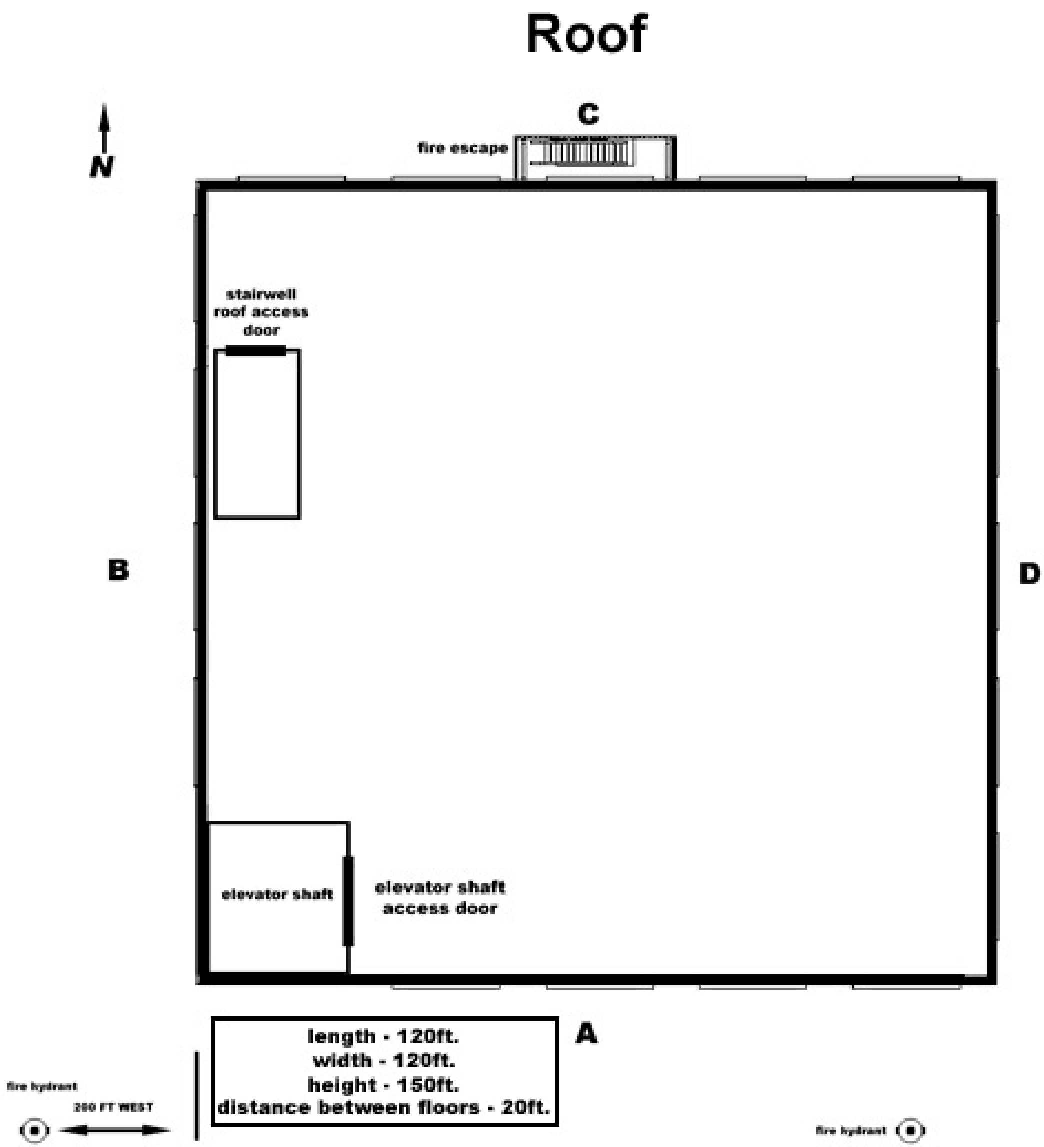
Simulation 15

Plot/Floor Plan (cont'd)



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SIMULATION 16: NURSING HOMES

(OPTIONAL)

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management tasks at fires involving nursing homes.*
2. *Perform the management functions required of the Command Officer at fires in nursing homes.*

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INTRODUCTION

A nursing home is a structure designed for the care of elderly or disabled persons. Many of the patients may be bedridden and not ambulatory. Most nursing homes meet numerous State and Federal requirements to maintain their licenses. Depending on the local jurisdiction and the State requirements that are currently in effect, many nursing homes may be considered relatively fire safe. However, even a small fire can create large amounts of smoke, and this toxic smoke, is detrimental to the life safety of the occupants.

OCCUPANCY-SPECIFIC CUES

The construction of nursing homes will vary with the age of the building, its design, and the building codes that were in effect when the structure was constructed. These types of buildings may be of ordinary, fire-resistive, noncombustible, and, in many cases, wood-frame construction. It is not unusual to find buildings of this type that have been expanded or remodeled and are of a mixed construction category.

It must be remembered that a construction type refers only to the basic structural elements and not to the furnishings or contents of the building. In many cases, modifications to the original basic structure may have occurred during remodeling or renovation.

In terms of separation of space on individual floors, nursing homes normally are well compartmented. The concept of compartmentation helps to contain a fire to the area of origin but is valid only if the concept is maintained by closed doors that separate an area of fire origin from the rest of the building. There may also be an open space concept in many nursing homes where patients are housed in dormitory-style areas.

Vertical compartmentation in multistory nursing homes relies on protected shaft enclosures. This concept can fail if fire enters stairshafts, elevator shafts, or vertical voids that penetrate floors. Also, it is defeated when fire laps upward (autoexposure), on the outside of the building.

Construction and code requirements for built-in fire protection will have a dramatic effect on problems encountered in these occupancies.

Alarm systems have to be considered the first line of defense in any habitational occupancy, and in nursing homes they can range from barely compliant to state-of-the-art. Even though alarm systems are installed, they may not be fully maintained, and may fail to function when fires do occur. Added to this is the fact that nursing home staff personnel often are reluctant to report fires until they have checked out the area.

Sprinkler systems are certainly one of the most effective built-in life safety feature, yet they are found only in the newest structures of this type or, in some cases, have been retrofitted under local or State ordinances that were passed following a "high-profile" tragic fire losses. Often nursing homes will have sprinklers installed only in selected areas such as basements or possibly in common hallways, but not in individual rooms.

Sprinkler/Standpipe systems found in nursing homes may consist of Class I systems which provide 2-1/2" outlets that are designed for firefighting purposes. These systems are to be considered reliable for primary fire department use and required in buildings of three or more stories (above or below grade). They are provided to reduce time in laying hoses from fire apparatus to remote building areas while providing better flow rates, preventing low working pressure and minimal water supply. Class I systems can used for initial attack but as always, should be backed up with regular fire department lines from an outside supply source.

Class II standpipe systems with 1-1/2" outlets may be found in many nursing homes. Class II systems are designed for occupant use and may be either wet systems or dry systems. Wet systems normally are supplied by a fire pump that provides much more water volume and pressure than a Class I system.

Standpipe systems found in nursing homes may only consist of Class III systems may be provided with 2-1/2" or 1-1/2" outlets that are supplied from the domestic water supply system. These systems should not be considered reliable for primary fire department use. In most cases, they provide low working pressure, minimal water supply, and any equipment attached to them is inferior when compared to fire department standards. If Class III systems are used for initial attack they should be backed up with regular fire department lines from a reliable supply source.

The location of standpipe outlets in the building should be noted on preplans.

Successful fire control and life safety operations in nursing homes require knowledge of the construction and physical layout of the building. Because of the potential for large life loss, these types of occupancies should be preplanned periodically. The preplan information should be readily available at the incident scene for use by Command Officers.

Life safety is the major issue in nursing homes because of the number, age, and agility of the occupants. Access to these types of structures will vary depending on the design of the building and original code requirements. Normally a minimum of two means of ingress/egress are required. In some cases, the number of access points may be determined by exit requirements, based on occupant load. Vehicles in the parking lots or narrow driveways and alleys may hamper access by fire apparatus to all sides of the structure. Because access points can be critical to fire control operations, they should be clearly noted on preplans.

Additional access inside the building is critical. Access to the fire may be delayed. This is especially true if the fire is located on an upper floor of a multistory building. Smoke and heat in the hallways may delay access to the area where the fire is burning. The horizontal distance that fire crews must travel, as well as the lengths of hose required to reach the fire area, are operational challenges that face fire officers at a nursing home fire.

The use of ground or aerial ladders to access the fire area may be difficult. Ground-level obstructions may prevent placing apparatus in positions from which ladders can be used. Utility poles and overhead electrical wires are common obstructions that often make ladder placement difficult, or sometimes impossible. Many newer multistory structures may have inoperable windows, which complicates entry from an exterior ladder.

Multiple stair shafts are common in many multistory nursing homes. This requires a decision as to which stairway should be used and for what tactical purpose. Selection of specific stair shafts for fire attack, ventilation, and evacuation may be necessary. It is also important to remember that all stair shafts in the building may not provide access to the roof. This can cause serious problems when occupants attempt to evacuate upward in the building, and also limits options for ventilating smoke-filled floors.

Multistory nursing homes are equipped with elevators which may be hydraulically or electrically operated. Regardless of the type of elevator system, they are subject to system malfunctions, which can cause them to respond to nonselected floors or become stuck in the hoistway. The safest approach is first to determine if the use of an elevator is safe. A departmental guideline regarding the use of elevators under fire conditions should be in place and followed by all responders.

Water supply in areas where nursing homes are constructed is usually from hydrants with adequate pressure and volume for most firefighting needs. However, many nursing homes are built in nonhydrant areas. If the fire involves several rooms or more than one floor, consider the ability of the hydrant supply to deliver the necessary fire flow. If a sprinkler system must be supplied, it may be necessary to assign additional firefighting resources to shuttle or relay water to met the required fire flow.

Fire development and behavior in nursing home fires normally are no different than in other types of structures, as the fires usually are confined to a single room or separate living unit. Extinguishment can be relatively simple if doors to the fire area are closed, and vertical lapping does not occur. However, if a door to the unit is open or fails, fire and smoke entering the corridors can create major operational problems. Any time that fire and smoke are allowed to enter corridors or stairshafts, serious life safety problems are created.

If vertical lapping occurs, there is the potential for fire on more than one floor. The rate of vertical extension will depend on several factors: The volume of fire exiting the area of origin, the spandrel space (distance between the top of a window on a certain floor and the bottom of the window on the floor directly above), the type and thickness of glass, and the materials used to construct the window frame. An example is single-pane glass set in aluminum frames; these can fail very quickly when autoexposed to flames from a fire below.

Consider resources in terms of fire condition and the amount of tasks that must be accomplished quickly. A small fire with no extensive search or rescues usually can be handled with the initial alarm assignment. In these cases, fire attack, limited evacuation, and possibly some simple ventilation will be required. However, with a larger fire that can spread rapidly, coupled with a major search and rescue operation and complex ventilation requirements, additional resources will be required immediately. If any doubt exists that initial alarm resources are adequate, additional resources should be requested in a timely manner.

MEDICAL GROUP/BRANCH

A Medical Group or Medical Branch may have to be established at a multicasualty situation.

The following units may have to be established in a Medical Group/Medical Branch:

- triage;
- treatment;
- transportation;
- medical supply; and
- morgue.

Some agencies establish an emergency medical service (EMS) Staging for patient transport vehicles under the Transportation Unit.

CUE-BASED PREDICTIONS

Many people may become victims in any fire that produces large amounts of smoke.

The ability to access the floors quickly may be hampered by open stairwells, people evacuating, limited number of stairways, or narrow stairways.

Lack of a standpipe system may delay fire attack.

Many occupants are disabled and will require assistance to evacuate the building.

Fires are often contained to a single room.

A Medical Group or Medical Branch may be required to care for the injured.

INCIDENT MANAGEMENT CUES

Working fires in nursing homes frequently require that several simultaneous tactical operations be performed. Fire attack, search, rescue, and ventilation usually are occurring at the same time. From the standpoint of personnel safety and effective fire control, these operations must be coordinated.

The responsibility for coordinating tactical operations rests with Command Officers who are directing or supervising these tasks. Proper coordination requires not only good communication but frequent feedback from personnel who are involved in the specific operations.

Failure to coordinate tactical operations can result in some very serious problems. One result of poor coordination can be mixed attack modes where offensive and defensive operations are occurring at the same time in opposition to each other. Delayed or improper ventilation is another example of poor coordination that can have a serious negative effect at incidents of this type.

Lack of coordination of tactical operations during a nursing home fire can jeopardize the lives of both building occupants and firefighters. Untenable conditions can be created within the building, which may prevent a speedy evacuation of occupants. Tactical operations may be seriously impeded, and fire and smoke can be spread throughout the entire structure.

ORGANIZATIONAL RESPONSE TO CUES

- A Vent Group for vertical and horizontal ventilation.
- A Division on each floor where operations are needed.
- A Rescue Group. A Branch in multistory nursing homes.
- A Safety Officer.

STRATEGY AND TACTICS

The basic strategy for fires in nursing homes should be based on the principles of Incident Priorities:

- life safety;
- incident stabilization; and
- property conservation.

An effective sizeup that identifies the problems that are present will be critical in determining the proper strategy. However, the problems may not all be evident from outside the building. Use outside observations as an indicator of problems on the interior until additional information can be provided.

Obtained an evaluation of conditions inside the building as soon as possible. In addition to life safety concerns, information should be provided on horizontal or vertical extension of the fire. Once the problems are identified, develop solutions in terms of what the strategy will be and what specific tactical operations will need to be accomplished.

Identifying the problems is the first step in determining what resources are required. In simple terms, match the problems with resources. In order to do this, it is necessary to have an understanding of the availability and capability of the resources that are responding or are on scene. Consider how long it will take requested resources to arrive at the scene and what tasks can be completed when they get there.

Assigning the resources on the initial alarm should be based on what actions must be done to achieve the most impact on life safety and fire control. In many cases, an immediate and aggressive attack on the fire will ensure the "greatest good." If an immediate attack on the fire cannot be started, evacuation of building occupants may be the best approach. Ideally, an immediate fire attack coupled with evacuation of those occupants in the most danger will work the best.

Consider how stairways will be used for fire attack and occupant evacuation. Avoid doing both from the same stairway because it can impede the progress of firefighters and endanger civilians who are trying to exit the building. It is better to designate one stairway for evacuation and another for fire attack. Maintain the stairway used for evacuation purposes free of smoke. This can be done by using a stair shaft with a roof opening to remove smoke from the stairway and by properly pressurizing the stair shaft from below.

The attack on the fire should be from a direction that does not push the fire into an unburned area of the floor. This can be difficult, depending on the location of the fire in relation to access points. However, often positioning a separate hoseline to limit fire extension is possible; be careful, however, that this protective hoseline is not used to attack the fire, which could create an opposing hoseline situation.

With regard to hoseline selection, 1-3/4-inch hoselines normally are sufficient for fires that are confined to one room or a small compartment. Always position a backup line as soon as possible. Search and rescue personnel should have a protective hoseline when working in areas exposed to the fire. Heat buildup in common hallways may require a large (2-1/2-inch) handline to absorb the heat and provide access to the fire area.

Search and rescue operations during fires in nursing homes should consist of a primary and secondary search. Start the search in the areas most adversely affected by fire and smoke. This normally will be the area of the fire's origin and those portions of the building in close proximity. Floors above the fire must be monitored for heat and smoke travel. Direct occupants of the building to designated evacuation routes.

In some cases, depending on fire and smoke conditions, all occupants of the building may not have to be evacuated. If the fire is contained quickly and smoke removal is started early, many of the building occupants will be in no danger and will be safe staying in their rooms. Base the decision not to evacuate on the severity of fire/smoke conditions, good judgment, experience, condition of the patients, and confidence that the fire and smoke are being controlled.

Removal of smoke and heat for most fires that are confined to one room can be accomplished by simple horizontal ventilation. Placing smoke ejectors in the hallway and opening windows or sliding doors in the affected areas usually are sufficient. Also, positive-pressure ventilation can be used effectively in some situations. One of the difficulties with this approach is that narrow corridors make it difficult to obtain the air seal needed if a single room is to be directly pressurized. An alternative is to pressurize the hallway from the stair shaft and open the door to the fire room or area.

Stair shafts in nursing homes can be used to exhaust smoke from the building under certain conditions. The first requirement is that the stair shaft have a roof exit and that it be opened. Smoke ejectors/blowers can be used to channel smoke down corridors to the stair shaft. Be careful that this type of tactic does not jeopardize building occupants who may be attempting to evacuate the building.

Start salvage operations as soon as resources are available. Normally this will entail removal of water from the fire floor and floor below, as well as smoke removal from the entire building.

Safety issues associated with significant nursing home fires must be considered when these types of incidents are encountered. Firefighters will become exhausted from the physical labor of moving patients. The duration of the incident and exertion associated with performing firefighting, search, rescue, and ventilation tasks at aboveground fires can tire responders quickly and lead to injuries. For this reason, at an extended incident, periodic relief and the use of a rehab area are recommended.

The potential for flashover of a fire area always exists with any structure fire, and nursing home with small rooms and low ceilings are no exception. Even if the fire is free-burning in a portion of the contents, a flashover may not have occurred. It is possible that flashover will occur when fire attack is being made. Areas where a fire is present should be cooled down with hose streams before attempting to enter.

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Simulation 16

Homework Assignment

Nursing Home Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on nursing homes the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the groups established for classroom activities. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation.

2. After reading the SM, your group will answer the questions pertaining to different situations or problems at nursing home fires.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems that were not discussed.

Scenario 1

At 2400 hours, Tuesday, a two-story nursing home is experiencing a fire on the first floor in a single room. There are large quantities of smoke on the first floor and light smoke on the second floor.

What problems are created, and what tactical and Incident Command System (ICS) solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution:

What cues led you to this solution?

Problem:

Tactical Solution:

ICS Solution:

What cues led you to this solution?

Problem:

Tactical Solution:

ICS Solution: ____

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What cues led you to this solution? ______________________________

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Problem: ____

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Tactical Solution: ______________________________________

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ICS Solution: ____

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What cues led you to this solution? ______________________________

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Problem: ____

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Tactical Solution: ______________________________________

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ICS Solution: ____

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What cues led you to this solution? ____

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Scenario 2

A large one-story noncombustible nursing home has a significant fire in a storage room on arrival. Fire is showing through the roof in the A-B corner. It is 25 ºF (-3.89 ºC) outside. There is heavy smoke throughout the building.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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In Class
Activity 16.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a nursing home scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the activity worksheet.

3. The class will be shown a slide of a nursing home. Everyone will review the scenario description and the plot/floor plan.

4. Your group will write its strategies on the Strategy Prompter and convert those strategies into an ICS organization chart. You will fill in up to five of the blank boxes with Division, Group, or Branch nomenclature appropriate to manage the incident.

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 15 minutes total. Be brief, but to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, you must identify which Division or Group is performing that task.

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In Class
Activity 16.1 (cont'd)

Scenario Description

Construction

120' x 50', two-story, noncombustible construction, nursing home.
17 rooms per floor, double occupancy.
Total patients--60 at the time of the incident.

Fire Location

Fire on the first floor near the left center of the building, Side A.

Time and Day

0600 hours, Saturday.

Water Supply

2,500 gpm total system flow.

Resources (1st alarm)

4 engines
1 truck
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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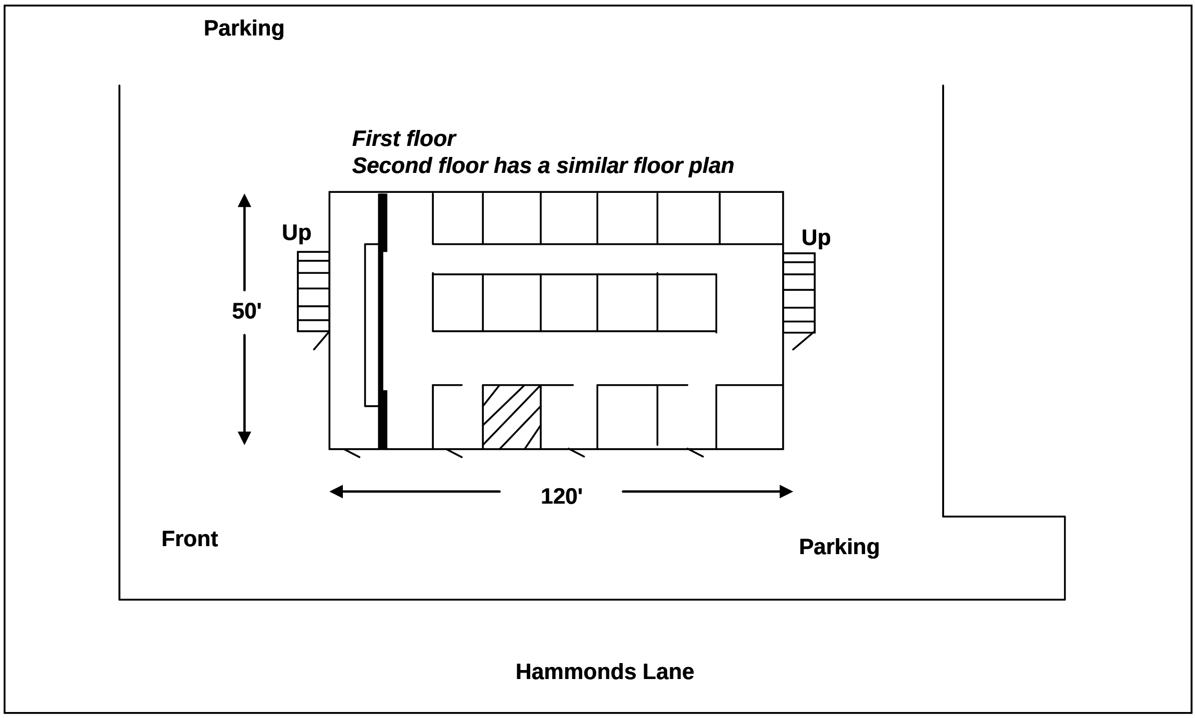
In Class
Activity 16.1 (cont'd)

Plot/Floor Plan



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Simulation 16

NURSING HOME

Incident Description

A large two-story, ordinary constructed, nursing home.

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Simulation 16

Quick Access Prefire Plan

Building Address:
DD and 15th Streets

Building Description:
120' x 50', two-story, ordinary construction

Roof Construction:
Parallel-chord wood truss, plywood decking, paper and tar.

Occupancy Type:
Nursing Home

Initial Resources Required:
4E, 1T, 1 Chief, 1 PM, 1 Safety Officer

Hazards to Personnel:
Piped-in oxygen; oxygen tank on Side D

Location of Water Supply:
Hydrants on main road every 500 feet

Available Flow:
4,000 gpm system flow

	Estimated Fire Flow*			
Level of Involvement	*10%*	*25%*	*50%*	*100%*
Estimated Fire Flow	250	625	1,250	2,500

**Basic fire flow-first floor and two exposure floors.*

Fire Behavior Prediction:
Horizontal fire and smoke spread on any floor.

Predicted Strategies:
Rescue, Exposures, Confinement, Ventilation.

Problems Anticipated:
Rapid fire growth, long hose lays.

☐ **Standpipe:** *No*	☐ **Sprinklers:** *No*	☒ **Fire Detection:** *Yes*

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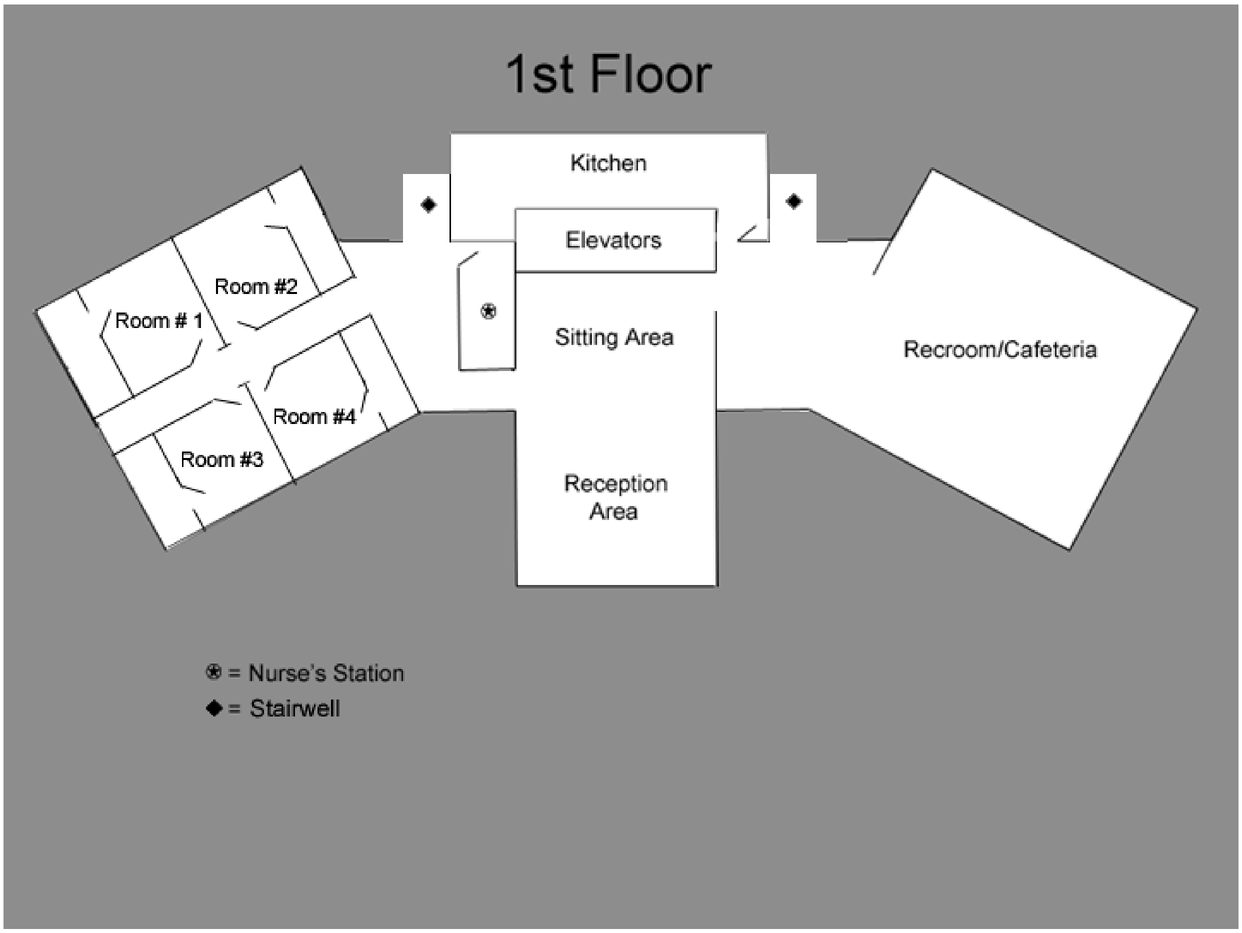
Simulation 16

Floor/Plot Plan

First Floor



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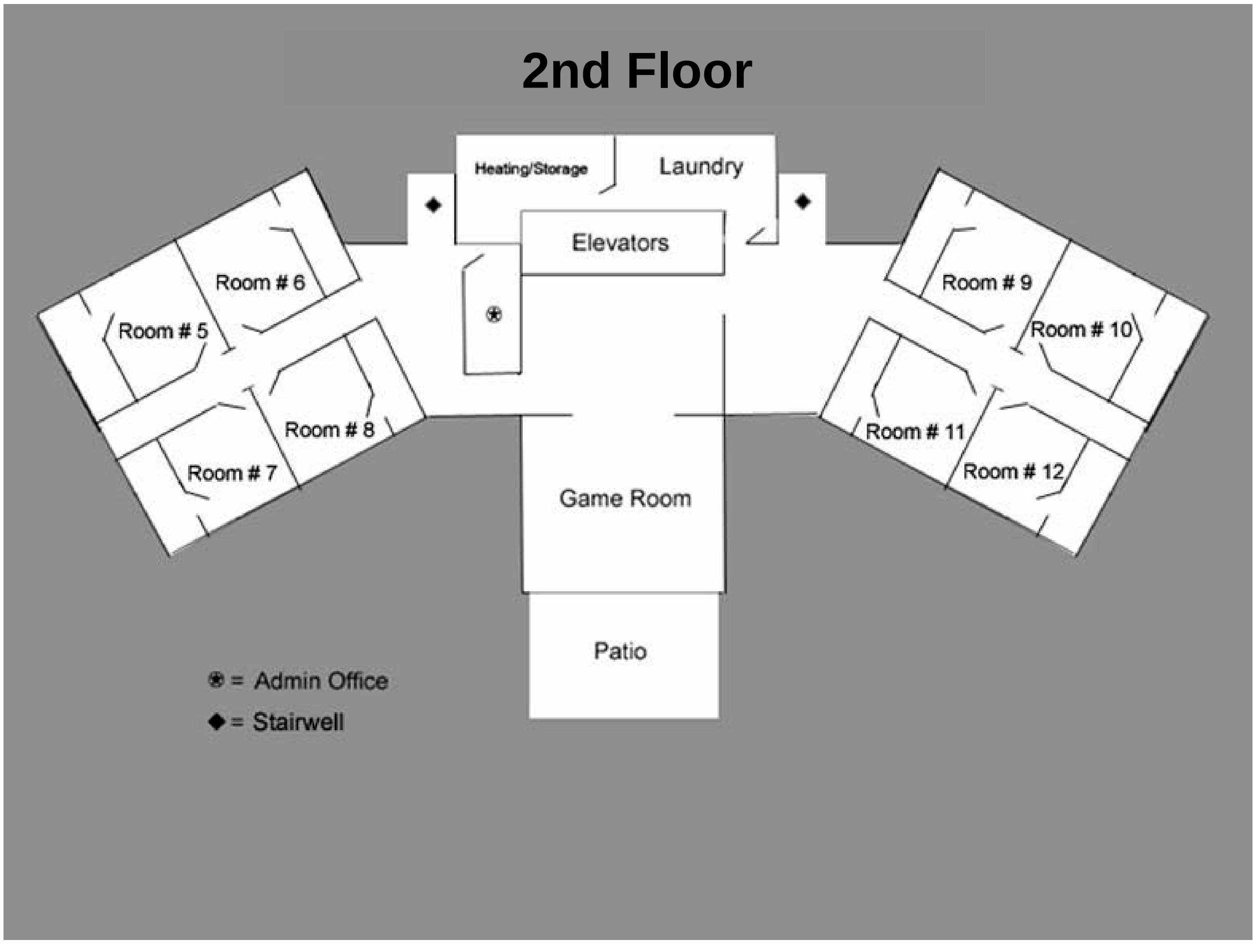
Simulation 16

Floor/Plot Plan (cont'd)

Second Floor



SIMULATION 17: BULK PROPANE FACILITY

(OPTIONAL)

OBJECTIVES

The students will:

1. *Understand the application of preincident planning to include hazardous materials (haz mat) contingencies specific to liquefied propane gas facilities.*

2. *Understand the importance of size-up and the implementation of the Command Sequence.*

3. *Understand the ability to assess and predict fire behavior relative to large open-space buildings and pressurized liquid/gas vessels (tanks).*

4. *Understand the importance of immediate Incident Command System (ICS) and implementation of an organizational structure to support a long-term incident.*

5. *Understand how to address incident scene safety issues including: safety implementation, Rapid Intervention Crew (RIC), Boiling Liquid Expanding Vapor Explosion (BLEVE)/container breech potential, and personnel accountability.*

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INTRODUCTION

This simulation unit is designed to provide the student with critical information regarding bulk propane distribution facilities. This critical information will provide the Command Officer with pertinent information that will be used in the decision making process for various incidents that could occur at such a facility.

Simply having an effective Incident Command System (ICS) is only one-half of the solution to the problems that may be faced by the Incident Commander (IC) and response personnel. Specific knowledge of the facility and various other factors, such as strategy and tactics, are critical to the solution of those problems.

DEFINITION

A propane bulk storage facility's primary purpose is to distribute propane. The facility typically will receive liquefied propane gas by a railroad tank car, tank truck, or pipeline and then distribute this gas to an end user by portable container via a tank delivery truck or piping/appliances at the facility.

OCCUPANCY-SPECIFIC CUES

Facility Construction

The buildings at a propane facility vary in type, occupancy, and construction, depending on the needs of the facility to sell and distribute the gas. The construction-type for the buildings could be:

- noncombustible;
- ordinary; and
- wood frame.

Access to Buildings

It may be difficult or impossible to drive fire apparatus around some of the buildings; however, there should be plenty of access from the parking lot to the front of the buildings.

Employee parking or parked delivery/company trucks may make it difficult or impossible to maneuver fire apparatus through parts of the facility.

Entry to the Sales Buildings

Doors

The facility is probably a business occupancy requiring only one exit.

Often the doors are metal clad in metal frames. Some may be wooden doors in wooden frames that would make the firefighter's job of entry easier.

They may have heavy-duty, rollup doors, usually of metal. Doors often have additional security features on inside.

Windows

Often there are large windows in sales office areas. Factory windows may be installed and located higher on the walls--often covered by steel mesh or bars.

Floor Assemblies

Most are poured concrete and probably do not have a basement.

Storage Rooms

Often contain empty sample propane cylinders. There are also ordinary combustibles and/or office equipment. The areas usually are not finished **all the way around** with drywall, leaving floor, ceiling, and/or wall assemblies exposed to the spread of fire.

Common Problems to Identify

Consider the possibility of security personnel and/or reduced work force after hours. The peripheral life hazard must be considered in the event of a propane release.

Fire Involvement Considerations

Has the fire extended to or impinged on roof assemblies? What are the signs of probable roof assembly involvement?

- "growing" vent pipes; vent pipes will appear to grow as the roof settles;
- hot smoke rising from vents;
- sagging roof;
- bubbling tar; and
- fire vented through the roof.

What are the signs that the fire likely will spread to the roof or ceiling assembly?

- high-piled combustible storage;
- duct work extending from ground level process area to roof; and
- underside of open or unsheathed roof assembly.

Structural Deterioration and Collapse

New lightweight construction roof assemblies are subject to early collapse, some after only five minutes of exposure to fire:

- lightweight trusses;
- panelized assemblies;
- wooden "I" beams; and
- fire retardant roofs (plywood) identified as degrading.

Heavy-timber construction, with excessive fire loads, oil-soaked floors, etc., can overcome resources quickly.

Metal construction will expand and twist when exposed to extreme heat, causing collapse.

Structural Deficiencies

Improper/Illegal modifications of bearing walls or other structural members.

Propane cylinder loading docks/buildings:

- normally they are noncombustible buildings, but other types of construction may be found;
- normally open on one or more sides with a roof covering;
- propane bottles in racks or standing free; and
- usually hold cylinders ranging from 25 pounds to 1,000 pounds.

Large propane tanks.

- Usually mounted on concrete mounts.

- Some may be made of steel.

- Hold from 20,000 gallons to 100,000 gallons of propane.

- Have pressure relief stacks and relief valves.

- With sustained direct flame impingement in as little as 10 to 20 minutes, a large tank could BLEVE.

- Large portions of tanks can be propelled up to a half-mile from the original location of the large tank during a BLEVE.

- The tanks may hold all propane, all butane, or a combination of these gases in liquid form based on the region of the country the gas is being sold.

CUE-BASED PREDICTIONS

Given the cues we have discussed, we can make some predictions in a fire situation.

- The facility building construction and the storage volume and configuration involved must be known.

- The presence of interior and exterior exposures must be known.

- Rescue will be a priority for any person injured by an explosion, fire, or BLEVE.

- Rapid confinement and extinguishment is critical.

- A haz mat team must be dispatched on first alarm.

- Large-scale evacuations of adjacent structures and facilities may be mandatory. (Remember the distance a BLEVE will throw shrapnel--one-half mile.)

- Must apply 500 gallons per minute (gpm) on each point of flame impingement. Master streams that can be deployed quickly must be available on the first-alarm units.

- Defensive operations must be considered early on any incident, especially one where the response time is elongated.

- Be sure to have a designated place where a facility's representative can meet with the first-in company and the IC.

INCIDENT MANAGEMENT CUES

Complexity

- A haz mat team with qualified personnel must be on first alarm.

- Adequate resources early. Very labor-intensive operation.

- An effective Water Supply Group usually will be required due to the large fire flow that is required.

Coordinated Operations

- **Rescue** must be coordinated with attack and exposure stream operations.

- Rescue **teams** should take **handlines** with them or have them provided by other crews.

Incident Command System Organization Cues

- Each function, e.g., rescue and evacuation, needs to be supervised.

- Each geographic area where personnel are operating needs to be supervised (**Divisions**).

- At working incidents, you should have a Safety Officer (SO) and an Assistant Safety Officer--Hazardous Materials (ASO-HM).

- Build your ICS organization early, and make it large enough to handle the **potential** of this incident.

STRATEGY AND TACTICS

Occupancy-Specific Strategies

Rescue cues:

- time of day/work schedule;
- peripheral life hazard;
- evaluation/accountability; and
- fire conditions.

Fire Control Cues in Buildings

- building construction;
- floor construction;
- roof construction;
- location and extent of fire; and
- material involved.

Fire Control Cues for Propane Tanks

- Small tanks, large quantity of water.

- Shut off valve, if possible.

- Large tanks, 500 gpm on each point-of-flame impingement.
- Cool tank vapor space with large quantities of water to get relief valve to close or stay shut.

Simulation 17

Homework Assignment

Bulk Propane Facility Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on bulk propane facilities the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the groups established for classroom activities. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation. Do not do any other work besides the scenario questions on the unit; the rest will be covered in class.

2. After reading the SM, your group will answer the questions pertaining to different situations or problems at bulk propane facilities incidents.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems that were not discussed.

Scenario 1

A fire is reported at a bulk propane facility. On arrival you see that the fire involves a home delivery propane truck that is being filled at a large propane tank. One of the hoses has ruptured and the fire is impinging on the tank of the truck.

What problems are created and what tactical and ICS solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this problem? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this problem? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this problem? ____

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Scenario 2

From the first scenario, the relief valve on the tank truck has vented and the flame from the vent is reaching well over 100 feet into the air.

What actions would you take at this time in an attempt to get the relief valve to close?

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In Class
Activity 17.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for an bulk propane facility scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the worksheet for the activity.

3. The class will be shown a slide of a bulk propane facility. Everyone will review the scenario description.

4. Your group will write its strategies on the Strategy Prompter and convert those strategies into an Incident Command System (ICS) organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident.

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 15 minutes total. Be brief, but to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, you must identify which Division or Group is performing that task.

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In Class
Activity 17.1 (cont'd)

Scenario Description

Construction

Bulk propane facility.
Noncombustible construction.
60,000-gallon large storage tanks.

Fire Location

Rear of delivery truck. Propane gas ignited from a burst hose coming from the tank.

Time and Day

1430 hours, Thursday.

Water Supply

Two hydrants outsides the fenced facility. 2,500 gpm system flow available.

Resources (1st alarm)

4 engines
1 truck
1 Haz Mat Response Unit
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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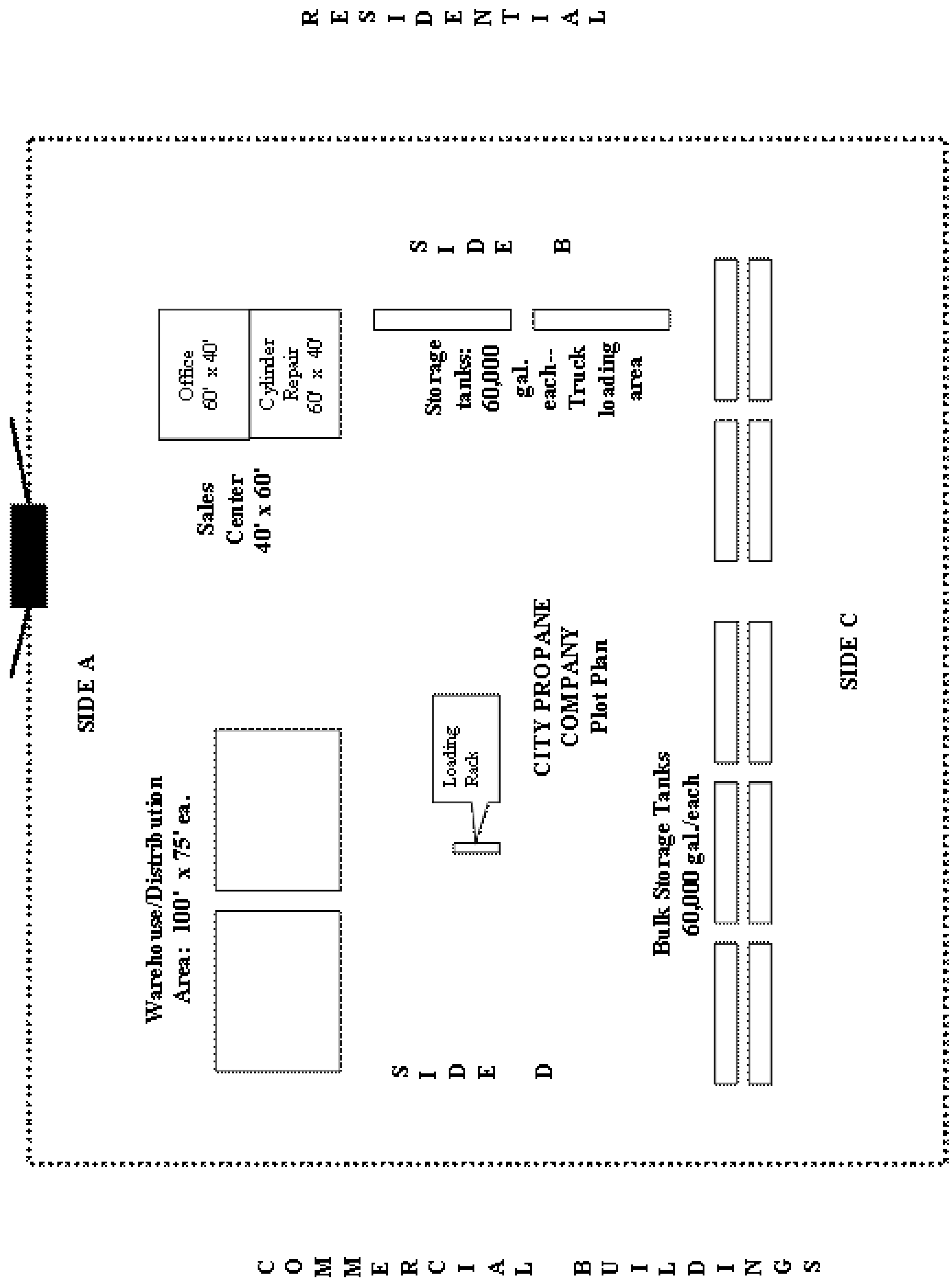
In Class
Activity 17.1 (cont'd)

Plot Plan



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Simulation 17
Quick Access Prefire Plan

Building Address:
600 24th Street

Building Construction:
60,000 gallon liquefied propane gas (LP) tanks

Construction:
Steel with safety vent stacks

Occupancy Type:
Bulk propane facility

Initial Resources Required:
4 Engines,1 Truck, 1 PM, 1 Chief, 1 Haz Mat Unit, 1 Safety Officer

Hazards to Personnel:
Radiant heat burns, possible BLEVE of a large tank or delivery vehicle tank

Location of Water Supply:
One hydrant outside front gate, one hydrant each, 200 feet east and west of facility

Available Flow:
6,500 gpm system flow

	Estimated Fire Flow--Cooling and Extinguishment*			
Level of Involvement	*Fire involving small propane containers*	*Impingement on two-axle delivery truck vapor space*	*Impingement on semi-truck tank vapor space*	*Impingement on Large Storage Tank Vapor Space*
Estimated Fire Flow	750	1,500	1,500	1,500

Fire flow based on a fire impinging on the vapor space of various sized tanks.

Fire Behavior Prediction:
Failure to cool involved tank will lead to safety valve discharge and then to possible BLEVE.

Predicted Strategies:
Exposure protection, confinement, extinguishment.

Problems Anticipated:
Large fire flow needs to be developed as soon as possible.

❑ **Standpipe:** *No*	❑ **Sprinklers:** *No*	❑ **Fire Detection:** *No*

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Simulation 17

International Chemical Safety Cards			
PROPANE			**ICS 0319**
n-Propane C_3H_8 / $CH_3CH_2CH_3$ Molecular mass: 44.1 (cylinder) (liquefied)			
TYPES OF HAZARD/ EXPOSURE	**ACUTE HAZARDS/ SYMPTOMS**	**PREVENTION**	**FIRST AID/ FIREFIGHTING**
FIRE	Extremely flammable.	**No** open flames, **No** sparks, and **No** smoking.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out; in other cases, extinguish with powder, carbon dioxide.
EXPLOSION	Gas/Air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding) if in liquid state. Use nonsparking hand tools.	In case of fire, keep cylinder cool by spraying with water. Combat fire from a sheltered position.
EXPOSURE			
INHALATION	Drowsiness; unconsciousness.	Closed system and ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
SKIN	**On contact with liquid: Frostbite.**	Cold-insulating gloves. Protective clothing.	**On frostbite:** rinse with plenty of water, do **not** remove clothes. Refer for medical attention.
EYES	**On contact with liquid: Frostbite.**	Face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
INGESTION			

SPILLAGE DISPOSAL	**STORAGE**	**PACKAGING & LABELLING**
Evacuate danger area! Consult an expert! Remove all ignition sources. Ventilation. **Never** direct water jet on liquid. (Extra personal protection: self-contained breathing apparatus.)	Fireproof. Cool.	F+ symbol R: 12 S: 2-9-16 UN Hazard Class: 2.1

<table>
<tr>
<td rowspan="1">IMPORTANT DATA</td>
<td>PHYSICAL STATE; APPEARANCE:
ODORLESS, COLORLESS COMPRESSED LIQUEFIED GAS.

PHYSICAL DANGERS:
The gas is heavier than air and may travel along the ground; distant ignition possible, and may accumulate in low ceiling spaces causing deficiency of oxygen. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 2,500 ppm as TWA; (ACGIH 2003).
MAK: 1,000 ppm, 1,800 mg/m³;
Peak limitation category: II(2); Pregnancy risk group: LLC;
(DFG 2003).
OSHA PEL: TWA 1,000 ppm (1,800 mg/m³)
NIOSH REL: TWA 1,000 ppm (1,800 mg/m³)
NIOSH IDLH: 2,100 ppm 10% LEL</td>
<td>ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation.

INHALATION RISK:
On loss of containment this liquid evaporates very quickly displacing the air and causing a serious risk of suffocation when in confined areas.

EFFECTS OF SHORT-TERM EXPOSURE:
Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</td>
</tr>
<tr>
<td>PHYSICAL PROPERTIES</td>
<td>Boiling point: -42 °C
Melting point: -189.7 °C
Relative density (water = 1): 0.5
Solubility in water, g/100 ml at 20 °C: 0.007
Vapor pressure, kPa at 20 °C: 840</td>
<td>Relative vapor density (air = 1): 1.6
Flash point: -104 °C
Auto-ignition temperature: 450 °C
Explosive limits, vol % in air: 2.1-9.5
Octanol/Water partition coefficient as log Pow: 2.36</td>
</tr>
<tr>
<td>ENVIRONMENTAL DATA</td>
<td colspan="2"></td>
</tr>
<tr>
<td colspan="3">NOTES</td>
</tr>
<tr>
<td colspan="3">Check oxygen content before entering area. Turn leaking cylinder with the leak up to prevent escape of gas in liquid state. High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.</td>
</tr>
</table>

SIMULATION 18: SCHOOL COMPLEX

(OPTIONAL)

OBJECTIVES

The students will:

1. *Develop their knowledge, skills, and abilities relating to a school complex.*
2. *Apply the knowledge, skills, and abilities while performing a school complex simulation.*

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INTRODUCTION

A school is a place or institution for teaching and learning.

Schools that include the kindergarten through 12th grade may have students ranging in age from 4 to 20 years old. Many schools have students who are considered "challenged." These students may present an increased degree of resource intensity to remove them to safety.

OCCUPANCY-SPECIFIC CUES

General Information

Schools may be any type of construction. Older schools may be wood-frame, but many older schools are of ordinary (masonry, wood-joist) construction. Modern schools are typically noncombustible construction, and some may be fire-resistive construction. Obviously, there are exceptions to any general rule.

Certain private schools may have converted dwellings or other occupancy types serving their students. Many public and private schools often have temporary classrooms in portable trailers of light wood frame and metal.

Roof Assemblies

Flat

- **Beam-and-rafter** with sheathing. This is normal for many flat-roofed school buildings of wood-frame or ordinary construction.

- **Parallel-chord wood truss** or **plywood I-beams.** May be found in modern school wood-frame or ordinary construction.

Pitched

- **Ridge-pole** and **rafter** is used where a usable attic space is desired, but usually is an indicator of older construction.

- **Wood truss** is the modern roof assembly base. Wood truss can be nailed at the joints. Toe-nailing the joints was the original method of truss assembly. In order to reduce labor costs, to speed truss construction, and to build a stronger truss, the manufacturers started using **gusset plates**. A gusset plate is simply a piece of **plywood or sheet metal** that is laid over the truss joints. Nails are driven through the gusset plate into the truss members.

The latest technique for truss assembly is the use of the **gang-nailer**. This is a sheet of **thick sheet metal** that has been punched. The punching produces a **large number of 3/8-inch points** protruding from one side. The gang-nailer is laid on the truss joint and the points are pressed into the truss members to hold them together.

Access

Whether or not the sides of a school are accessible, one has to go to the location and simply evaluate the ability to get apparatus to any side of the building. This is obviously part of preplanning.

Common Problems to Identify

Schools are naturally occupied during the school year on school days. In addition, most schools allow community groups to use the facilities during the evenings and on weekends.

Many schools are overcrowded. This may create a situation where too many students are in the building for the amount of exits and stair shafts in the building. This condition may lead to a greater commitment of resources to rescue, especially from upper stories.

Upper-level schools often have chemistry labs. There may be a number of hazardous materials stored in the facility, even though they are in relatively small quantities.

Fire Involvement Considerations

On arrival, what is involved and at what percentage?

- analyze the situation thoroughly as rapidly as possible;
- determine where the rescue situation is in the structure; and
- assign sufficient companies/crews to the rescue effort.

Some schools are located in areas in a community where municipal water supply is insufficient or nonexistent.

Water supply must be analyzed and calculated. You should use the Tender Delivery Rate (TDR) to determine how much water can be supplied at the incident scene from each tender.

TDR = tender capacity in gallons divided by cycle time.

Tender capacity in gallons = the capacity of the tender being calculated.

Cycle time = the time from starting to dump into a portable tank, going to get water from the source, to returning to the scene to start dumping again.

For example, a 3,000-gallon tender has a cycle time of 20 minutes:

- TDR = 3,000 gallons divided by 20 minutes.
- TDR = 150 gallons per minute (gpm) continuous supply to the scene from the portable tank.
- Now, calculate how many tenders are required to achieve the needed fire flow for the facility. There is obviously only so much you can do in a tender operation--you will need to prioritize the water use.

Relay Operations

The following information on friction loss is provided for those who have the capability of doing relay operations in rural, nonhydrant areas.

POUNDS PER SQUARE INCH (PSI) PER 100 FEET SINGLE LINE						
HOSE U.S. GPM	**1"**	**1 1/2"**	**1 3/4"**	**2 1/2"**	**3"**	**4"**
30	26	4	1.5			
60		9	6	1		
95		22	14	2		
125		38	25	3.5	1	
150		54	35	5	2	
200			62	8	3.5	
250				13	5	1.5
DUAL HOSELINES	**2 1/2"**	**3" with 2 1/2" cpls**	**3"**			
500	13	3	2			
750	32	6	4			
1000	56	10	7.5			
1250	87	15	12			

Note: When you double the flow in any sized hoseline, you quadruple the friction loss per 100 feet.

Structural Deterioration and Collapse

These structures are **not prone** to early collapse; however, evaluate the building construction type for a more accurate picture under major fire situations. Collapse of a well-involved, unsavable structure may reduce the amount of radiant heat by producing a smaller fire-front.

CUE-BASED PREDICTIONS

Given the cues just presented, and adding a fire situation, we can make **predictions**:

- Rescue will be a primary concern for response commanders.
- Sufficient resources must be called as early as possible.
- School construction can include lightweight and noncombustible construction.
- Fires usually are contained to a compartment, unless they start in open areas such as cafeterias, public assembly areas, or gymnasium areas.
- Access to various sides of the building is an important life safety consideration.
- Water supply considerations are critical to fire containment and extinguishment.
- Medical care for injured victims probably will be required.

INCIDENT MANAGEMENT CUES

Coordinated Operations

- Rescue efforts must be coordinated with ventilation and fire attack.
- Horizontal and vertical ventilation often is required to vent the structure. Many roofs on modern schools are difficult and time-consuming to vent due to the metal decking or prestressed concrete roof assemblies.
- Fire attack must not push the fire or products of combustion on to evacuating students and staff or the rescuers.

Each function (e.g., ventilation and rescue) needs to be supervised. Each geographic area where personnel are operating needs supervision (e.g., Division 1 and Division 2). At working incidents, you will need a Safety Officer.

STRATEGY AND TACTICS

Any Fire Situation--Primary Search and Rescue

- **Immediately** begin a primary search. Start closest to the fire, work outward, then do the floor above, then the top floor, and work your way down.

- Establish a **Rescue Group** and assign the necessary companies/crews to the most critical areas of the building.

- Establish a **Rescue Branch** and have Rescue Divisions on each floor for schools with three or more stories.

Fire Attack--Classroom or Office Area

- Enter the building with charged hoselines and contain the fire to the compartment of origin.

- Be sure to have additional hoseline crews check for extension in adjacent areas, including the roof assembly should the fire be on the top floor.

- Ensure that victim evacuation efforts are not hampered by the fire attack.

Fire Attack--Public Assembly Areas

- Provide sufficient fire flow to confine and extinguish the fire. These areas could be well-involved due to their large, open areas.

- Be sure to have additional hoseline crews check for extension in adjacent areas, including the roof assembly should the fire be on the top floor.

- Ensure that victim evacuation efforts are not hampered by the fire attack.

Ventilation

- Depending on the location of the fire, horizontal, vertical, and/or positive-pressure ventilation (PPV) may be used at school fires.

- When fire, smoke, and toxic gases reach the top floor, efforts must be made to ventilate this smoke. However, as stated earlier, certain types of roof construction may be difficult, if not impossible, to vent.

- Be cognizant of smoke in stair shafts; they are the means of egress for the students and staff and also the means to attack upper-level fires.

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Simulation 18

Homework Assignment

School Complex Questions

Directions

1. You were assigned to read the entire SM portion on school complexes the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the groups established for classroom activities. Provide written answers on the worksheet and bring the worksheets to class to use during the presentation. At the conclusion of the presentation, the instructor will collect the worksheets from you and retain them. Only do the two scenarios and the related problems; the rest of the unit will be done in the classroom.

2. After reading the SM, your group will determine the problems facing the Incident Commander (IC) based on the limited incident information given. For each problem, you must provide both a tactical solution and an ICS solution.

3. The instructor will review each of the assigned scenarios by asking the questions and selecting several of you to respond with the answers from your worksheets. Other students will be asked to respond from their worksheets if they have additional problems or solutions that were not discussed.

Scenario 1

A 75' x 175', two-story, with basement, ordinary-constructed school has a 20-percent fire in the basement storage area. Heavy smoke has entered two of the three stair shafts and is starting to fill the second floor with large amounts of smoke. The school is occupied, as it is a school day.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ______________________________

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Tactical Solution: ______________________________

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ICS Solution: ____________________

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What cues led you to this solution? ____________________

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Problem: ____________________

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Tactical Solution: ____________________

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ICS Solution: ____________________

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What cues led you to this solution? ____________________

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Problem: ____________________

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Tactical Solution: ____________________

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ICS Solution: ____________________

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What cues led you to this solution? ____________________

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Problem: ____________________

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Tactical Solution: ____________________

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ICS Solution: ____________________

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What cues led you to this solution? ____________________

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Scenario 2

A 75' x 125', three-story, with basement, noncombustible constructed school has a fire in a third-floor classroom. The roof assembly is steel bar-joist with metal decking. It is 0300 hours.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____________________

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ______________________________

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ICS Solution: ______________________________

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What cues led you to this solution? ______________________________

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Problem: ______________________________

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Tactical Solution: ______________________________

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ICS Solution: ______________________________

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What cues led you to this solution? ______________________________

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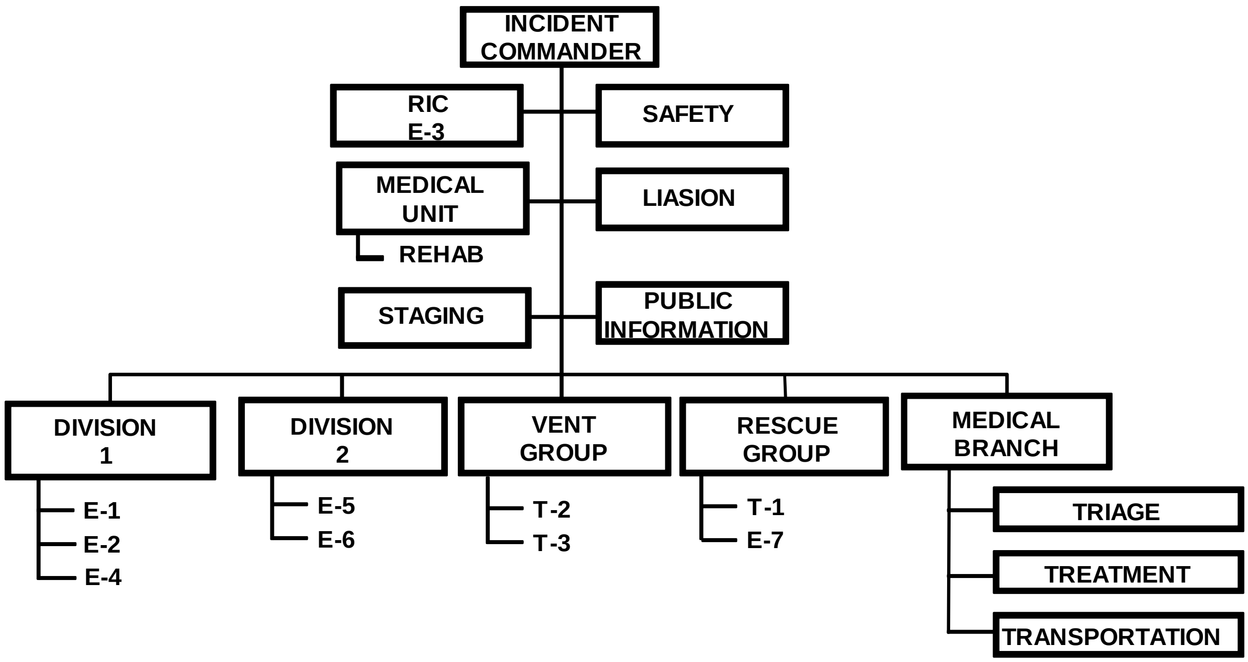
ICS Organization

Fire on First Floor of Two-Story School



In Class
Activity 18.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a school complex scenario.

Directions

1. The class will be divided into four groups.

2. Students will be shown a slide of a school complex. In the SM, there is a plot/floor plan showing the fire location and a Strategy Prompter. The Strategy Prompter will be used as the worksheet for the activity.

3. The students will write their strategies and convert those strategies into an ICS organization chart. They will fill in up to five of the blank boxes with Division and Group nomenclature appropriate for the incident.

4. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time should be limited to no more than 15 minutes total. Be brief, but to the point.

5. Each of the major strategies shown must be addressed within the ICS organization and specifically during the reporting phase. For example, if there is no Vent Group and ventilation is required, you must identify which Division or Group is performing that task.

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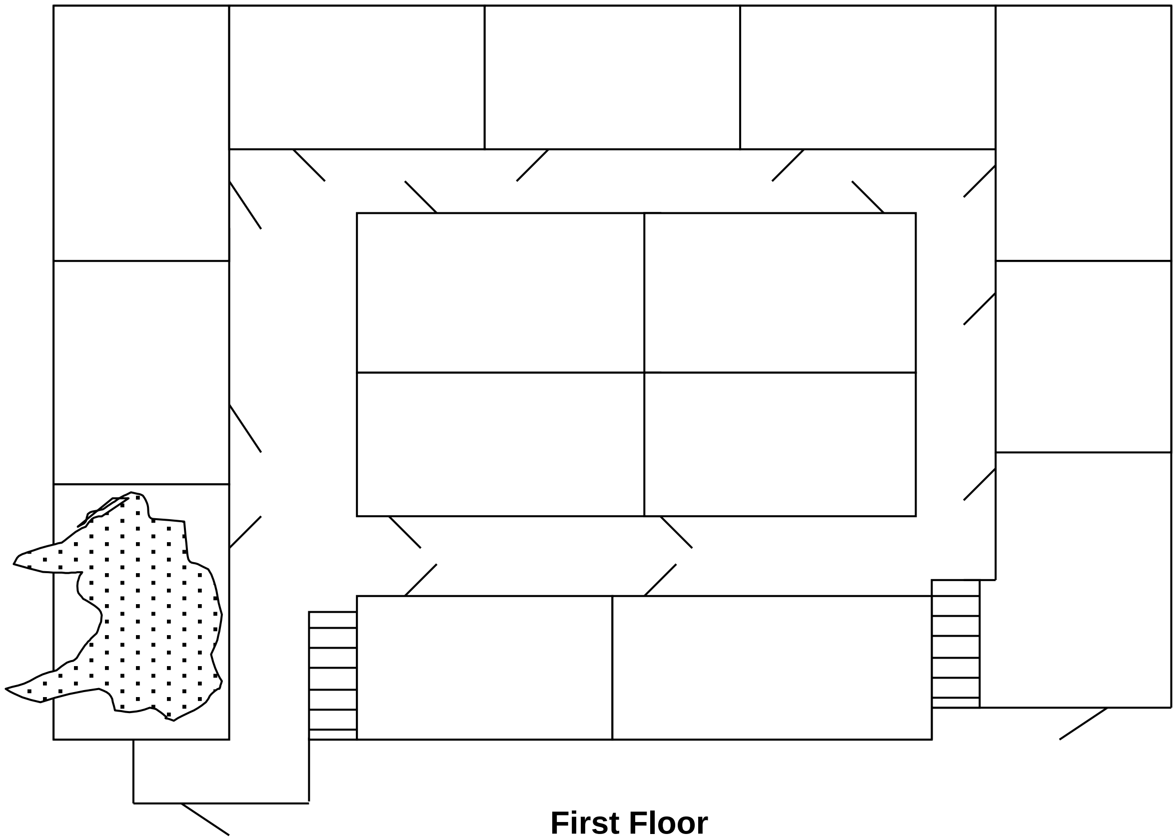
In Class
Activity 18.1 (cont'd)

School Plot/Floor Plan



First Floor

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Simulation 18

SCHOOL COMPLEX SIMULATION

Incident Description

- The school complex was constructed in 1982.
- It is of noncombustible construction--masonry walls and steel bar-joist floor and roof assemblies.
- The school educates approximately 1,000 students on any given day.

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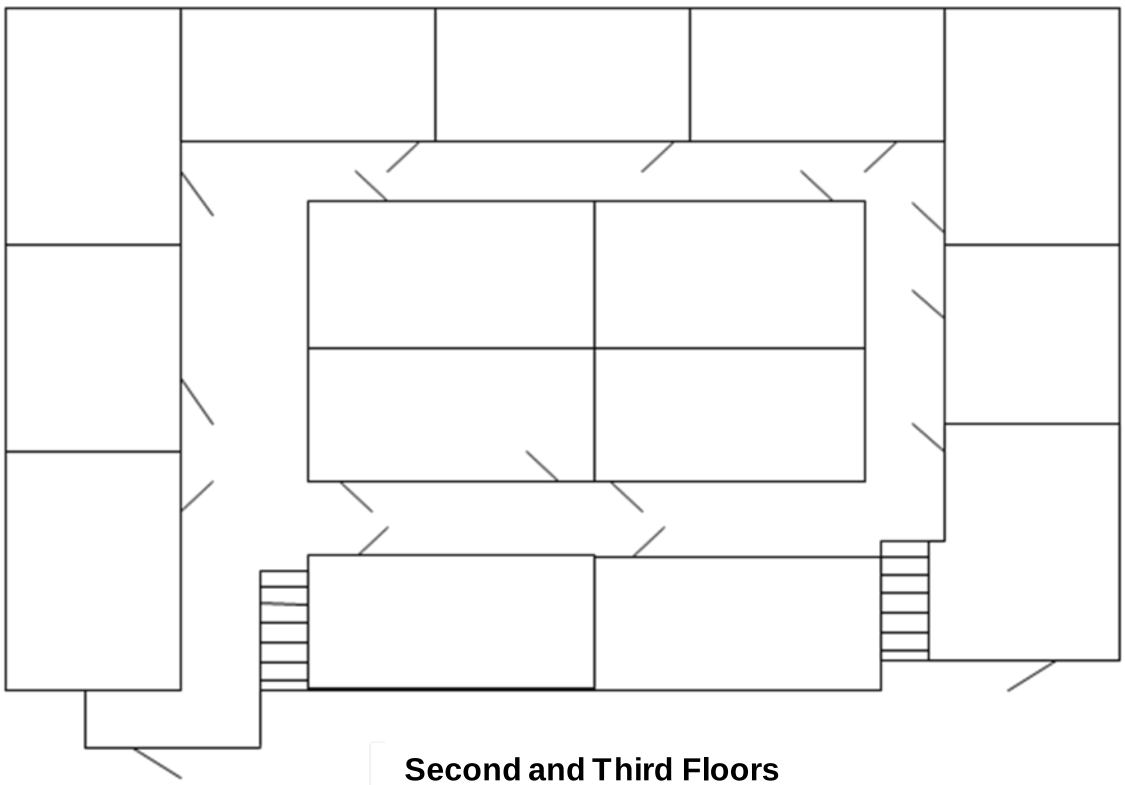
Simulation 18

School Plot/Floor Plan (cont'd)



Second and Third Floors

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Simulation 18

Quick Access Prefire Plan

Building Address:
2640 26th Street

Building Description:
Irregular-shaped school

Roof Construction:
Steel bar-joist with metal decking, tar paper, rolled roofing

Floor Construction:
First floor--concrete slab; second floor--steel bar-joist, concrete

Occupancy Type:
High school

Initial Resources Required:
4 engines, 1 truck, 1 PM, 1 BC, 1 Safety Officer

Hazards to Personnel:
Early collapse of roof and/or floor assemblies

Location of Water Supply:
Hydrants all around building

Available Flow:
6,000 gpm

	Estimated Fire Flow*			
Level of Involvement	*10%*	*25%*	*50%*	*100%*
Estimated Fire Flow	400	1,000	2,000	4,000

**Based on gymnasium (80' x 120') with one exposure (largest single area).*

Fire Behavior Prediction:
Slow vertical and horizontal spread.

Predicted Strategies:
Rescue, Ventilation, Exposures, Confinement.

Problems Anticipated:
Many students (accountability); long hose stretches.

☐ **Standpipe:** *No*

☐ **Sprinklers:** *No*

☒ **Fire Detection:** *Yes*

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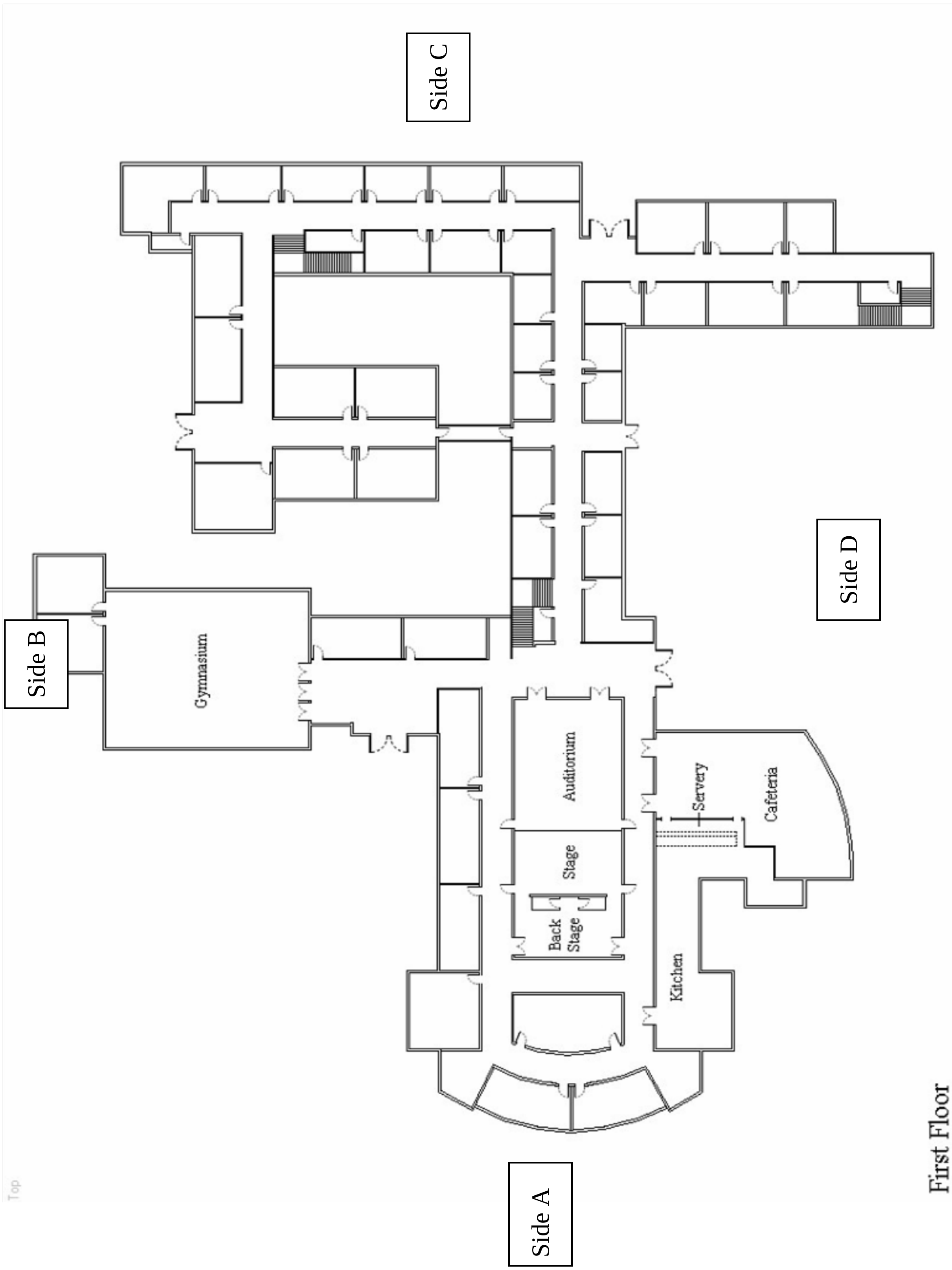
Simulation 18

Floor/Plot Plan



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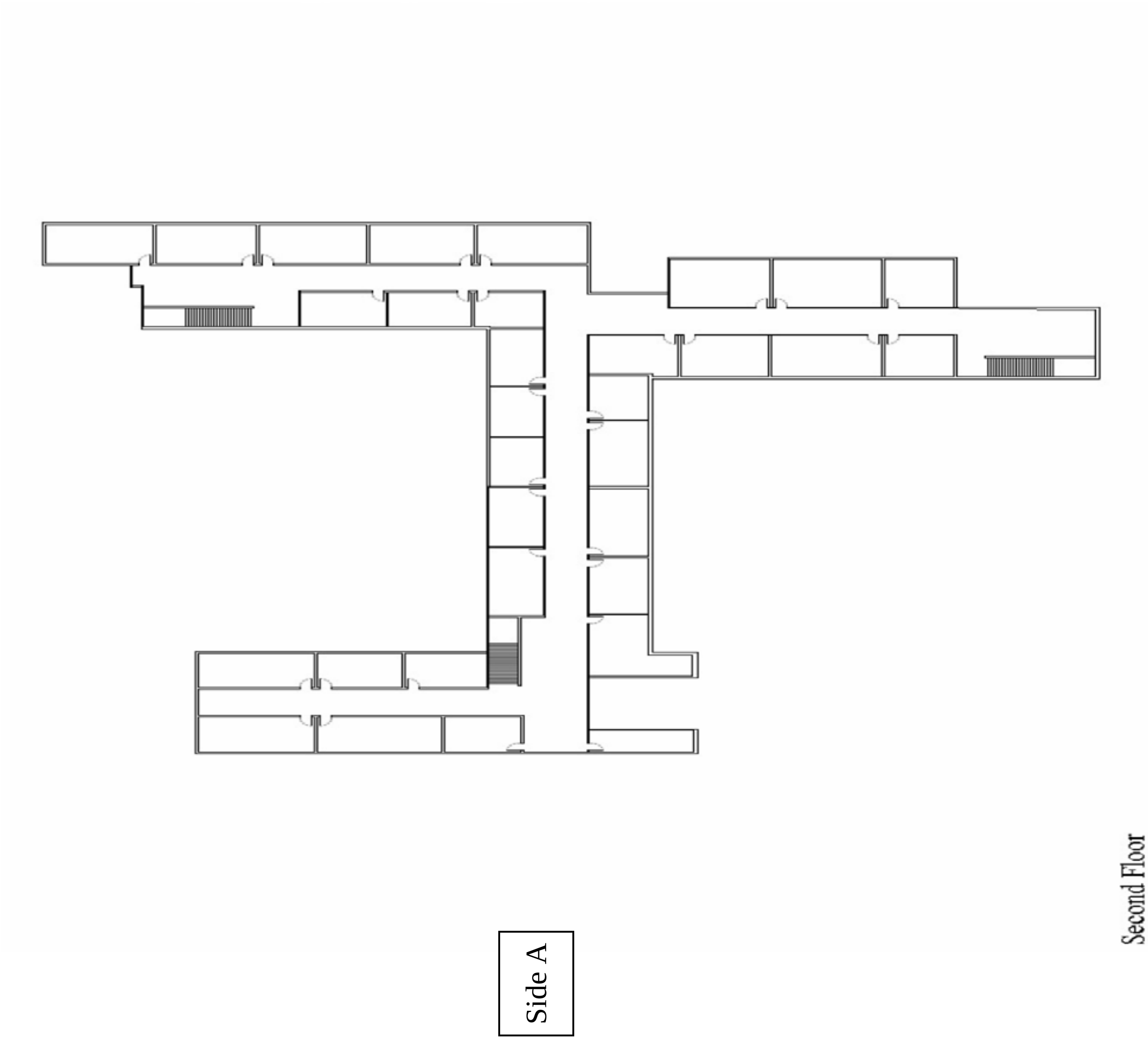
Simulation 18

Floor/Plot Plan (cont'd)



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SIMULATION 19: COURTHOUSE

(OPTIONAL)

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management tasks at incidents involving dirty bombs.*

2. *Perform the management functions required of the Incident Commander (IC) at dirty bomb incidents.*

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INTRODUCTION

Terrorism is a threat that now looms for civilians and emergency responders alike. Terrorists strike unsuspecting, innocent people and then claim victory over dead and maimed men, women, and children. The terrorist acts at the World Trade Center in New York, the Pentagon in Washington, DC, and the Murrah Building in Oklahoma City are prime examples.

Numerous types of terrorist events could be directed against both civilians and emergency workers. The type that will be addressed in this simulation is the detonation of a dirty bomb in a courthouse setting.

COMMON FACTORS

Risk Assessment

When conducting a risk assessment for potential targets of a terrorist attack on a community, consider public assembly buildings or buildings of significant importance to a community. This can include historic sites; museums; schools; churches; law offices; police stations; and local, State, and Federal buildings. Since this simulation will involve a courthouse, consider the various types of construction for courthouses: they can vary from a fire-resistant structure to a frame building.

Dirty Bomb

There is a distinct difference between a nuclear bomb and a dirty bomb. Nuclear bombs, like those dropped on Japan during World War II, were conventional nuclear weapons involving a fission reaction. A "dirty bomb" is a homemade bomb that uses conventional explosives and contains radioactive material that is intended to be dispersed as the bomb explodes. A dirty bomb is also referred to as a Radiological Dispersion Device (RDD). The concept is to blast radioactive materials into the area around the explosion. The intent is to cause damage from the explosive force of the bomb, to cause injury and death to those in the immediate area, and to expose people to radioactive material. The intended purpose is to frighten people and leave the buildings and land unusable for a long period of time. A dirty bomb can be contained within a multitude of vessels: a pipe bomb, a paint can, or a truck, for example. The detonation device can be dynamite, plastic explosives, or ammonium nitrate. Any type of blasting cap attached to switches or cell phones can be used to trigger the bomb.

A dirty bomb also could be designed to detonate on a train or vehicle. Another method of attempting to spread radioactivity may be by placing a bomb on a vehicle or train that contains radioactive material which, when exploded, will disperse the radioactive contents contaminating the surrounding area.

Radioactive Materials

The types of radioactive materials that can be used in a dirty bomb include materials used in military, industrial, or medical applications. Though weapons-grade plutonium and uranium would be most deadly, they are the hardest to obtain and the most difficult to handle. The most likely radioactive materials for these devices would be cesium, cobalt, and iridium isotopes. These materials are widely used for industrial applications in labs, hospitals, and factories. Typically there is minimal, if any, security at these facilities, and the material can be obtained easily by theft.

Some experts have identified cesium 137 as the most likely radioactive element to be used in a dirty bomb. It is created as a byproduct of nuclear reaction. It has a wide variety of uses, from treating cancer to maintaining atomic clocks. Cesium is the most reactive metal found. It easily attaches to many materials, including roofing materials, concrete, and soil. As cesium cools from its radioactive to its normal state, the isotope emits gamma radiation. These rays are extremely difficult to contain. Only concrete, steel, or lead can keep gamma radiation in check.

There have been reports of missing radioactive materials, both in the United States and in Russia. Terrorists worldwide would be receptive to purchasing these materials.

Bomb Construction

It takes little experience to assemble a dirty bomb, other than knowing how to build a conventional bomb. The explosive is intended to disperse the radioactive material in the bomb. The only restrictive part is acquiring and handling the radioactive material. Improper handling of the radioactive material will seriously endanger the bomb maker. Though many terrorists are suicide bombers, high levels of radioactivity could sicken and kill anyone handling these materials. A case that illustrates the danger of handling radioactive material occurred in Goiaina, Brazil, in September 1987. A worker found a discarded canister in a scrap yard that contained a sparkling blue powder that turned out to be radioactive cesium. Local residents found the powder very interesting and passed it from one household to another. Over 200 people were exposed to the cesium, resulting in four deaths. The radioactivity contaminated soil and businesses, and 85 homes had to be leveled in the cleanup process.

Strategic Considerations

Dirty bombs are not intended for mass destruction, but to cause economic destruction. It has been said they target mass disruption and panic, more so than mass destruction.

Responders should approach any suspected or confirmed bombsite with caution. Attempt to position personnel upwind and uphill of the site if possible. Once a bomb is detonated, perform sizeup to assess the potential damage and threat to civilian and response personnel.

Ensure that all personnel wear a self-contained breathing apparatus (SCBA) or respirator to prevent the inhalation of radioactive dust that may be present.

Protect any open wounds or cuts from radioactive contamination. Do not permit eating, drinking, or smoking while exposed to contaminated dust or smoke.

The immediate protection to any radiation exposure is time, distance, and shielding. The less time spent in contact with radiation the better. The further away a person is from the radiation the less his/her chances of it affecting him/her. Shielding will protect a person and can come in many forms including masonry, lead, and steel. Maximize the amount of shielding by keeping dense buildings between you and the site.

With a dirty bomb few people will be subjected to acute doses of radiation in the short term, though anyone remaining in the contaminated area would be subject to increased risk of developing cancer in the future. Since there is little immediate risk from the contamination, those in the vicinity of the dirty bomb should remain calm and exit the area. Panic could prove more deadly than the bomb.

Should a bomb be detonated, implement monitoring devices by both fire and bomb squad personnel. Keep monitoring devices in plastic bags to prevent their contamination, and use them to identify areas of the highest dose rates. If radioactive readings are found, the Incident Commander (IC) must determine the need for personnel to remain in the area for firefighting or search and rescue. Avoid areas of high dose rates unless to save lives, in which case entry should be as brief as possible.

Firefighters should consider using individual alerting and monitoring devices for the presence of radioactivity. Some bomb squads have made it mandatory that each member wear an alerting device during investigations for suspected devices. Squads that use dogs to search for bombs have found that attaching an alerting device to the dogs' collars can keep humans from being exposed to radiation, due to the early warning.

Once radiation is found, set up decontamination immediately and enact measures to remove and replace contaminated clothing of civilians and response personnel. This will assist in eliminating the radioactive dust that may have accumulated on clothing. Bag all clothing for later disposal.

Onscene Considerations

Whether a bomb is intended strictly as a destructive device or as a dirty bomb does not alter the actions of firefighters and bomb squad personnel. Situations where reports of explosive devices are suspected or found fall into two basic categories: exploded and unexploded devices. This difference determines the actions of the fire department and the bomb squad.

An unexploded device should be viewed as a police scene and should be left to the bomb squad and not be handled by firefighters unless they are specifically trained as bomb squad members.

With an unexploded device, typical firefighter actions should be

- To set up a safety zone around the suspected site. A clear zone of at least 500 feet should be maintained from the location of the suspected device. This should be considered an exclusion zone, and firefighters should not enter it.

- To deploy hoselines, should the device detonate.

- To attach hoselines to Siamese connections that supply sprinkler and standpipe systems and be prepared to pressurize the systems if needed.

- Cell phones and portable radios should not be used within this zone, since there is the possibility that radio waves may trigger the explosive devices.

- Establish communications with the dispatcher outside of the safety zone.

Handle an exploded device as a fire situation. Assess the need for fire control and rescue. This includes assessing building damage, the potential for structural collapse, and finding the safest way possible to accomplish firefighting and search and rescue. Consider the possibility of any secondary devices or the presence of radioactive or chemical material that would be contained in a dirty bomb.

Bunker Gear Protection

Typically the radiation that could be expected at the site of a dirty bomb would be reasonably low. A firefighter's bunker gear and SCBA will provide sufficient protection at low levels for a prolonged period without exceeding regulatory limits for radiation workers. Even at elevated levels the firefighters' personal protective gear should permit operating within an area for a few minutes. This should be enough time to permit a primary search and allow removal of injured civilians.

Firefighters Exposed to Radiation

Emergency exposures usually are allowed to exceed those that are considered tolerable to persons who work continuously with radioactive materials. In an emergency such as a necessary rescue operation, raising the exposure, within limits, for single dosage is considered acceptable. For a life-saving action, such as for search and rescue and removal of injured persons, or for entry to prevent conditions that would injure or kill numerous persons, the planned dose to the whole body should not exceed 100 rems. During less stressful circumstances, where it still is desirable to enter a hazardous area to protect facilities, eliminate further escape of effluents, or control fires, the recommended planned dose to the whole body should not exceed 25 rems. These rules apply to a firefighter for a single emergency; further exposure is not recommended.

Protecting the Injured and Exposed

If a dirty bomb has detonated in a public assembly building, firefighters must anticipate a mass casualty incident. Remove seriously injured people from the source of radiation, decontaminate and stabilize them, and send them to hospitals. Those with lesser injuries then can be decontaminated, triaged, treated, and transported to hospitals.

After treatment of serious physical injuries, preventing the spread of the radioactive material or unnecessary exposure of other people is paramount. Carry out the following immediate response actions without waiting for any radiation measurements.

- Establish an exclusion zone around the source. This should be of significant distance to anticipate spread of the radioactivity. It is easier to shrink the zone at a later time than to expand it.
- Mark the area with ropes or tape.
- Reroute traffic.
- Limit entry to rescue personnel only and strictly monitor each firefighter's exposure time.
- Detain uninjured people who were near the event or who are inside the control zone until they can be checked for radioactive contamination.
- Take action to limit or stop the release of more radioactive material, if possible, but delay cleanup attempts until radiation protection technicians are on the scene.
- Notify nearby hospitals of the incident, the type of injuries involved, and the possibility of the arrival of radioactively contaminated and injured people.
- Everyone near the scene should be checked for radioactive contamination. As soon as you can obtain monitoring equipment, establish a decontamination area for this purpose.
- Decontaminate people before sending them to hospitals. Do not send people without physical injuries to hospitals.

Recordkeeping is as important for the long-term health of the victims as it is for emergency responders. Record contact information for all exposed people so they can be given medical examinations later. The Department of Health and Human Services will request this information later.

Recommendations for Civilians Following an Explosion

Radiation cannot be seen, smelled, felt, or tasted by humans. Therefore, people present at the scene of an explosion will not know whether radioactive materials were involved at the time of the explosion. If people are not too severely injured by the initial blast, they should

- Leave the immediate area on foot. Do not panic. Do not take public or private transportation such as buses, subways, or cars because, if radioactive materials were involved, they may contaminate cars or the public transportation system.

- Go inside the nearest building. Staying inside will reduce exposure to any radioactive material that may be on dust at the scene.

- Remove clothes as soon as possible, place them in a plastic bag, and seal it. Removing clothing will remove most of the contamination caused by external exposure to radioactive materials. Saving the contaminated clothing would allow testing for exposure without invasive sampling.

- Take a shower or wash themselves as best they can. Washing will reduce the amount of radioactive contamination on the body and will effectively reduce total exposure.

- Be on the lookout for information. Once emergency personnel can assess the scene and the damage, they will be able to tell people whether radiation was involved.

Even if people do not know whether radioactive materials were present, following these simple steps can help reduce their injury from other chemicals that might have been present in the blast.

Cleanup of Radiation Site

A dirty bomb detonated in a populated city probably will not be the cause of immediate deaths, but the resulting cleanup problem can be tremendous. The cleanup at radiation sites consists of removing the layers of contamination and taking them from the site for disposal. This can involve demolition of buildings, sandblasting the contaminated face of buildings, and removing soil. This material then must be disposed of properly, since it will be many years before the radioactive contamination will decay. In reality, radiated sites cannot be decontaminated; the material only can be transferred to another site.

INCIDENT MANAGEMENT CUES

Incident Command System Organization

The complex situation created by a dirty bomb explosion will require that an Incident Command System (ICS) be initiated immediately. This type of incident will have the potential for establishing a Unified Command. The initial response of the fire department and bomb squads will require close coordination. Often the bomb squad is staffed by police officers.

In addition to fire and police, many other agencies can be requested and can be invaluable in the handling of the incident. These include, but are not limited to:

- public works;
- health department;
- private resources:
  - waste cleanup, and
  - removal of decon materials; and
- outside agencies:
  - American Red Cross,
  - county/State medical,
  - mutual and automatic aid,
  - Environmental Protection Agency (EPA),
  - U.S. Coast Guard,
  - Federal Emergency Management Agency (FEMA),
  - military,
  - Federal Bureau of Investigation (FBI),
  - Department of Defense,
  - Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), and
  - Department of Homeland Security (DHS).

Multiple major functions will be occurring simultaneously that may dictate the need for Branches. This could include Medical Branch, Suppression Branch, or Haz Mat Branch. Multiple operations in various areas can dictate the need for Groups and Divisions. They could include Decon Group and Rescue Group.

Coordination

Coordination will be a major concern between fire department units operating at the scene and the bomb squad members, and early consideration should be given to establish a Planning Section, Liaison, Public Information Officer (PIO), and Safety Officer to assist the IC.

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Simulation 19

Homework Assignment

Courthouse Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on courthouses the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the groups established for classroom activities. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation.

2. After reading the SM, your group will answer the questions pertaining to different situations or problems at courthouse incidents.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems that were not discussed.

An explosion on the first floor of a two-story courthouse has spread radioactive materials within the building.

Scenario 1

In addition to monitoring areas for levels of radiation, what other precautions can responders take to provide protection for members operating in an area where a dirty bomb has been detonated?

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____

____

____

Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

____

____

What cues led you to this solution? ____

____

____

Scenario 2

What would be the considerations of the Haz Mat Unit when confronted with a large number of occupants and firefighters, some of whom are injured, and all in need of decontamination?

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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In Class
Activity 19.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a courthouse scenario.

Directions

1. The class will be divided into four groups.

2. You will be shown slides of the incident.

3. Refer to the scenario description, plot/floor plan showing the incident location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the worksheet for the activity.

4. Your group will write its strategies on the Strategy Prompter and convert those into an ICS organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident.

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 15 minutes total. Be brief, but to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, identify which Division or Group is performing that task.

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In Class
Activity 19.1 (cont'd)

Scenario Description

Construction

80 by 80 feet, two story.
Ordinary construction (masonry, wood-joist).
Walls--concrete block and brick.
Roof--peaked with ridgepole and rafter, 1- by 6-inch sheathing, with composition shingles.

Fire Location

There is a 25-percent involvement of fire on the second floor. The police bomb squad reports that it has radioactive readings on the second floor.

Time and Day

0900 hours, Monday.

Water Supply

4,500 gallons per minute (gpm) total system flow.

Resources (first alarm)

4 engines
1 truck
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (second alarm only)
1 PM Unit

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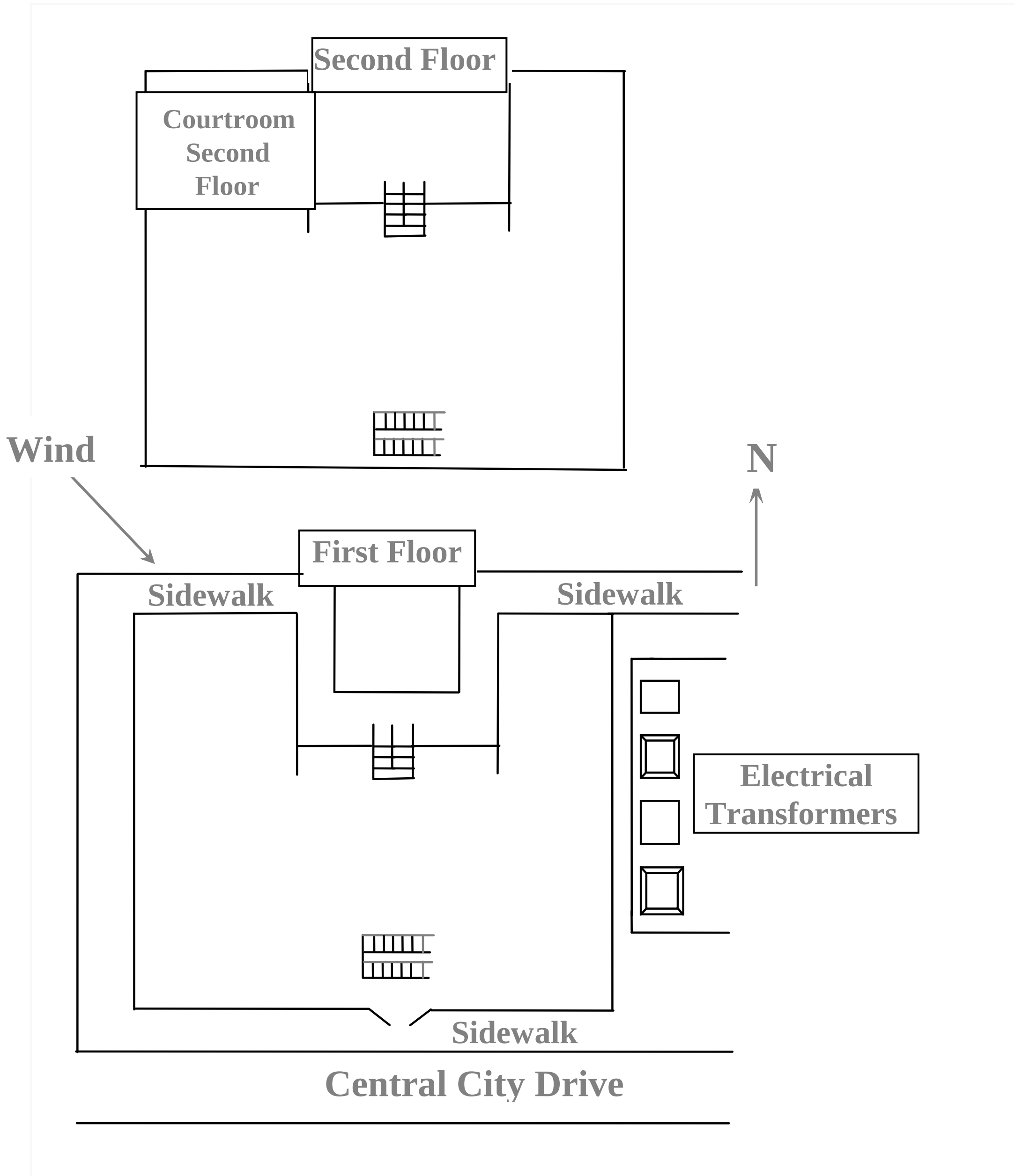
In Class
Activity 19.1 (cont'd)

Plot Plan



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Simulation 19

COURTHOUSE--DIRTY BOMB

Purpose of Simulation

This simulation requires you to stabilize the building, abate the fire, and rescue any trapped occupants as a result of a dirty bomb explosion. In addition you will be required to assist and treat those injured, decontaminate, and transport them to hospitals. You also will need to conduct necessary evacuations in the surrounding area. An emergency medical services (EMS) organization capable of handling many victims should be anticipated.

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Simulation 19

Quick Access Prefire Plan

Building Address:
X and 19th Streets

Building Description:
150' x 100', 2-story courthouse, ordinary construction

Roof Construction:
2" x 12" ridgepole and rafter with plywood and composition shingles

Floor Construction:
2" x 10" beam and rafter with plywood sheathing

Occupancy Type:
Courthouse

Initial Resources Required:
4 Engines, 1 Truck, 1 Chief, 1 PM,
1 Safety Officer

Hazards to Personnel:
Prisoners need to be confined and controlled by the sheriff/police

Location of Water Supply:
Hydrants every 600 feet

Available Flow:
1,000 gpm per hydrant

	Estimated Fire Flow*			
Level of Involvement	*10%*	*25%*	*75%*	*100%*
Estimated Fire Flow	625	1,550	3,125	6,250

**Fire flow calculated on first floor with the second floor as an exposure.*

Fire Behavior Prediction:
If sprinklers are operating they should control the fire.

Predicted Strategies:
Rescue, Ventilation, Confinement/Extinguishment.

Problems Anticipated:
Panic of occupants and evacuation problems.

☐ **Standpipe:** *No*	[X] **Sprinklers:** *Yes*	[X] **Fire Detection:** *Smoke and heat*

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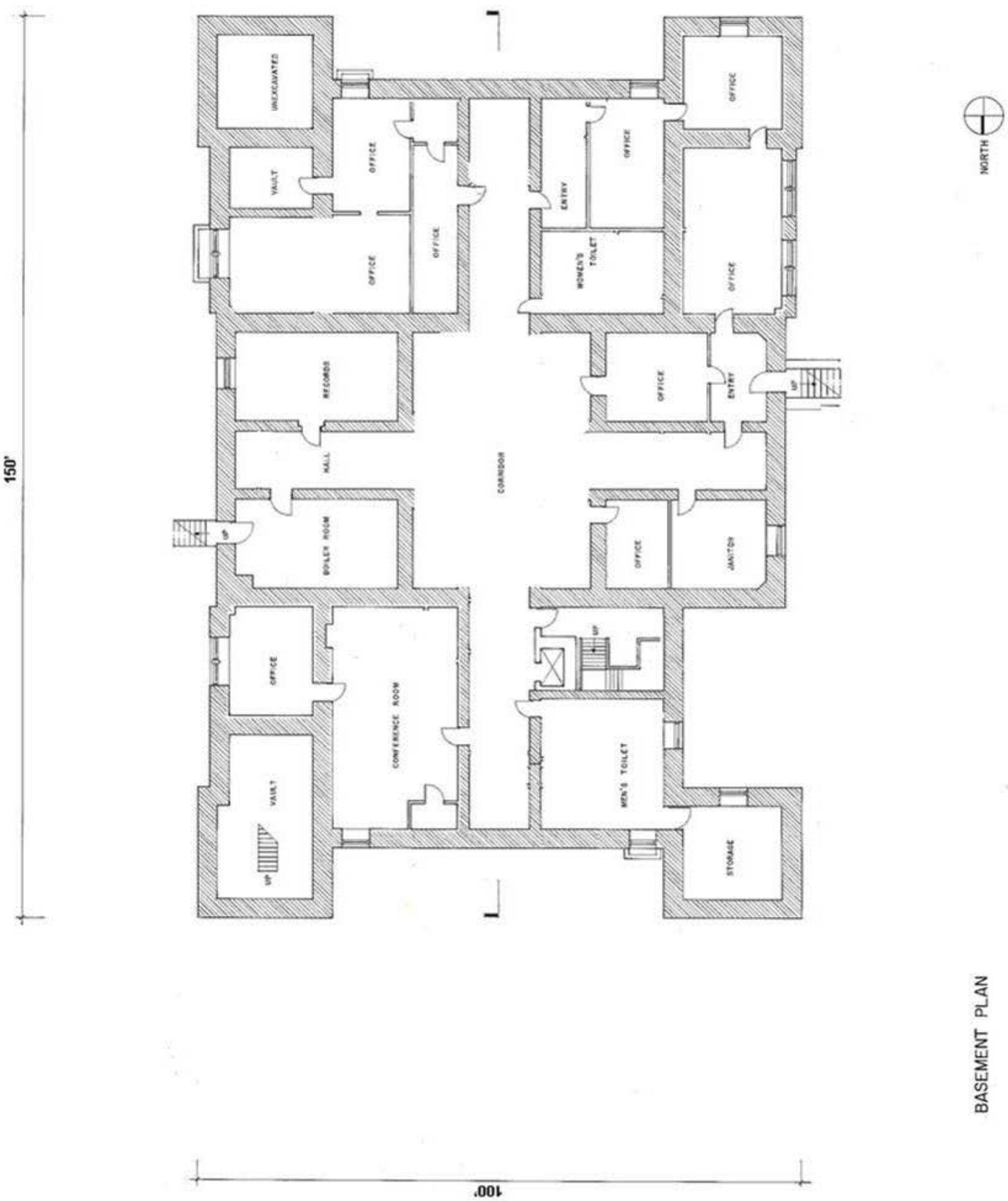
Simulation 19

Plot/Floor Plan



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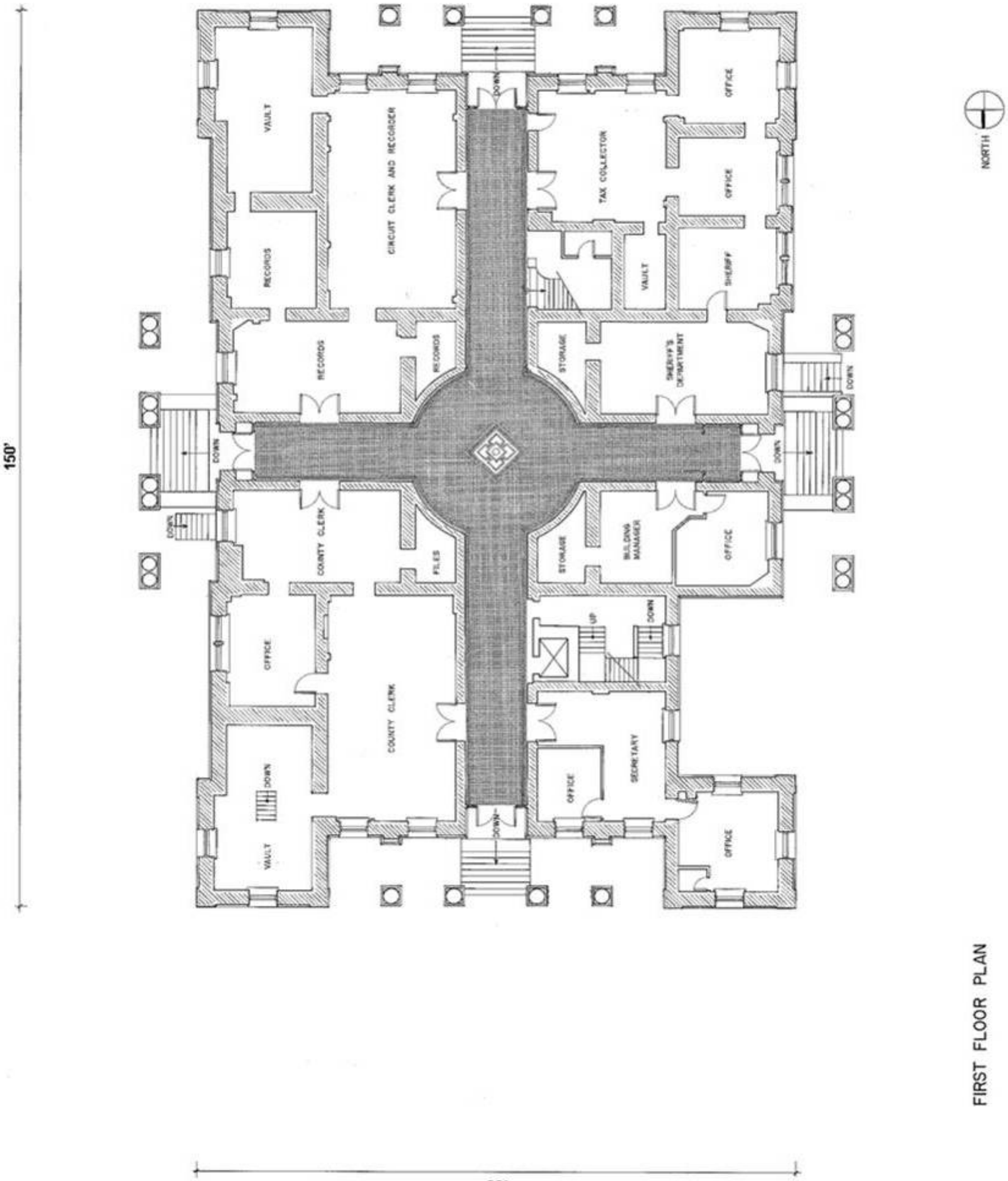
Simulation 19

Plot/Floor Plan (cont'd)



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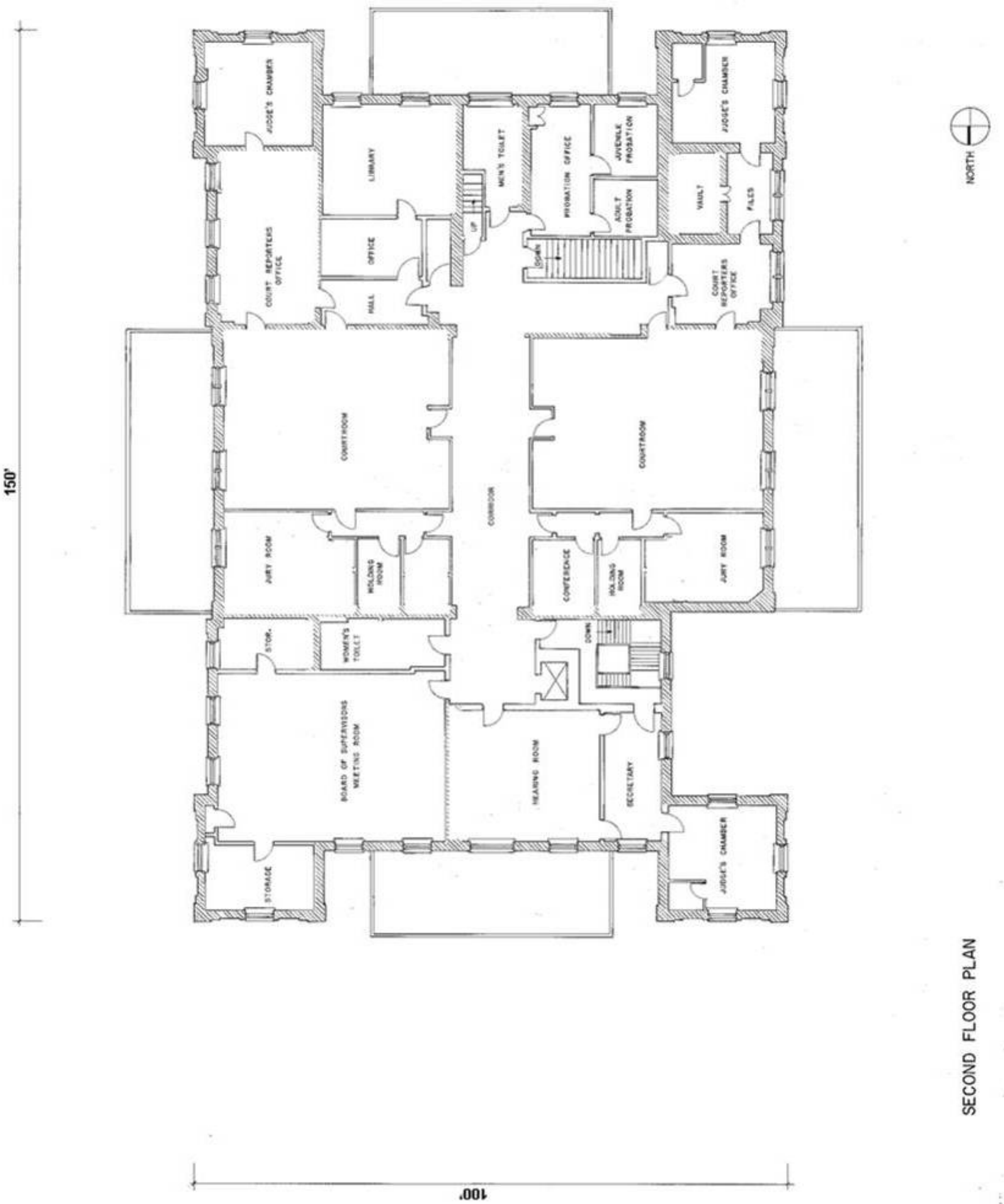
Simulation 19

Plot/Floor Plan (cont'd)



SIMULATION 20:
FARM COMPLEX

(OPTIONAL)

OBJECTIVES

The students will:

1. *Develop their knowledge, skills, and abilities relating to a farm complex.*

2. *Apply the knowledge, skills, and abilities while performing a farm complex simulation.*

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INTRODUCTION

Farm complexes generally are found in the rural areas of most communities. Yet, there are some that are now within a city's limits due to the ever-widening growth of communities. For this discussion, we will concentrate on the difficulties of farm complex fires in rural areas.

Farm complexes range from an acre or two to many thousands of acres. However, most of the buildings are concentrated on a small portion of land. While some farms have ponds on the property, many do not. Some are located near rivers and streams, and many are not.

Exposure protection and the safety of farm animals normally are the strategies for these types of incidents. Of course, exposure protection requires the support of adequate water supplies.

OCCUPANCY-SPECIFIC CUES

General Information

The **dwellings** on some farms were built many years ago. These buildings often were built with balloon-frame construction, and typically are 1-1/2 to 2 stories in height, many with basements. The walls of the balloon-frame structure are connected by combustible void spaces with the floors, basement, and attic assemblies. The walls often were covered with either wood or metal lathe and then plaster was applied. When fire enters the void space in a wall or floor assembly, these building pose a difficult fire to firefighters. The fire spreads rapidly through the voids and extends into the walls and floors on multiple levels. Firefighting actions are slowed by the difficulty of opening the walls, ceilings, and floors to find the hidden fire. Removing real plaster is much more laborious than opening drywall.

The **barns and outbuildings** normally are post-and-beam construction. Here, heavy posts carry the beams that support interior floors and the roof. The roof assemblies are generally of the ridgepole and rafter type, leaving usable space in the upper levels of the structure. The exterior walls are most often wood planking. Some may have sheet metal walls. Interior partitions usually are made of wood. These buildings often are grouped together in close proximity on the site, posing a severe radiant heat danger.

Garages and some **outbuildings** may be constructed as described above, but there also can be ordinary construction (masonry walls and wood roof assemblies) as well as noncombustible, modern buildings.

Roof Assemblies

<u>Flat</u>

- **Beam** and **rafter** with sheathing. This is normal for many flat-roofed farm buildings.
- **Parallel-chord wood truss** or **plywood I-beams.** May be found in modern farm construction.

- Outbuildings may have **metal roofs**--subject to early collapse.

Pitched

- **Ridgepole** and **rafter** is used where a usable attic space is desired, but more so is an indicator of older construction typically used on farms.

- **Wood truss** is the modern roof assembly base. Wood truss can be nailed at the joints. Toe-nailing the joints was the original method of truss assembly. In order to reduce labor costs, to speed truss construction, and to build a stronger truss, manufacturers started using **gusset plates.** A gusset plate is simply a piece of **plywood or sheet metal** laid over the truss joints. Then nails are driven through the gusset plate into the truss members.

The latest technique for truss assembly is the use of the **gang-nailer.** This is a sheet of **thick sheet metal** that has been punched. The punching produces a **large number of 3/8-inch points** protruding from one side. The gang-nailer is laid on the truss joint and the points are pressed into the truss members to hold them together.

Access

Access may be as simple as being able to spot apparatus anywhere around the structures. However, fences, cattle pens, etc., may interfere with the ability to maneuver and spot. Many farms are accessed from a main road by a narrow dirt driveway, thereby limiting apparatus setup.

Common Problems to Identify

Always consider that **every** single-family dwelling is **occupied 24 hours** a day. Be aware that there may be **unattended** children left in any dwelling. Some dwellings house the **elderly.**

Many farms have animals that the farm owner depends on for a living. The safety of the animals is probably more important to the farmer than the structures. Attempt to ensure the safety of these animals; also take care to prevent damage to farm equipment/machinery.

Water supply is critical during farm complex fires. Preplan these facilities, and emphasize getting large amounts of water to the scene as early as possible in the incident.

Remember, on horse farms, the horse, once taken from the barn/stable, will try to re-enter the structure.

Pesticides normally are present on farm complexes.

FIRE INVOLVEMENT CONSIDERATIONS

On arrival, what is involved and at what percentage? Here is where we do as the wildland firefighters do--structure triage.

- thoroughly analyze the situation as rapidly as possible;
- determine what can't be saved; and
- concentrate efforts and water on what can be saved.

Water supply must be analyzed and calculated. You should use the TDR (Tender Delivery Rate) to determine how much water can be supplied at the incident scene from each tender.

TDR = Tender capacity in gallons divided by cycle time.

Tender capacity in gallons = the capacity of the tender being calculated.

Cycle time = The time from starting to dump into a portable tank, going to get water from the source, to returning to scene to start dumping again.

E.g., A 3,000-gallon tender has a cycle time of 20 minutes.

TDR = 3,000 gallons divided by 20 minutes.

TDR = 150 gallons per minute (gpm) continuous supply to the scene from the portable tank.

Now, calculate how many tenders are required to achieve the needed fire flow for the facility. There is obviously only so much you can do in a tender operation--you will need to prioritize the water use.

Relay Operations

The following information on friction loss is provided for those who have the capability of doing relay operations in rural, nonhydrant areas.

POUNDS PER SQUARE INCH (PSI) PER 100 FEET SINGLE LINE						
HOSE U.S. GPM	**1"**	**1-1/2"**	**1-3/4"**	**2-1/2"**	**3"**	**4"**
30	26	4	1.5			
60		9	6	1		
95		22	14	2		
125		38	25	3.5	1	
150		54	35	5	2	
200			62	8	3.5	
250				13	5	1.5
DUAL HOSELINES	**2-1/2"**	**3" With 2-1/2" cpls**	**3"**			
500	13	3	2			
750	32	6	4			
1000	56	10	7.5			
1250	87	15	12			

Structural Deterioration and Collapse

These structures are **not prone** to early collapse. But heavy fire and radiant heat conditions probably will prevail. Collapse of a well-involved, unsavable structure may reduce the amount of radiant heat by producing a smaller fire-front.

CUE-BASED PREDICTIONS

Given the cues just presented, and adding a fire situation, we can make **predictions:**

- There could be animals housed in barns.
- Barns can be multistoried.
- Barn construction can include lightweight and noncombustible construction.
- Barns of heavy timber, ordinary, or post-and-beam construction are subject to early roof collapse when fire is large.
- Outbuildings of wood frame can ignite from radiant heat. Noncombustible can collapse quickly.
- Silos--dust explosions are a consideration.

INCIDENT MANAGEMENT CUES

Coordinated Operations

- Exposure protection and water supply must be coordinated and established early.
- Fire attack water must not be wasted on buildings that cannot be saved.
- Moving animals and farm equipment must be coordinated with farm workers. Animals may act up during fire conditions.
- Vertical ventilation should be attempted only after a risk-benefit analysis.
- Assume that pesticides are present on the complex.

Each function (e.g., ventilation and rescue) needs to be supervised. Each geographic area where personnel are operating needs supervision (e.g., Barn Exposure Division and Garage Exposure Division). At working incidents you will need a Safety Officer.

STRATEGY AND TACTICS

Any Fire Situation--Primary Search and Rescue

- **Immediately** begin a primary search.
- **Search** the building involved, if possible, and evacuate any victims.
- **Work with farm workers** to free any animals trapped/tied and move them to a safe area.
- Do a **structure triage** and write off what cannot be saved.
- Establish **Exposure Divisions**, assign companies to the most endangered structures, and create a **Water Supply Group.**
- **Do not** waste water on structures that become so involved that they are lost.
- Protect apparatus and personnel from radiant heat.

Hay Barns

- Barns that have considerable hay in them are very difficult to control under fire conditions.
- It is necessary to remove the hay to get to the deep-seated fires.

- This is laborious work and farm machinery operated by qualified civilians may be something that can be applied.

Simulation 20

Homework Assignment

Farm Complex Questions

Directions

1. Read the entire Student Manual (SM) portion on farm complexes the evening before the simulation.

2. Work on the scenarios for the questions in the same groups you have been assigned to in the classroom.

3. For each scenario, you may have up to three problems identified.

4. For each problem identified, define the tactical solution for that problem and the appropriate Incident Command System (ICS) solution to manage the personnel doing the tactical solution.

Scenario 1

A large barn, 200' x 150', containing tobacco, in a nonhydrant area, is 10 percent involved in fire. The nearest water is a river 1,800 feet away. The wind is carrying brands into the surrounding residential area and into the brush in this rural area.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Scenario 2

For the fire problem in Scenario 1, how many tenders will it take to deliver a continuous flow of 1,000 gpm? Give the cycle time and the capacity of the tenders.

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In Class
Activity 20.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a farm complex scenario.

Directions

1. You will be divided into four groups.

2. You will be shown a slide of farm complex. In the SM, there is a scenario description, plot/floor plan showing the fire location, and a Strategy Prompter. The Strategy Prompter will be used as the worksheet for the activity.

3. Write your strategies and convert those strategies into an ICS organization chart. Fill in up to five of the blank boxes with Division and Group nomenclature appropriate for the incident.

4. You have 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time should be limited to no more than 15 minutes, total.

5. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, identify which Division or Group is performing that task.

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Simulation 20

FARM COMPLEX SIMULATION

Incident Description

This farm complex was originally constructed about 1946. All the buildings were constructed at the same time.

The dwelling is balloon-frame construction, 24' x 30', two stories. It has a basement.

The rest of the structures are post-and-beam construction with wood-plank siding and metal-covered roof.

The barn is 80' x 100', two stories.

The bunk house is 15' x 30'.

The farm machinery shed is 100' x 45'.

The work shed is 75' x 20'.

The tool shed is 20' x 12'.

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Simulation 20
Quick Access Prefire Plan

Building Address:
1335 Stambaugh Road

Building Description:
Barn: 80' x 100', two-story, post-and-beam, wood plank siding
Roof Construction:
Ridgepole and rafter, metal covering
Floor Construction:
Floor is dirt

Occupancy Type:
Barn--hay

Initial Resources:
4 engines, 1 tender, 1 PM, 1 BC,
1 Safety Officer

Hazards to Personnel:
Early collapse of roof assembly, pesticides

Location of Water Supply:
Pond 2 miles east

Available Flow:
4,250 gallons on first alarm

	Estimated Fire Flow*			
Level of Involvement	*10%*	*25%*	*50%*	*100%*
Estimated Fire Flow	900	2,250	4,500	9,000

**Based on the two-story large barn with three exposures (rounded).*

Fire Behavior Prediction:
Rapid spread to other nearby structures.

Predicted Strategies:
Exposure protection; water supply.

Problems Anticipated:
Rapid fire spread; conflagration possibility.

❑ **Standpipe**: *No*	❑ **Sprinklers**: *No*	❑ **Fire Detection**: *No*

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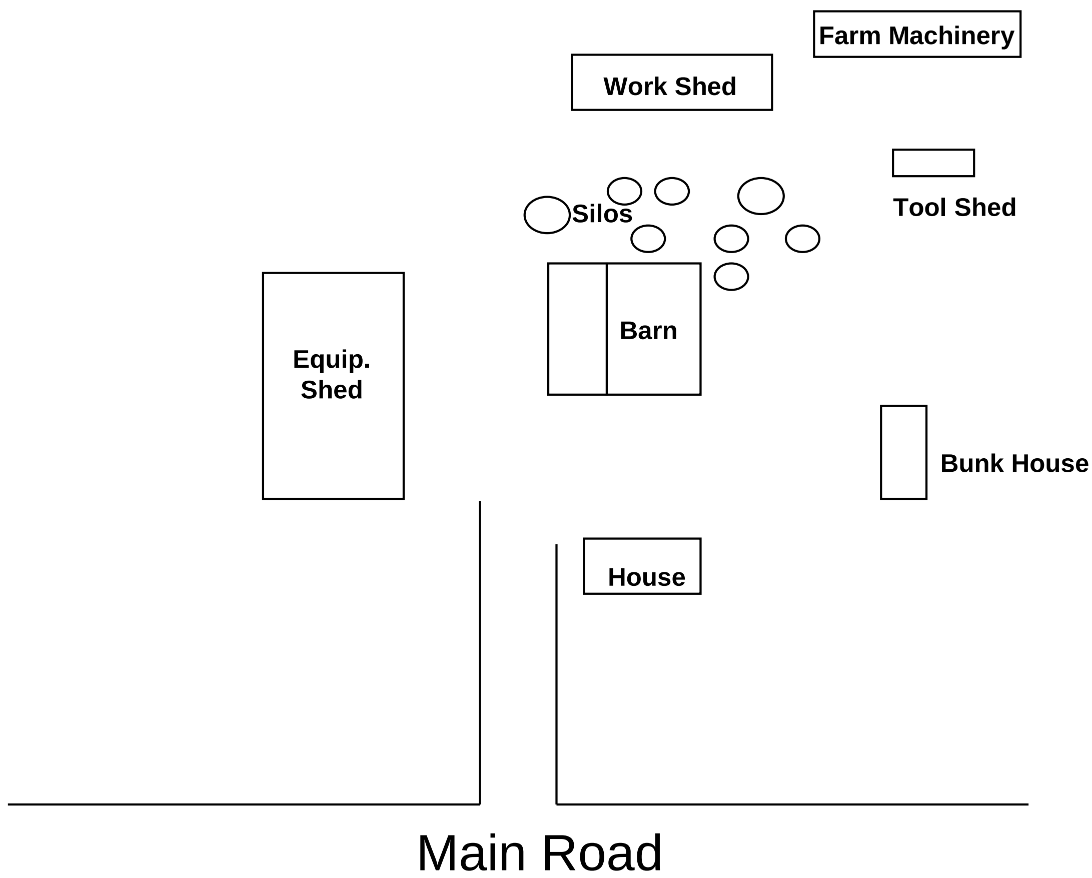
Simulation 20

Plot Plan



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SIMULATION 21: PLACES OF WORSHIP

(OPTIONAL)

OBJECTIVES

The students will:

1. *Develop the knowledge, skills, and abilities to perform management functions at fires involving places of worship.*

2. *Apply the knowledge, skills, and abilities to manage a simulated fire situation involving a place of worship.*

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CHARACTERISTICS OF PLACES OF WORSHIP

Places of worship vary in size and have many names: cathedral, chapel, church, temple, synagogue, and mosque. A place of worship can be as simple and humble as a tent or it can be as magnificent and imposing as the National Cathedral in Washington, DC. A place of worship may consist of a small stand-alone structure or it can be part of a large complex that also may include day care centers, schools, and recreational facilities.

National Fire Protection Association (NFPA) 101, *Life Safety Code*®, classifies a place of worship as assembly occupancy if 50 or more persons gather in the facility for worship. Portions of the facility also may be classified as a day-care occupancy, educational occupancy, or as a residential occupancy if sleeping accommodations are provided, as might be the case if a parsonage (also known as a rectory or vicarage) is provided or a dorm or convent is present.

A place of worship may be characterized by the presence of a large number of people for a few hours a week. The particular day of the week will vary by faith, and should be identified in the preincident planning process. Unless there is a school or day-care center associated with the facility, the building or complex will be vacant most of the time. The absence of occupants will contribute to fire spread if private fire suppression and/or detection systems are not provided and may also encourage acts of vandalism such as intentionally set fires.

Building Configuration

Places of worship do not follow any single format. Typical configurations include, but are not limited to:

- stand-alone sanctuaries or worship areas;
- sanctuaries or worship areas with attached educational areas and offices;
- campus-type complexes with separate sanctuaries, classrooms or schools, day-care centers, community rooms, recreational facilities, etc.; and
- co-location in another facility such as a shopping center.

Building Construction

The method of construction employed to build a place of worship varies greatly, and an example of every type of construction may be found within a particular community. The hazards associated with the method of construction and occupancy makes it imperative that fire departments prepare a preincident plan for every place of worship within their community.

A place of worship may have been built for that specific purpose, or it may be housed in a building that was converted from another use; for example, a single-family dwelling or former business occupancy. In many rural areas, a place of worship may have been constructed without any requirement to conform to fire or building codes. In urban areas, older buildings may have been constructed prior to the enactment of codes. The issue of the separation of church and state also may have resulted in the exemption of the building from some or all the provisions of a particular code.

Renovations and additions to places of worship, as with many occupancies, may not result in an upgrade in the fire resistance of the structure nor improve safety features. For example, walls may be breached to create large open areas or the distance to exits may be increased. Additions and modernization of the structure may have created horizontal and/or vertical voids. Additionally, separations between the addition and the older structure depend on fire doors or other compartmentation features that may not be maintained (doors blocked open, etc.). In older buildings, the materials originally used to construct the structure may no longer be available and may result in the substitution of another product that lacks the fire resistance of the original materials. For example, if the original structure was built with a heavy-timber frame or roof supports, it may be impossible to find new timbers of equal or adequate dimensions.

Most places of worship will have significance to their congregations and possibly to the whole community because they are used for such emotional events as weddings and funerals. Others may be located in structures that have historic significance because of their age and method of construction. In areas with significant crime or vandalism problems, the large stained glass windows may be covered with plastic (Lexan® and other products) to prevent breakage. In some cases, it will be difficult to cut or break the material in the event that it is necessary to vent the windows or open them for the operation of exterior hose lines.

Onsite Fire Protection

New places of worship may have a number of built-in fire protection features such as fire suppression and detection systems. Older places of worship, however, typically will not have any built-in fire protection and may lack the compartmentation found in other occupancies of similar size. The absence of built-in fire protection and compartmentation will contribute to significant fire spread because many places of worship are unoccupied for extended periods of time.

Built-in fire protection features may include any or all of the following:

- fire detection and alarm systems;
- automatic fire sprinkler and standpipe systems;
- hood protection systems in kitchen facilities; and
- portable fire extinguishers.

Risk and Mitigation

Life Safety: The hazard to life is severe when the congregation is present on days of worship. If the place of worship operates a school or day-care facility, the life hazard also may be significant when these facilities are in operation. At other times, the facility may be unoccupied for extended periods of time unless staff members are present.

The hazard to firefighters is significant, especially if the fire has been burning for a prolonged period of time before it was discovered and reported. There is a potential for backdraft to occur, and structural collapse is always a possibility, particularly in buildings constructed of lightweight materials. Partial interior collapse is also a possibility in the sanctuary or worship area if there is a balcony or cantilever choir/organ loft.

Property

In an unprotected structure, fire damage may be significant because fires may burn for extended periods of time before they are detected. Concealed spaces beneath floors, in walls, and in hanging ceilings contribute to rapid fire spread and the large open areas common in sanctuaries create significant drafts.

The threat to exposures may be significant. Educational buildings and the rectory may be attached by a breezeway or other similar passage. Flying sparks and brands are also a possibility, particularly in areas with wooden roofs.

Community Value

Places of worship tend to be focal points in many communities. The loss by fire of a place of worship may have an emotional impact on the community that extends well beyond the monetary impact of having to rebuild the structure. A place of worship may be on the local historic register or it may contain pipe organs, religious relics, and works of art, some irreplaceable. Many places of worship have large stained and/or leaded glass windows that may be lost or damaged in a fire.

Mitigation

The value of preincident planning and fire prevention inspections are well documented. Education and awareness are the keys to successful mitigation efforts because some congregants do not believe that a fire can occur in their place of worship. Other mitigation strategies include training staff and members of the congregation on how to use fire extinguishers and on the proper steps to take in the event of a fire. Some communities also have been successful in persuading places of worship to retrofit their facilities with detection and suppression systems. If the facility has a school, evacuation drills and other public education programs should be made available to the students and faculty.

Historically, places of worship have been the target of arson and acts of domestic terrorism. For example, the National Church Arson Task Force was formed in June 1996 and investigated 827 arsons, bombings, or attempted bombings in churches, which resulted in 364 arrests and the conviction of 287 defendants in connection with 206 arsons or bombings at houses of worship. The task force found that, while some of the arsons were racially motivated, the usual range of motives such as vandalism, pyromania or mental issues, burglary cover-up, retribution against religious authorities, other disputes, and financial profit all were present. In response to this potential, mitigation strategies also may include provisions for security systems as well as built-in fire detection and suppression systems.

A resource for keeping places of worship safe from fire is NFPA 909, *Standard for the Protection of Cultural Resources, Including Museums, Libraries, Places of Worship, and Historic Properties.*

FIRES IN PLACES OF WORSHIP

Frequency

Between 1980 and 1994, an average of 2,490 fires occurred in places of worship and caused an annual average property loss of $61.8 million. An average of 3 civilians were killed and 29 were injured. The average number of fires decreased to 1,990 between 1994 and 1998, and the average of number of fatalities decreased to two per year. The number of injuries increased, however. The average number of structure fires, casualties, and direct property damage per year from 1994 through 1998 for places of worship is listed below. During that period, fires in places of worship accounted for 0.4 percent of all structure fires that occurred on an annual basis.

Fires in places of worship also kill firefighters as evidenced by the tragic loss of three firefighters on February 15, 1999, in Lake Worth, Texas, when the truss roof system collapsed.

Structure Fires in Places of Worship
1994-1998 Averages

Occupancy	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Church, temple, mosque, or chapel	1,240	1	23	$40.5
Church hall	330	0	3	$5.8
Religious education facility	160	0	2	$2.5
Unclassified or unknown-type church property	180	0	1	6.6
Total	1,910	1	31	$55.4

Source: NFPA Fire Analysis and Research
Note: Fires in funeral properties have been excluded.

Fires in Places of Worship and Funeral Properties By Year: 1980-1998

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
1980	3,500	2	23	$62.1
1981	3,340	0	14	$79.2
1982	3,350	16	58	$43.3
1983	2,850	7	26	$114.0
1984	2,930	3	45	$50.4
1985	3,020	0	30	$60.5
1986	2,770	2	29	$51.5
1987	2,660	4	23	$51.7
1988	2,360	4	14	$69.0
1989	2,160	3	11	$59.0
1990	2,100	0	17	$62.1
1991	2,120	2	34	$56.9
1992	2,190	0	28	$70.7
1993	2,030	5	41	$57.7
1994	2,040	1	25	$60.7
1995	1,890	5	62	$52.1
1996	2,180	1	27	$62.1
1997	1,950	0	25	$43.6
1998	1,910	4	25	$68.4
1980-1994 Annual average	**2,490**	**3**	**29**	**$61.8**
1994-1998 Annual average	**1,990**	**2**	**33**	**$57.4**

Source: National estimates based on National Fire Incident Reporting System (NFIRS) and NFPA Survey

Cause

Between 1994 and 1998, the leading cause (22 percent) of fires in places of worship was incendiary or suspicious, followed by electrical (17 percent), and heating equipment (12 percent). Fires occurred most frequently on Sundays (19 percent) and two-thirds of all fires occurred between 0900 and 2100 hours. The leading area of origin was the kitchen (12 percent). Only 39 percent of the fires occurred in properties with a smoke or fire alarm. Automatic fire suppression systems were present only in 4 percent of these fires.

COMMAND OPERATIONS IN PLACES OF WORSHIP

Characteristics of Sanctuary/Worship Area Fires

Sanctuary/Worship area fires present one of the most challenging events faced by Command Officers in this type of occupancy. The large open space with high ceilings and heavy fire loading create an atmosphere for rapid fire development and loss of structural stability.

Many of these fires will be in advanced stages if the building is unoccupied at the time of the incident and in the absence of built-in private fire protection systems. Large caliber streams, in conjunction with roof-top ventilation, will be required to control the progress of these fires. However, historically there is little opportunity for success in controlling these fires in advanced stages safely. Due to the significant British thermal unit (Btu) production, and large cubic feet of space, structural integrity is compromised to the point that an interior attack cannot be conducted safely.

The roofs of these structures create their own unique challenges to firefighters. High, steep angles are often found with heavy exterior coverings such as slate or terracotta tile. More contemporary places of worship use flat, mansard, or hip-roof configurations, with roof coverings of asphalt/fiber glass shingles, flat slag etc.

In some cases sanctuary/worship area fires may have originated in the basement, creating an immediate floor collapse risk to advancing firefighters if the Command Officer has not assessed the location and extent of the fire properly prior to initiating an interior attack.

The sanctuary/worship area may contain very valuable pieces art and ritual items that are irreplaceable, as well as large overhanging light fixtures, pictures, and/or ornamental figures, along with cantilever balconies and pulpits. This creates the potential for falling objects, and also creates a collapse hazard. If firefighters are not familiar with the building, these unique adornments also cause difficulty in reaching the ceiling with advancing hosestreams, and may require firefighters to make adjustments to their hoseline placement.

In many cases, the ceilings are open, cathedral-type construction, using heavy timber; however, more contemporary structures use laminated wood or rigid-frame steel trusses, or light wood frame (especially susceptible to early collapse).

Sanctuaries/Worship areas may contain large, heavy pipe organs that may be placed on balconies or stages. Fires originating in the basement or in the area around the organ may create a collapse hazard.

Tactical Solutions: Sanctuary/Worship Area

Fires in advanced stages must be approached with caution. Exterior attack with ample distance factors (100 percent of the height) for personnel and apparatus is in order. Advance knowledge of the interior configuration, type of construction, and exposures will dictate how and where streams should be placed. The use of positive-pressure fans in exposed portions of attached structures may prove to be beneficial in assisting exposure protection. This tactic must be coordinated at the Incident Commander (IC) level.

Wind direction will play a strong influence in the propagation of the fire and the rate of spread. Exposure lines should be placed on the leeward side of the fire with safe distances in mind.

Fires that are in their early stages can be attacked once the origin of the fire is determined to be at the sanctuary/worship area level. Given the size of the area and potential fire development, 2-1/2-inch-hoselines should be deployed, backed up with additional 2-1/2-inch-hoselines supported by dismounted deluge sets. Every offensive attack in a large structure must be supplemented with a defensive attack strategy. In this case, elevated streams should be called for early, and placed strategically to provide an alternate/defensive attack, should the offensive attack fail. Elevated streams seldom will reach the seat of the fire, due to building configuration, ceiling arrangement, and balconies; however, exterior streams will offer protection of exposures (other buildings, steeple, bell towers, etc.) Attached buildings/structures must be protected and the progress of the attack, along with structural stability be closely monitored. Ventilation should take place in coordination with the attack to eliminate built up heat and products of combustion as rapidly as possible to assist in the success of the interior attack.

Numerous voids may exist in sanctuary/worship areas. Voids may be found under the pulpit, around the choir loft, behind balconies, and in closets/storage areas. Some places of worship may have a baptistery, which could pose a risk to firefighters if it is uncovered and/or full of water. In older/traditional places of worship, interior and exterior walls may not be fire stopped. Keep watchful eye on conditions and signs of vertical and horizontal fire spread. Hose lines should be advanced in advance of fire spread.

Critical Factors, Decisions, and Actions During Initial Operations: Sanctuary/ Worship Area

- consider the time of day and the day of the week to determine potential life safety risk;
- note weather (wind and temperature example: colder temperatures = potential fire in heating unit/basement origin;
- note size and location of fire;
- note condition of roof (heavy smoke and heat conditions at interior ceiling);

- consider building construction (advanced fire in light wood frame = defensive attack with exposure protection);
- evaluate fire flow requirements for initial attack versus available resources (apparatus, personnel, water supply);
- initiate request for appropriate resources for initial attack, potential fire development, and alternative plan of operation;
- consider preburn time and its effect on structural stability;
- pull the preincident plan and make use of information to devise your initial attack plan--share information with first in attack crew officer and other company officers;
- organize the attack (assign Incident Command System (ICS) positions);
- initiate attack;
- monitor progress or lack of progress;
- consider length of time attack crews are in building versus progress or lack of progress;
- develop an alternate plan, and implement preliminary actions (position back up lines and/or master streams); and
- assign personnel to relieve interior crews.

FIRES IN COMMUNITY ROOM/SCHOOL/OFFICE COMPLEX ATTACHED TO SANCTUARY/WORSHIP AREA

Characteristics

Places of worship may include a sanctuary/worship area, an office facility, a community room, recreational facilities, and/or a school/day-care facility. These facilities may be a part of a single large structure, or may be spread out in a campus-type setting. These ancillary facilities may be occupied on any day of the week. Offices are used on weekdays, weekends, and evenings by church staff. Community rooms are used primarily for special occasions (wedding receptions, other gatherings), on weekends and evenings. School facilities are used weekdays--daytime and occasionally in the evenings during the week for church and community use. All of these rooms will be in use on religious worship days. Preincident planning should include review and enforcement of practiced escape plans for all facilities, in particular the school facility, and the sanctuary/worship area. The school facility, in most States, is required to meet fire code regulations for an education facility. These code requirements normally require fire-rated exit corridors, proper exit ways, and panic hardware and exit signs. Sanctuary/Worship area fires in places of worship with community rooms, school facilities, and/or office complexes create a significantly complicated and challenging incident for Command Officers.

Tactical Solutions: Church Complexes

The location of the fire will determine the nature and scope of strategic and tactical objectives. An advanced fire in the sanctuary/worship area will dictate to the Command Officer to commit all initial arriving units to the protection of attached facilities. The only exception to this recommendation is when search and rescue operations are needed in either facility.

Generally, if a school, community room, and/or office facility is connected to the sanctuary/worship area on two sides, then the exposure on the leeward side would take precedence over the exposure on the windward side. The use of positive pressure ventilation (PPV) fans in the exposure to create a barrier against the propagation of smoke, heat, and fire may be a favorable consideration along with hoselines exterior and interior, and connecting to private protection systems where provided.

Critical Factors, Decisions, and Actions During Initial Operations: Church Complexes

- Consider the time of day and the day of the week.
- Location of the fire (sanctuary/worship area, school, community room, offices, etc.).
- Water supply.
- Access.
- Conditions upon arrival versus resources enroute and on the scene.
- How are the facilities connected (breezeway, closed corridor, direct connection)?
- What type of separation is provided (self-closing fire door, firewall--masonry, fire separation, dry wall)?
- What is the roof exterior covering?
- What is the nature of the roof assembly (wood-frame, steel truss, etc.)?
- What type of fire detection, fire alarm, fire suppression systems are installed in the facilities?
- What is the interior finish (combustible, flame-retardant, dry wall, etc.)?
- Begin to develop strategic and tactical objectives and assign ICS positions.
- Request additional resources as required.

STEEPLE FIRES

Characteristics of Steeples

Steeples may be constructed at the time of the initial construction of the building, added at a later time (added to an existing roof), or modified (extended/reshaped). These structures may be an integral part of the roof assembly, creating a void that will transmit fire directly into the roof area over the sanctuary/worship area. These structures inherently posses their own void spaces, since they are essentially hollow.

The method of construction used to frame a steeple typically is wood frame, although some may be constructed of steel or other alloy materials. Many of these structures may include large bells or speaker systems used to call members to worship and/or other purposes. These conditions create a significant risk to firefighters during operations involving roof fires. Since these structures are essentially for aesthetics, spontaneous collapse is a real possibility in fires involving steeples. Accordingly, an interior fire attack is seldom recommended when confronted with a fire in a steeple, unless the fire in the incipient stage. Many of these fires are started by lightning, and may not be noticed if the structure is unoccupied, creating a situation where the fire is in an advanced stage prior to the arrival of the fire department. Firefighters should recommend the installation of lightning protection (grounding) for these structures during preplanning or inspections.

Tactical Solutions: Steeple Fires

Fires involving steeples should be approached with the strategic objective of ensuring that the main structure and immediate exposures are protected first, and then focus on suppression of the fire in the steeple. The value of these structures are not significant in comparison to the whole structure. However, a steeple fire may contribute to the loss of the entire structure if it is not contained early in the incident. Advanced steeple fires are best attacked from the exterior with elevated streams at the appropriate distance to avoid the risk of collapse, coupled with protection of the sanctuary/worship area from both the interior and the exterior. Reaching a fire in the under side of the ridge board (peak of the roof), may be challenging if not impossible due to the height of the ceiling. (The term "church raise" in ladder work was derived from this.) It is extremely difficult to attack a fire employing a church raise, coupled with the use of a handline, although not impossible. Only trained and experienced teams of personnel should attempt to attack fires running the underside of the roof employing a "church raise."

In some cases, rather than attempt an attack from the interior to suppress a fire running the roof of a sanctuary/worship area, the use of a cellar nozzle, or piercing nozzle may prove to be effective when deployed from an aerial device.

Critical Factors, Decisions, and Actions During Initial Operations: Steeple Fires

- consider the time of day and the day of the week (potential victims);
- water supply;
- weather conditions (especially wind);
- access;
- fire conditions (advanced stage = protection of exposed structures);
- type of roof configuration (style, height, construction, etc.);
- monitor structural stability of steeple and main building;
- consider potential fire development;
- request appropriate resources;
- consider property conservation (removal of valuable items if conditions warrant);
- develop strategic objectives;
- assign ICS positions; and
- ensure safe operating area is maintained in vicinity of steeple.

BASEMENT FIRES

Characteristics of Basement Fires

Many places of worship will include basements. Basements may be used for storage, mechanical and heating/ventilation/air conditioning systems, offices, and, in some cases, classrooms or recreational halls. In older structures, the void between the ceiling and the floor above the basement may include numerous vertical and horizontal openings.

Basements may be divided into many small rooms creating a maze of short, dead-end corridors that can confuse firefighters and trap occupants. Kitchens may be in the basement area of many places of worship. Vertical shafts leading from stove ventilation systems create avenues for fire and smoke spread. When preparing the preincident plan, methods of access from the outside should be noted, along with windows that will provide the means for rapid ventilation and possible escape for firefighters. The interior finish of the basement area may be combustible, which can create a flashover threat. Most local codes will not allow combustible interior finishes in public assemblies; however, the code may not require noncombustible interior finish in a basement unless public access is allowed.

Tactical Solutions: Basement Fires

A fire in the basement of a place of worship may threaten the entire structure and pose a major safety threat to firefighters. Where only one means of ingress (interior stairs) is provided to the basement, firefighters face a difficult challenge in extinguishing fires in advanced stages. In these instances, the use of basement or cellular nozzles may be an answer if the floor construction will allow for rapid deployment and the floor above the basement is deemed safe for operations. In some cases, PPV may be used if a portal can be found on the opposite side of the attack, and sufficient staffing is available to coordinate the attack.

Basement fires are best extinguished with the least threat and exposure to firefighters, making use of an exterior entryway, as apposed to an interior stairway. The use of straight streams rather than fog streams is recommended, since most basements have low ceilings and provide little or no ventilation opportunities. Checking for extension early into the incident is advisable, especially around the pulpit area, organ/choir lofts, and stages. In older places of worship, partitions may not be fire-stopped. Therefore, a watch for extension is important in all partitioning on the main level above the basement.

Critical Factors, Decisions, and Actions During Initial Operations: Basement Fires

- consider the time of day and the day of the week (potential victims);
- water supply;
- access to basement (interior/exterior stairs);
- construction (especially floor construction);
- fire conditions;
- fire extension potential;
- check for exterior access to the basement;
- ventilation opportunities;
- sufficient and type of tools and other resources;
- request appropriate resources;
- develop strategic and tactical objectives;
- assign units to check for extension; and
- assign ICS positions.

CUE-BASED PREDICTIONS

- A large number of people may become victims in any fire that produces large amounts of smoke.

- The ability to access the floors quickly may be hampered by open stairwells, people evacuating, limited number of stairways, or narrow stairways.

- Lack of a standpipe system may make fire attack more difficult.

- Fires are not often contained to a single room.

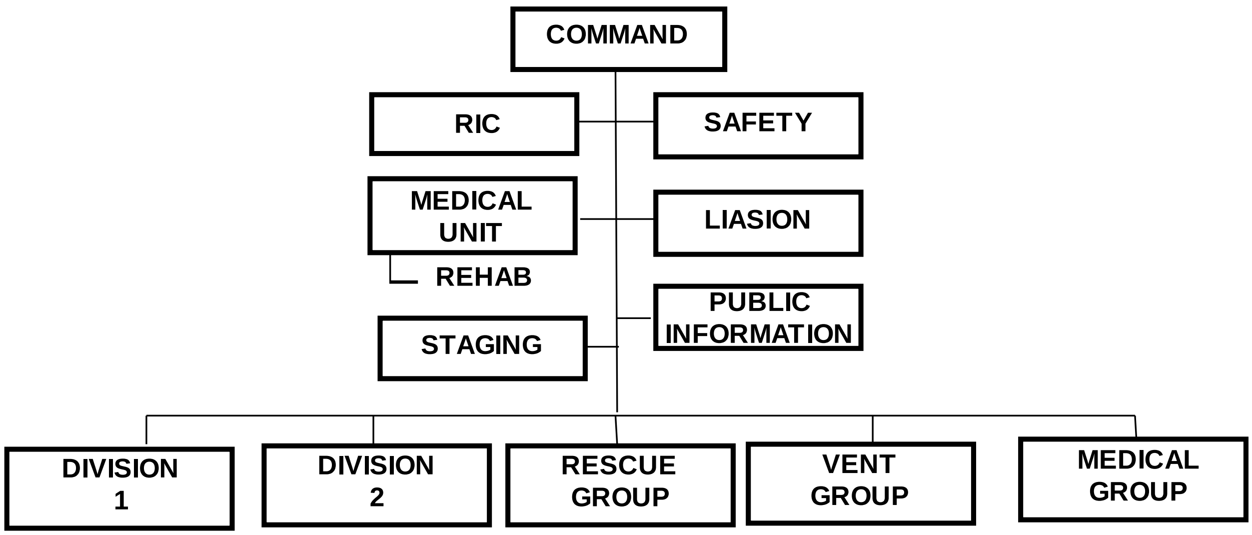
- A Medical Group or Medical Branch may be required to care for the civilian injuries.

- Offensive operations in places of worship normally require the following ICS organization entities:

  - Command,

- Branch,
- Divisions--fire floor, above and below, and
- Vent Group.

- Example of organization for a two-story church with fire on the first floor, on a Friday at 1300 hours.



Simulation 21

Homework Assignment

Places of Worship Questions

Directions

1. You were assigned to read the entire Student Manual (SM) portion on fires in places of worship the evening before the simulation. This worksheet of questions pertains to the reading material. You will work in the same groups established for classroom activities. Each student will provide written answers on the worksheet and bring the worksheets to class to use during the presentation.

2. After reading the SM, your group will determine a number of the problems facing the IC, based on the limited incident information given. For given problems, you must provide both a tactical solution and an ICS solution.

3. The instructor will review each of the assigned questions by asking the question and selecting several students to respond with the answers from their worksheets. Other students will be asked to respond from their worksheets if they have additional problems or solutions that were not discussed.

Scenario 1

A fire in reported in the sanctuary of a two-story church. The fire has gained considerable headway and is involving the sanctuary and starting to extend upwards towards the ceiling along the wood-covered rear wall. It is Saturday afternoon, and the business office above the church is occupied by 12 employees. What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this problem? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this problem? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this problem? ____

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Scenario 2

A large church that is an historic place has a large fire in the front of the church. The church has many colored, very expensive leaded windows on all sides except the rear wall. The IC is contemplating a master stream attack through the leaded-glass windows.

Discuss why you would or would not make this type of attack due to the historical age of the church.

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In Class
Activity 21.1

Incident Command System Organization

Purpose

To complete a Strategy Prompter for a church fire scenario.

Directions

1. The class will be divided into four groups.

2. Refer to the scenario description, plot/floor plan showing the fire location, and the Strategy Prompter for this activity. The Strategy Prompter will be used as the worksheet for the activity.

3. The class will be shown a slide of a places of worship fire. Everyone will review the scenario description and the plot/floor plan.

4. Your group will write its strategies on the Strategy Prompter and convert those into an ICS organization chart. You will fill in up to five of the blank boxes with Division and Group nomenclature appropriate to manage the incident.

5. Your group has 10 minutes to complete the worksheet. Following worksheet completion, one student from each group will explain the group's organization and basic tactics to the class. The reporting time is limited to 15 minutes total. Be brief, but to the point.

6. Each of the major strategies shown must be addressed within the ICS organization and specifically identified during the reporting phase. For example, if there is no Vent Group and ventilation is required, identify which Division or Group is performing that task.

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In Class
Activity 21.1 (cont'd)

Scenario Description

Construction

175 feet X 80 feet one-story church and school w/basement meeting rooms.
Wood-frame construction.
Pitched cathedral roof on church.
Lightweight construction.

Fire Location

25 percent involvement at the front of the church--fire showing on the first floor.

Time and Day

1900 hours, Thursday--there is meeting of 23 people in the basement.

Water Supply

1,500 gpm total system flow.

Resources (1st alarm)

4 engines
1 truck
1 PM Unit
1 B/C
1 Safety Officer

Resources (additional alarms)

3 engines
1 truck
1 B/C
1 D/C (2nd alarm only)
1 PM Unit

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Simulation 21

PLACES OF WORSHIP

Incident Description

This simulation is designed to have you command an incident that occurs in a place of worship.

The facility is primarily ordinary construction with masonry walls, wooden floors, and roof assemblies.

Access is limited to Sides C and D of the building.

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Simulation 21

Quick Access Prefire Plan

Building Address:
2640 26th Street

Building Description:
180' x 60', 1-story, ordinary construction, church

Roof Construction:
Glu-lam beams, 1" x 8" decking, composition shingles, cathedral ceiling

Floor Construction:
2" x 16" wood beams, plywood sheathing, hardwood flooring

Occupancy Type:
Church

Initial Resources Required:
4E, 1T, 1 PM, 1 Chief, 1 Safety Officer

Hazards to Personnel:
Basement of church is a storage area

Location of Water Supply:
Four hydrants within 500 ft. in each direction

Available Flow:
3,600 gpm system flow

	Estimated Fire Flow*			
Level of Involvement	*10%*	*25%*	*50%*	*100%*
Estimated Fire Flow	450	1,100	2,200	4,500

**Basic fire flow--Based on the 1-story church sanctuary and one exposure.*

Fire Behavior Prediction:
Rapid horizontal fire spread.

Predicted Strategies:
Rescue, Exposures, Confinement, Ventilation.

Problems Anticipated:
High ceiling and possible roof collapse in large fire situation.

☐ **Standpipe:** *No*	☐ **Sprinklers:** *No*	☒ **Fire Detection:** *Yes*

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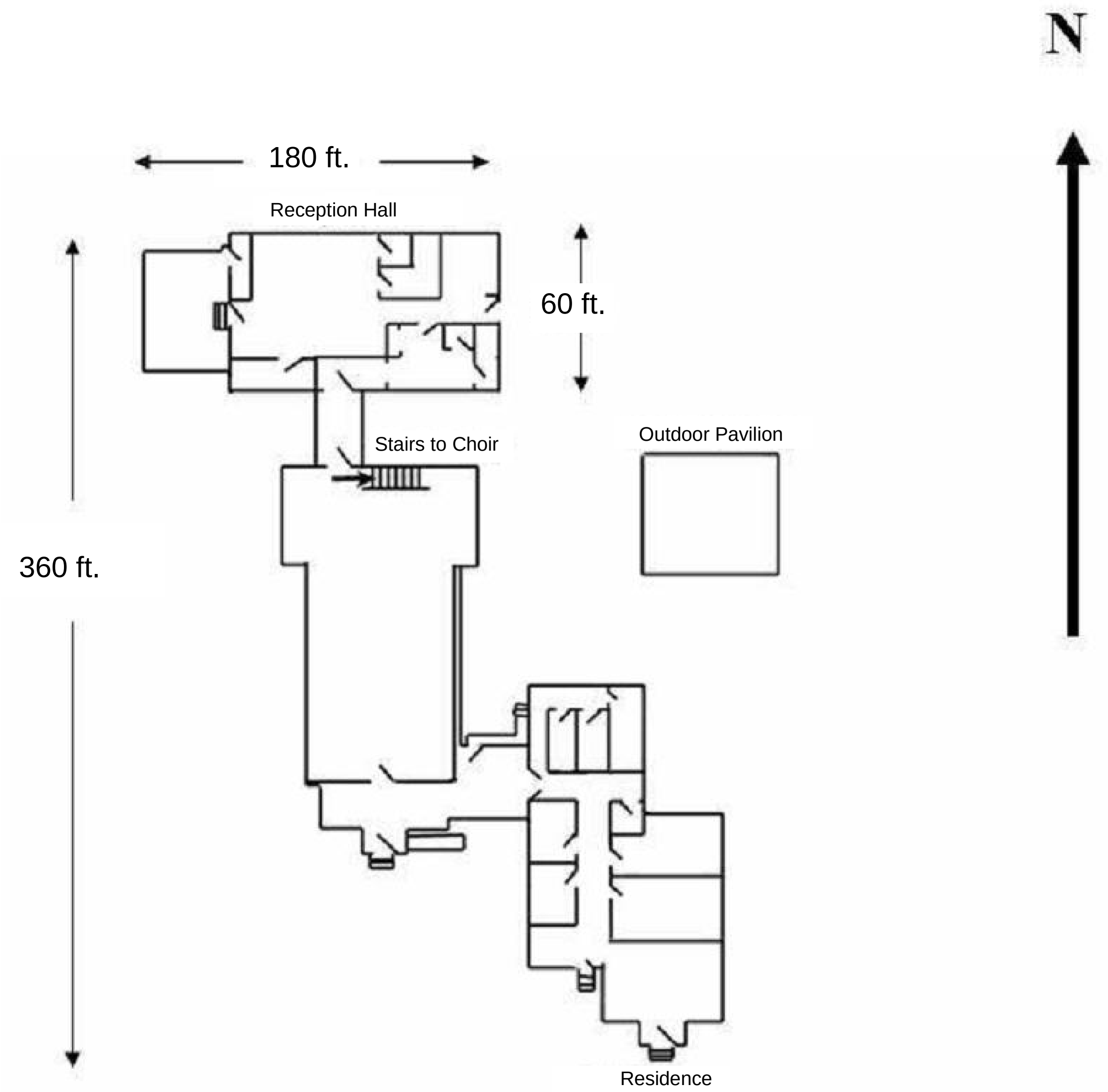
Simulation 21

Plot Plan



SIMULATION 22: SUPERMARKETS

(OPTIONAL)

OBJECTIVES

The students will:

1. *Develop their knowledge, skills, and abilities related to emergency incidents involving supermarkets.*

2. *Apply the knowledge, skills, and abilities while performing a supermarket simulation.*

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DEFINITION

Supermarkets are retail outlets specializing in produce, groceries, meats, poultry, and a variety of household products. In some cases, they may be part of a larger box store that markets appliances, automobile supplies, lawn and garden equipment, etc.

OCCUPANCY-SPECIFIC CUES

General Information

Supermarkets vary in design and configuration. They may be a one-story structure that is an anchor store of a strip center, or a multilevel stand-alone facility.

Newer supermarket construction is usually noncombustible--masonry walls and lightweight steel truss roof assembly with a metal deck that may be covered with a poured concrete or built-up finish. A rubber membrane roof finish will be found on newer stores or facilities that have had recent roof work.

Depending on when it was built, it could be either ordinary or wood-frame. Prefire planning should include a close review of the construction features, recognizing that fire behavior has a direct relationship to construction.

Older facilities may meet the noncombustible criteria, but could be ordinary construction, in particular if the roof assembly is combustible. Masonry walls do not determine the type of construction.

Life Safety Issues

The life safety problem for customers is usually limited due to self-evacuation; however, elderly customers and employees may need assistance. Life safety problems for employees will vary, depending on the time of day and ability to reach an exit.

Firefighter safety must be constantly evaluated. Early collapse of the roof assembly with its live load of air-conditioning and other mechanical components is always a potential hazard.

Roof Assembly

Roof or floor assembly construction type **must** be identified ahead of time on a prefire plan.

If roof construction is unknown: **assume that it is lightweight and subject to early collapse.**

At the incident scene, go to the adjacent, uninvolved occupancies and pull ceiling. **Note:** Where the supermarket is an anchor store and separated from the adjacent property by a firewall, it may not be possible to identify the actual roof type in the supermarket.

Rear Entry

Windows are limited.

Door types will vary: They may be steel, steel-clad, wood, or some other combination. Locking will present problems: Security is a primary issue.

Normally, rear entry is time-consuming, even when the occupancy is open for business.

Most fire departments choose front entry even when it goes against the "unburned to the burned" philosophy.

Warning: When people are known to be trapped between the fire and the rear of the occupancy, a judgment must be made as to which entry, front or rear, offers the best chance for rescue.

Access

It may not be possible to drive apparatus to the rear. Front access may be blocked by customers' cars. Preincident planning can determine hours when doors are accessible.

COMMON PROBLEMS TO IDENTIFY

Ventilation Considerations

Trench cuts or strip ventilation are extremely time-consuming; fire can overrun the Ventilation Team.

It is critical to know the built-in ventilation features such as operable hatches, skylights, heating, ventilating, and air-conditioning (HVAC) exhaust capability, etc.

Fire Involvement Considerations

- Has the fire extended to the roof assembly area?
- What are the signs of probable roof/ceiling assembly involvement?
- Is there a major fire involvement in the high-rack storage area?
- Is hot smoke rising from roof vents?
- Has the fire vented through the roof?

Structural Deterioration and Collapse

In one-story structures, collapse potential is related directly to the roof construction type. Any type of truss construction can be expected to collapse early once it has become well involved in fire. Collapse can come as soon as 5 minutes after involvement.

Old buildings may have structural deficiencies before the fire, such as missing components or precode construction.

Loads on the roof such as HVAC systems may accelerate the collapse.

CUE-BASED PREDICTIONS

- Although most occupants will self-rescue, a thorough primary search must be conducted.
- Depending on time of day and year, hundreds of people could be in a supermarket.
- With stores of 100,000 square feet or more, Task Forces may be required to conduct search and rescue and perform firefighting operations.
- Rescue crews must ensure that a coordinated search is conducted that includes the use of a means of returning to the exterior, such as a rescue guideline.
- Heavy stream appliances will be needed to ensure rapid knockdown.
- There is a potential for multiple injuries to customers and employees.
- Smoldering fires undetected in the overhead can spread rapidly when the ceiling is breached.
- Heavy smoke development may occur rapidly.

INCIDENT MANAGEMENT CUES

- Dependent on time of day, rescue may be a high priority and must be coordinated with fire attack and ventilation.
- Horizontal ventilation will assist in rescue and fire attack.
- Provide adequate Rapid Intervention Crews (RICs) for firefighter rescue.
- Sprinkler systems, where present, must be supported by the first or second engine.
- Fires extending into the roof assembly area can result in early failure and collapse.

- Large-caliber streams will be required for rapid control.
- An RIC should be considered for working fires.
- Accountability of fire/rescue personnel must be done.

STRATEGY AND TACTICS

Any Fire Situation--Primary Search and Rescue

Immediately begin primary search. Start closest to the fire, work outward. If there is a second floor not involved in fire, it still must be searched. At some point, as soon as possible, a secondary search must be completed by companies that were not involved in the primary.

Establish a Rescue Group and assign the necessary companies/crews to the most critical areas of the building. (If a Division approach is used, it is critical that adequate support be provided to ensure a rapid search; this may require the assignment of Task Forces.)

Fire Attack

Provide sufficient fire flow to confine and extinguish the fire. These areas could be well involved due to their large, open areas.

Where high-rack storage is used, significant high-challenge fires can occur.

If automatic sprinkler protection is installed and operating, ensure that the system is supported by a first-alarm company.

Ventilation

Dependent on the fire location, a combination of horizontal, vertical, and positive pressure ventilation (PPV) may be employed. Recognize that there will be rapid horizontal smoke movement and it is critical to remove these products of combustion rapidly.

A Medical Branch

Due to the potential for numerous injuries, a Medical Branch may be required. In this situation, the use of triage tags will be required.

Simulation 22

Homework Assignment

Supermarket Questions

Directions

1. Read the entire Student Manual (SM) portion on supermarkets the evening before the simulation.

2. Work in the same groups you have been assigned to in the classroom.

3. For each scenario, you may identify up to four problems.

4. For each problem identified, define the tactical solution for that problem and the appropriate Incident Command System (ICS) solution to manage the personnel doing the tactical solution.

Scenario 1

A 125' x 300', one-story supermarket of noncombustible construction is the anchor store of a strip center. It is 1400 hours on a Wednesday. A fire has been started in combustibles on a lower shelf of a grocery aisle by a disgruntled customer. Fire has spread vertically and horizontally in this shelf assembly, with radiant heat igniting combustibles across the aisle. Smoke is spreading through the retail area. There are 50 customers and 15 employees in the structure.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ______________________________

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Problem: ______________________________

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Tactical Solution: ______________________________

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ICS Solution: ______________________________

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What cues led you to this solution? ______________________________

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Problem: ______________________________

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Tactical Solution: ______________________________

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ICS Solution: ______________________________

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What cues led you to this solution? ____

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Scenario 2

A 125- by 300-foot, one-story supermarket of noncombustible construction is the anchor store of a strip center. It is 1200 hours on a Saturday. A coolant line from a compressor to a cooler in the retail area has failed, releasing significant quantities of coolant into the retail area. On arrival, 20 people are outside complaining of respiratory distress. An additional 100 remain inside the store; many are disoriented and unable to leave on their own.

What problems are created, and what tactical and ICS solutions must be applied?

Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ____

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ______________________________

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Problem: ____

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Tactical Solution: ____

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ICS Solution: ____

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What cues led you to this solution? ______________________________

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Simulation 22

Homework Assignment (cont'd)

Refrigeration Coolants

With concerns raised about the depletion of the earth's ozone layer, actions were taken in the late 1980s to ban the use of chlorofluorocarbons (CFCs) as the primary cooling agent in refrigeration systems. This became known in the industry as the Montreal Protocol. In its place are coolants known as HCFCs and HFCs.

HCFCs and HFCs have some of the chlorine atoms replaced with hydrogen. These gases, which have shorter lifespans than the CFCs, are scheduled for phase-out in 2020. These two products and mixtures of both are the current alternative cooling agents being used while research continues on future coolant alternatives.

CFCs used as the primary cooling agent in large refrigeration systems, such as those found in supermarkets, still may be found in use at facilities that have not yet been converted to alternative coolants. CFCs are made up of carbon, chlorine, and fluorine and have been used as coolants for over 40 years. They form a family of chemicals known as halogenated carbon compounds. CFCs present hazards to those who have heart conditions, causing cardiac arrhythmias. There are no serious long-term effects.

Many equate the term "freon" with CFCs. However, Freon® is a trademark used by DuPont for marketing a wide variety of coolants, including CFCs and the current substitutes. Other manufacturers also market the substitute coolant gases.

CFCs were banned due to the destruction of the ozone layer attributed to the accidental and/or intentional release of these products into the atmosphere. They were to be phased out of production by 2000.

A modern supermarket uses 600 to 900 pounds of coolant to operate its freezers, display cases, and walk-in coolers.

Should a catastrophic fracture of a piping system carrying HCFC or HFC occur, the retail area could be flooded with the coolant gas. This coolant (an asphyxiant) will displace the oxygen within that space, possibly creating an oxygen-deficient and/or toxic atmosphere. Since these products contain hydrogen, they present some flammability problems. In addition, when under pressure and released into the atmosphere, oils used within the system can be atomized with the potential of an explosion and/or fire.

Ammonia also is used in large refrigeration systems. It will not be found in the supermarket environment, but will be found at supermarket warehouse operations where large quantities of food products must be kept cold.

A Material Safety Data Sheet (MSDS) follows.

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Simulation 22

Homework Assignment (cont'd)

International Chemical Safety Cards

AMMONIA (ANHYDROUS)	ICSC: 0414

NH_3
Molecular mass: 17.03
(cylinder)

ICSC #	0414
CAS #	7664-41-7
RTECS #	BO0875000
UN #	1005
EC #	007-001-00-5

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIREFIGHTING
FIRE	Flammable.	NO open flames. NO sparks, and NO smoking.	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Gas/Air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting.	In case of fire: keep cylinder cool by spraying with water.
EXPOSURE		AVOID ALL CONTACT!	
INHALATION	Burning sensation. Cough. Labored breathing. Shortness of breath. Sore throat. Symptoms may be delayed (see Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration if indicated. Refer for medical attention.
SKIN	Redness. Skin burns. Pain. Blisters. ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.
EYES	Redness. Pain. Severe deep burns.	Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
INGESTION			

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! Ventilation. NEVER direct water jet on liquid. Remove gas with fine water spray. (Extra personal protection: gas-tight chemical protection suit including self-contained breathing apparatus).	Fireproof. Separated from oxidants, acids, halogens. Cool. Keep in a well-ventilated room.	T symbol N symbol R: 10-23-34-50 S: 1/2-9-16-26-36/37/39-45-61 UN Hazard Class: 2.3 UN Subsidiary Risks: 8

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS, COMPRESSED LIQUEFIED GAS, WITH PUNGENT ODOUR. **PHYSICAL DANGERS:** The gas is lighter than air. **CHEMICAL DANGERS:** Shock-sensitive compounds are formed with mercury, silver, and gold oxides. The substance is a strong base; it reacts violently with acid and is corrosive. Reacts violently with strong oxidants and halogens. Attacks copper, aluminum, zinc, and their alloys. Dissolves in water, evolving heat. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 25 ppm; 17 mg/m^3 (as TWA); 35 ppm; 24 mg/m^3 (as STEL) (ACGIH 1997). MAK: 20 ppm; 14 mg/m^3; (1993) OSHA PEL: TWA 50 ppm (35 mg/m^3) NIOSH REL: TWA 25 ppm (18 mg/m^3) ST 35 ppm (27 mg/m^3) NIOSH IDLH: 300 ppm	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation. **INHALATION RISK:** A harmful concentration of this gas in the air will be reached very quickly on loss of containment. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is corrosive to the eyes, the skin, and the respiratory tract. Inhalation of high concentrations may cause lung edema (see Notes). Rapid evaporation of the liquid may cause frostbite. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling Point: -33 °C Melting Point: -78 °C Relative density (water = 1): 0.7 at -33 °C Solubility in water, g/100 ml at 20 °C: 54	Vapor pressure, kPa at 26 °C: 1013 Relative vapor density (air = 1): 0.59 Autoignition temperature: 651 °C Explosive limits, vol % in air: 15 - 28
ENVIRONMENTAL DATA		The substance is very toxic to aquatic organisms.

NOTES

The symptoms of lung edema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation therefore is essential. Immediate administration of an appropriate spray, by a doctor or a person authorized by him/her, should be considered. Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

Transport Emergency Card: TEC (R)-1
NFPA Code: H3; F1; R0

Simulation 22

Homework Assignment (cont'd)

International Chemical Safety Cards

CHLORODIFLUOROMETHANE	ICSC: 0049

$CHClF_2$
Molecular mass: 86.5

CAS # 75-45-6
RTECS # PA6390000
UN # 1018

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIREFIGHTING
FIRE	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			In case of fire: keep cylinder cool by spraying with water.
EXPOSURE			
INHALATION	Cardiac arrhythmia. Confusion. Drowsiness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
SKIN	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention.
EYES	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
INGESTION		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation.	Fireproof. Cool. Ventilation along the floor.	UN Hazard Class: 2.2 Special insulated cylinder.

<table>
<tr>
<td rowspan="2">IMPORTANT DATA</td>
<td>PHYSICAL STATE; APPEARANCE:
COLOURLESS COMPRESSED LIQUEFIED GAS.

PHYSICAL DANGERS:
The gas is heavier than air and may accumulate in low ceiling spaces causing deficiency of oxygen.

CHEMICAL DANGERS:
On contact with hot surfaces or flames this substance decomposes, forming toxic and corrosive gases (hydrogen chloride (ICSC 0163, phosgene ICSC 0007, hydrogen fluoride ICSC 0283, carbonyl fluoride ICSC 0633). Attacks magnesium and its alloys.</td>
<td>ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation.

INHALATION RISK:
On loss of containment this gas can cause suffocation by lowering the oxygen content of the air in confined areas.

EFFECTS OF SHORT-TERM EXPOSURE:
Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the cardiovascular system and central nervous system, resulting in cardiac disorders and central nervous system depression. Exposure could cause lowering of consciousness. See Notes.</td>
</tr>
<tr>
<td>OCCUPATIONAL EXPOSURE LIMITS:
TLV: 1000 ppm at TWA A4 (ACGIH 2001).
MAK: 500 ppm, 1800 mg/m^3, IV, C (DFG 2001).</td>
<td>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</td>
</tr>
<tr>
<td>PHYSICAL PROPERTIES</td>
<td>Boiling Point: -41 °C
Melting Point: -146 °C
Relative density (water = 1): 1.21
Solubility in water, g/100 ml at 25 °C : 0.3</td>
<td>Vapor pressure, kPa at 20 °C: 908
Relative vapor density (air = 1): 3.0
Autoignition temperature: 632 °C
Octanol/Water partition coefficient as log Pow: 1.08</td>
</tr>
<tr>
<td>ENVIRONMENTAL DATA</td>
<td colspan="2">This substance may be hazardous to the environment; special attention should be given to its impact on the ozone layer.</td>
</tr>
<tr>
<td colspan="3">NOTES</td>
</tr>
<tr>
<td colspan="3">High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death. Check oxygen content before entering area.
The odor warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
Turn leaking cylinder with the leak up to prevent escape of gas in a liquid state.
Freon 22, Frigen 22, Halon 22 are trade names.

Transport Emergency Card: TEC (R)-20G2A</td>
</tr>
</table>

Simulation 22

Homework Assignment (cont'd)

<table>
<tr><th colspan="4">International Chemical Safety Cards</th></tr>
<tr><th colspan="3">DIFLUOROMETHANE</th><th>ICSC: 0049</th></tr>
<tr><td colspan="4">CH_2F_2
Molecular mass:

SYNONYMS: HFC 32, R32, FC 32, Freon 32, Genetron 32, methylene fluoride, methylene difluoride
EC #:</td></tr>
<tr><th>TYPES OF HAZARD/ EXPOSURE</th><th>ACUTE HAZARDS/ SYMPTOMS</th><th>PREVENTION</th><th>FIRST AID/ FIREFIGHTING</th></tr>
<tr><td>FIRE</td><td>Stable. Highly flammable. Incompatible with strong oxidizing agents.</td><td></td><td></td></tr>
<tr><td>EXPLOSION</td><td></td><td></td><td></td></tr>
<tr><td>EXPOSURE</td><td></td><td></td><td></td></tr>
<tr><td>INHALATION</td><td>May be harmful if inhaled. Toxicology not fully investigated.</td><td></td><td></td></tr>
<tr><td>SKIN</td><td></td><td></td><td></td></tr>
<tr><td>EYES</td><td></td><td>Safety glasses. Good ventilation.</td><td></td></tr>
<tr><td>INGESTION</td><td></td><td></td><td></td></tr>
</table>

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS GAS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** **OCCUPATIONAL EXPOSURE LIMITS:**	**ROUTES OF EXPOSURE:** **INHALATION RISK:** **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling Point: -51.6 °C Melting Point: -136 °C Relative density (water = 1): Critical pressure: 58 bar	Vapor pressure, Relative vapor density (air = 1): Autoignition temperature: Critical temperature: 351K
ENVIRONMENTAL DATA		
NOTES		

In Class
Activity 22.1

Incident Command System Organization

Purpose

To develop the skills needed to complete a Strategy Prompter for a supermarket incident.

Directions

1. Your small groups will be shown slides of a supermarket fire.

2. View the corresponding plot plan in your SM.

3. Discuss the strategies that you will need to employ to bring an effective solution to the incident and put them on the Strategy Prompter form.

4. Convert the strategies into an ICS organization on the Strategy Prompter form.

5. You will have 10 minutes to complete this activity.

6. Select one person from your group to report your findings to the class. Reporting out time is 15 minutes total.

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In Class
Activity 22.1 (cont'd)

Scenario Description

Store employees, as part of the morning cleanup, had placed combustibles into the compactor attached to the facility on Side B. They left the compactor door to the store open, intending to load more trash. About an hour later, fire broke out in the compactor and rapidly spread to the storage area, with smoke entering the retail area. Three employees attempted to fight the fire with hand extinguishers and have sustained smoke inhalation and first- and second-degree burns.

Two dozen customers and five additional employees have evacuated, but are showing signs and symptoms of respiratory distress. On arrival of the first engine, the store manager reports that two employees are missing, and he does not know if all the customers got out.

Resources (first alarm)

Engines 1, 2, 3, 4
Truck 2
PM 1
B/C 1
Safety Officer
Haz Mat 9

Resources (second alarm)

Engines 5, 6, 7
Truck 5
B/C 2
D/C 1
PM 2

Resources (third alarm)

Engines 8, 9, 10
Truck 7
Rescue 1
B/C 3
Administrative BC
PM 3

Any other needs must be requested from the dispatch center.

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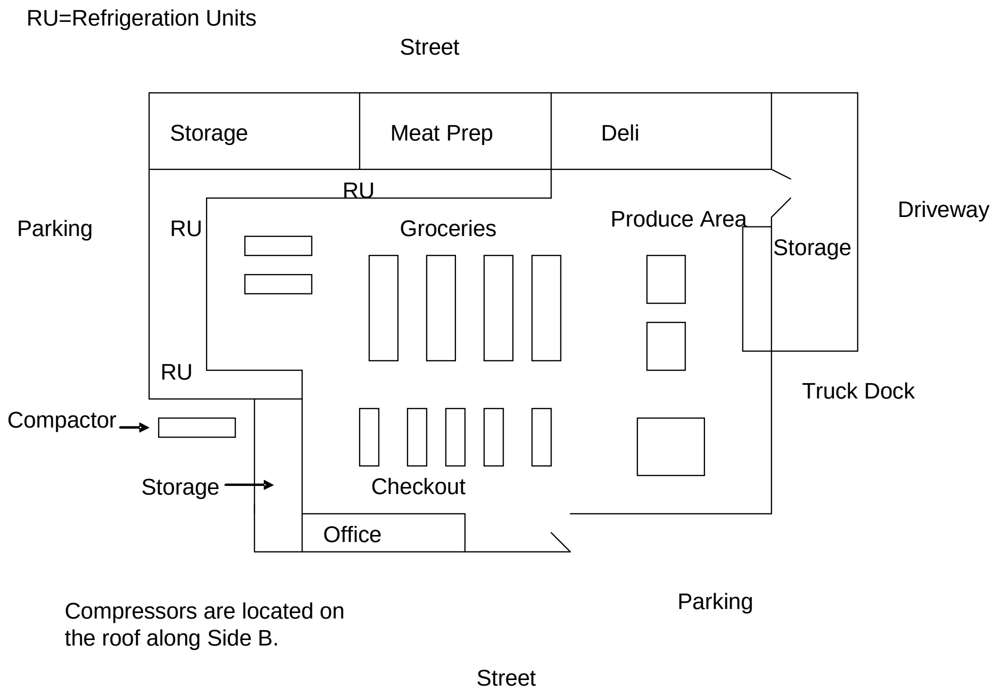
In Class
Activity 22.1 (cont'd)

Plot/Floor Plan



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Simulation 22

SUPERMARKET

Incident Description

This supermarket was built in the 1970s, with a significant renovation and extension in 2003.

It is of noncombustible construction--masonry walls and steel bar-joist floor and roof assemblies. It is fully sprinklered.

Compressors for all refrigeration equipment are located on a mezzanine level accessible from the interior or Side C via metal stairs. The door from the exterior is locked.

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Simulation 22
Quick Access Prefire Plan

Building Address:
Giant Foods, G and 15th Sts., Central City

Building Description:
400' by 150'; noncombustible

Roof Construction:
Steel bar joist with metal decking, insulating board, rubber membrane

Floor Construction:
1st floor--concrete slab; second floor--steel bar joist, poured concrete. (Note: second floor covers an area of 50' by 100' at the center rear of the store.)

Occupancy Type:
Supermarket

Initial Resources Required:
4E, 1 Truck, 1 PM, 1 BC, HM, 1 Safety Officer

Hazards to Personnel:
Early collapse of roof; toxic and flammable products in retail and stock rooms

Location of Water Supply:
Hydrants within 200 feet of Side A entrance, both directions. At Side C near loading dock

Available Flow:
5,000 gpm

	Estimated Fire Flow*			
Level of Involvement	*25%*	*50%*	*75%*	*100%*
Estimated Fire Flow	3,000	7,500	15,000	30,000

**Based on retail area (largest single area) with two exposures (Side B and second floor)*

Fire Behavior Prediction:
Slow vertical and horizontal spread; potential for hidden fire above ceiling.

Predicted Strategies:
Rescue, Ventilation, Confine/Extinguish.

Problems Anticipated:
Lots of shoppers and employees; overnight employees may be locked in.

☐ **Standpipe:** *No*

☒ **Sprinklers:** *Yes*

☒ **Fire Detection:** *Yes*

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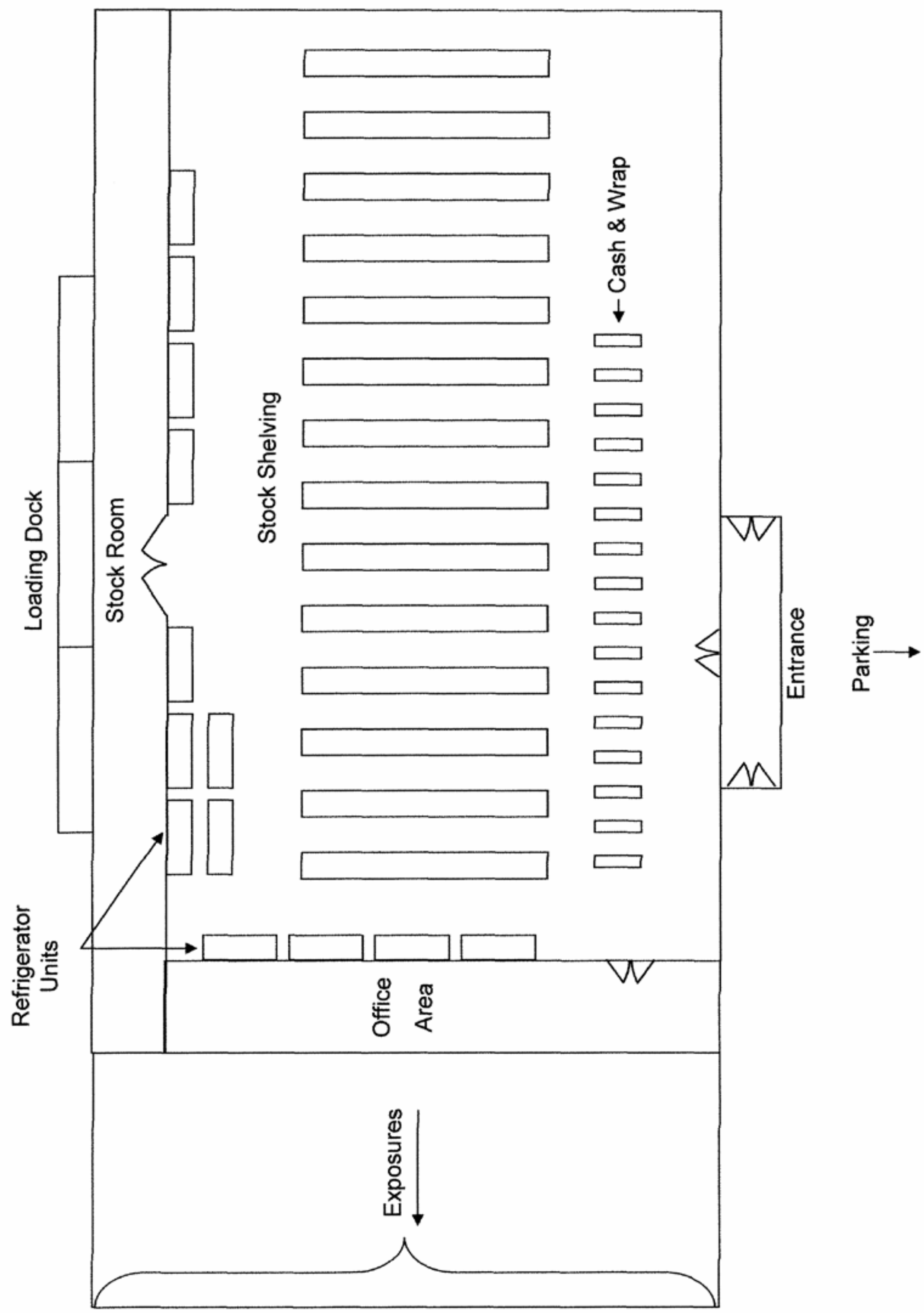
Simulation 22

Supermarket Plot Plan



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