

Arson Detection for the First Responder

ADFR-Instructor Guide

1st Edition, 3rd Printing-February 2006



Homeland
Security

FEMA/USFA/NFA
ADFR-IG
February 2006
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U.S. DEPARTMENT OF HOMELAND SECURITY

PREPAREDNESS DIRECTORATE

UNITED STATES FIRE ADMINISTRATION

NATIONAL FIRE ACADEMY

FOREWORD

The U.S. Fire Administration (USFA), an important component of the Department of Homeland Security (DHS) Preparedness Directorate, 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), National Fire Programs (NFP), and the National Preparedness Network (PREPnet). 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.

The *Arson Detection for the First Responder* two-day training course is designed specifically to provide a clear definition of the role of initial responder organizations and to provide essential knowledge to enable them to recognize the potential of an intentionally set fire, preserve evidence, and properly report the information to appropriate officials.

The training course includes the following basic topics: fire behavior, critical observations of the first responder, fire causes, scene security and evidence preservation, legal considerations, and reporting of findings.

The *Arson Detection for the First Responder* training course is specifically designed for the firefighter who is inexperienced in arson detection and the preservation of evidence at the fire scene. It is **not** designed for the arson-experienced firefighter or inspector.

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INSTRUCTIONAL AIDS

Slides

UNIT 1:	Slides 1-1 to 1-20	20
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Total Slides 348

Videos

- Unit 1: "Intro to NIMS/NRP"
"Dorney Park"
- Unit 2: "Fire Test"
"Backdraft" segment

Handout

- Handout 1-1: NIMS/NRP Video Factsheet

SCHEDULE

UNIT 1: INTRODUCTION	2 hr., 25 min.
UNIT 2: FIRE BEHAVIOR	2 hr.
UNIT 3: FIRST RESPONDER OBSERVATIONS	3 hr.
UNIT 4: FIRE CAUSES	3 hr., 30 min.
UNIT 5: SCENE SECURITY AND PRESERVATION OF EVIDENCE	1 hr., 30 min.
UNIT 6: LEGAL CONSIDERATIONS	45 min.
UNIT 7: REPORTING OF FINDINGS	20 min.
Total Time:	13 hr., 30 min.

END-OF-COURSE EXAMINATION

Note to Instructor and Students: There are 12 questions in this examination, with a total of 25 responses possible in the questions. Each response has a value of four points. The student must achieve a grade of 72 percent or select 18 correct responses to complete the training course successfully and receive a National Fire Academy certificate of training.

1. What is the primary role of the first responder at a fire which may be of suspicious origin?

2. When a fire occurs, the many social and economic costs to the community are devastating. List **two** important costs to the community.
 - a.
 - b.

3. List **two** safety issues which the first-in officer must consider before assigning tasks at a structure fire.
 - a.
 - b.

4. Which one of the following elements is not part of the fire tetrahedron?
 - a. sufficient heat to vaporize and ignite material
 - b. vapor density
 - c. fuel
 - d. oxygen
 - e. uninhibited chain reaction

5. What are the **three** methods of heat transfer?
 - a. convection
 - b. radiation
 - c. backdraft
 - d. conduction
 - e. heat transfer

6. At a fire in a structure, you observe flames in the basement and on the third floor, with no flames in between. What kind of building construction is indicated?
 - a. ordinary
 - b. fire resistive
 - c. balloon
 - d. heavy timber
 - e. noncombustible

ARSON DETECTION FOR THE FIRST RESPONDER

7. The first responder is responsible for critical observations during **five** phases of fire scene operations. List all five.
- a.
 - b.
 - c.
 - d.
 - e.
8. Improving observations of the crowd during sizeup may provide important information about arson fires. List **two** characteristics of individuals gathered at a fire which may indicate arson.
- a.
 - b.
9. During fire suppression activities, the first responder may note indicators of a possible arson incident. List **three** indicators.
- a.
 - b.
 - c.
10. A _____ is a combustible or flammable material used to spread fire from one area to another.
11. It is imperative to control access to a fire scene prior to release. Only **three** groups of persons should have access. Which of the three groups listed below should be allowed on the actual fire scene?
- a. evidence technicians
 - b. tenants
 - c. reporters
 - d. firefighters
 - e. fire investigators
 - f. neighbors and friends who want to save valuables
12. What is the only situation when a first responder may remove evidence from a fire scene before an investigator secures it?

ANSWER KEY

1. What is the primary role of the first responder at a fire which may be of suspicious origin?
Observe and note conditions which indicate origin and cause of fire.
2. When a fire occurs, the many social and economic costs to the community are devastating. List **two** important costs to the community.
 - a. **Loss of tax base**
 - b. **Loss of jobs**
 - c. **Injuries and deaths of civilians**
 - d. **Injuries and deaths to firefighters**
3. List **two** safety issues which the first-in officer must consider before assigning tasks at a structure fire.
 - a. **Load-bearing capacity of floors**
 - b. **Stability of load-bearing walls**
 - c. **Stability of load-bearing roof and ceilings**
4. Which one of the following elements is not part of the fire tetrahedron?
 - a. sufficient heat to vaporize and ignite material
 - b. **vapor density**
 - c. fuel
 - d. oxygen
 - e. uninhibited chain reaction
5. What are the **three** methods of heat transfer?
 - a. **convection**
 - b. **radiation**
 - c. backdraft
 - d. **conduction**
 - e. heat transfer
6. At a fire in a structure, you observe flames in the basement and on the third floor, with no flames in between. What kind of building construction is indicated?
 - a. ordinary
 - b. fire resistive
 - c. **balloon**
 - d. heavy timber
 - e. noncombustible

7. The first responder is responsible for critical observations during **five** phases of fire scene operations. List all five.
- a. **At the initial call**
 - b. **On route to fire scene**
 - c. **Upon arrival**
 - d. **During fire suppression**
 - e. **During overhaul**
8. Improving observations of the crowd during sizeup may provide important information about arson fires. List **two** characteristics of individuals gathered at a fire which may indicate arson.
- a. **Spectator(s) observed at earlier fires**
 - b. **Odors or charring on clothing**
 - c. **Person(s) too eager to help**
 - d. **Manner of dress inappropriate for emergency situation**
9. During fire suppression activities, the first responder may note indicators of a possible arson incident. List **three** indicators.
- a. **Blocked doors and passageways**
 - b. **Obstructions to hydrants and standpipe connections**
 - c. **Closed Post Indicator valves (PIVs)**
 - d. **Inoperative alarm bells**
 - e. **Holes in doors**
10. A **trailer** is a combustible or flammable material used to spread fire from one area to another.
11. It is imperative to control access to a fire scene prior to release. Only **three** groups of persons should have access. Which of the three groups listed below should be allowed on the actual fire scene?
- a. **evidence technicians**
 - b. tenants
 - c. reporters
 - d. **firefighters**
 - e. **fire investigators**
 - f. neighbors and friends who want to save valuables
12. What is the only situation when a first responder may remove evidence from a fire scene before an investigator secures it?

When there is immediate danger of evidence being destroyed by fire.

UNIT 1: INTRODUCTION

COURSE OBJECTIVES

The students will be able to:

- 1. Recognize as first responders the indicators of an intentionally set fire, preserve evidence, and report the information to the appropriate official.*
- 2. Define clearly the role of the first responder, and understand that the first responder's role is not to determine the origin or cause of the fire, and that he/she is not responsible as an investigator.*

UNIT OBJECTIVE

Students will understand the direct and indirect impact of the crime of arson.

INTRODUCTION

POINTS FOR THE INSTRUCTOR

This unit sets the atmosphere for the rest of the course. Time has been allotted so that the instructor can review the course content and requirements effectively, and at the same time try to establish a professional rapport with the class to ensure student participation in discussions throughout the course. This unit and course focuses on developing first responders' observations and their abilities to recall specific details so that a complete investigation can follow.

METHODOLOGY

This unit uses lecture, discussion, video, and an individual/small group activity.

(Total Time: 2 hr., 25 min.)

	Lecture/Discussion/Video
I. OBJECTIVES.....	3
II. INTRODUCTIONS.....	4
III. COURSE PROCEDURES.....	5
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V. SOCIAL COST OF FIRE.....	17
VI. FIREFIGHTER SAFETY.....	18
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AUDIOVISUAL

Slides 1-1 to 1-20
Videos: "Intro to NIMS/NRP"
"Dorney Park"

HANDOUT

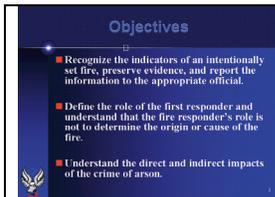
Handout 1-1: NIMS/NRP Video Factsheet



Slide 1-1 Arson Detection for the First Responder

Lecture/Discussion
Video

I. OBJECTIVES



Slide 1-2 Course Objectives

A. Course Objectives.

The students will be able to:

1. Recognize as first responders the indicators of an intentionally set fire, preserve evidence, and report the information to the appropriate official.
2. Define clearly the role of the first responder and understand that the first responder's role is not to determine the origin or cause of the fire, and that he/she is not responsible as an investigator.

B. Unit Objective.

Students will understand the direct and indirect impact of the crime of arson.

II. INTRODUCTIONS



Slide 1-3 Introductions

A. Instructors.

Have instructors introduce themselves, giving brief summaries of their related experience, education and training, and length of time teaching at the National Fire Academy, specifically teaching this course.

B. Host.

The lead instructor introduces host officials or department personnel as necessary.



Slide 1-4 Student Introductions

C. Students.

Ask the students to identify themselves briefly by name, rank, and department.

INTRODUCTION



Slide 1-5 Administrative

D. Administrative.

Handle any administrative information with class, and fill out all paperwork.



Slide 1-6 Course Requirements

III. COURSE PROCEDURES

A. Daily schedule.

1. Class begins at 8:00 a.m. and ends at 5:00 p.m. the first day. Class begins at 8:00 a.m. and ends at 2:00 p.m. the second day.

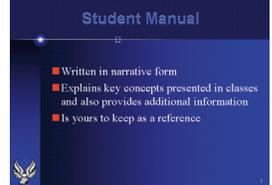
This class starting time may vary with each class delivery; however, the course will require 14 hours for delivery.

2. Breaks.

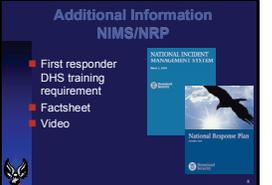
- a. One midmorning and one midafternoon.
- b. The lunch break.

INTRODUCTION

- c. No evening class.
 3. Exits (explain where the exits are).
 4. Restrooms (explain where the restrooms are).
- B. Successful course completion.
 1. Attendance at all classes is required to complete the course successfully and to receive a certificate of completion.

 <p>Student Manual</p> <ul style="list-style-type: none">■ Written in narrative form■ Explains key concepts presented in classes and also provides additional information■ Is yours to keep as a reference	<p>Slide 1-7 Student Manual</p>
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2. The Student Manual is a textbook that explains the key concepts presented in the class and provides additional information.
 - a. The Student Manual is intended to be read outside of class and can be used as a reference book after the course is over. There are additional reading materials in the bibliography for further studies.
 - b. The students should follow along in the Student Manual, highlighting the content.

 <p>Additional Information NIMS/NRP</p> <ul style="list-style-type: none">■ First responder DHS training requirement■ Factsheet■ Video	<p>Slide 1-8 Additional Information</p>
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C. NIMS/NRP Factsheet.

Handout 1-1

IG p. 1-27

Video

Review the factsheet with the students. Discussion of this material should be limited to the strategic level.

This video factsheet and the accompanying video meet the intent of the Department of Homeland Security (DHS) to place National Incident Management System (NIMS) and the National Response Plan (NRP) instructional/informational material in each DHS course offering. Distribute Handout 1-1. Additional information has been provided in the Appendix of this unit.

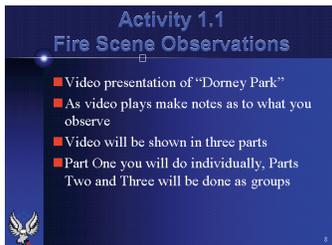
Show the 10-minute video "Intro to NIMS/NRP." Answer any questions raised by the students after viewing the video.

Be alert for opportunities to integrate NIMS and NRP concepts as appropriate, into subsequent class discussion and activities.

Upon conclusion of the administrative paperwork and introductions, introduce Individual Activity 1.1. Turn off the slide projector while the student activity is underway.

45 min.
Individual/
Small Group
Activity 1.1

Slide 1-9



Activity 1.1

Fire Scene Observations

Purpose

To introduce the students to the course.

This fire occurred at the Dorney Park amusement park in Allentown, Pennsylvania. The fire occurred just before opening for the day; it was accidental and started in the kitchen area of the Mexican food stand.

You will need the following materials:

- A copy of the video, "Dorney Park."
- A Student Manual for each student.

The entire activity should take about 45 minutes.

Directions to Students

1. Ask the students to turn to Activity 1.1 in their Student Manuals.
2. Show students the video, pausing each time as indicated on the tape to allow for individual or small group work.

SM p. 1-9

Video

3. At the first pause in the video, have students work alone to complete Task I of the activity.
4. After no more than 5 minutes on Task I, stop and ask some of the students to volunteer their answers. When you feel that you have received a satisfactory sampling of answers, continue playing the tape to the second pause.
5. At the second pause in the video, the students work in small groups to complete Task II of the activity.
6. After no more than 5 minutes on Task II, stop and ask the groups to provide their answers. Suggested responses are provided on the following Student Activity Worksheet.
7. After students have viewed the whole video, have them complete Task III. Suggested responses are provided on the Student Activity Worksheet.

IG p. 1-11

IG p. 1-11

Summary

Summarize the answers, linking them together and tying everything to the course objective and the observations of the first responder, from the time the alarm was received to the reporting (oral/written) of the incident to the Incident Commander/Supervisor or to the investigator.

STUDENT ACTIVITY WORKSHEET

Activity 1.1

Fire Scene Observations

Purpose

To introduce you to the course.

Directions

1. Watch the 4-minute video.
2. There are three stopping points within the video. The video will pause for 5 minutes at each of the breaks.
3. What are some of the things you would notice or observe as the first responder arriving at the scene of the fire?

Task I

Working independently, make a list of some of your observations.

Suggested responses:

1. *Large amounts of black smoke.*
2. *Volunteer fire department siren alerting volunteers.*
3. *Firefighter directing traffic.*
4. *Some type of trucks.*
5. *Large volume of fire in the center of picture.*
6. *Camper vehicle leaving the area.*
7. *Parking lot not full.*
8. *People/Tourist/Employees standing around, don't appear excited.*
9. *Engine pumping and large volume of fire behind building on the street.*

STUDENT ACTIVITY WORKSHEET

Task II

Working in small groups, make a list of some of your observations.

Suggested responses:

1. *People pulling hose.*
2. *Men working to help or giving some type of direction.*
3. *Fire extending to waffle shop.*
4. *Building heavily involved (carousel).*
5. *Carousel horse on ground.*
6. *Roof of ice cream shop burning.*
7. *Novelty shop burning.*
8. *Employees moving stock.*

Task III

Working in small groups, make a list of some of your observations.

Suggested responses:

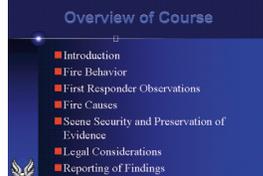
1. *Heavy involvement of carousel.*
2. *Employee giving statement to news media.*
 - a. *Fire started near merry-go-round.*
 - b. *Mexican food stand.*
 - c. *Call fire department.*
 - d. *Arrived in three to four minutes.*
 - e. *Man with walkie-talkie behind employee.*
 - f. *When fire department arrived, roof of carousel was on fire.*
 - g. *High winds spread fire (probably created by fire).*

STUDENT ACTIVITY WORKSHEET

- h. List of businesses burning or damaged.*
 - *Skeet ball alley.*
 - *Fish and chips stand.*
 - *Combustible parts of ride (tracks).*
 - *Ice cream stand.*
 - *Carousel.*
- i. Park almost 100 years old (old wood).*
- j. Carousel constructed in 1913.*

Lecture

IV. OVERVIEW OF COURSE

 <p>Overview of Course</p> <ul style="list-style-type: none">IntroductionFire BehaviorFirst Responder ObservationsFire CausesScene Security and Preservation of EvidenceLegal ConsiderationsReporting of Findings	<p>Slide 1-10 Course Overview</p>
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A. Introduction.

1. Fire behavior.
2. Critical observations of the first responder.
3. Fire causes.
4. Scene security and evidence preservation.
5. Legal considerations.
6. Reporting of findings.

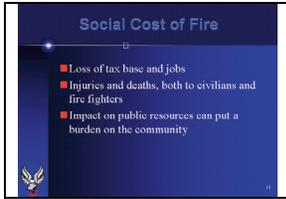
B. Fire Behavior.

1. Definitions of fire heat transfer.
2. The fire triangle and the fire tetrahedron.
3. Fuel loading and first ignition.
4. Building construction types.
5. Normal fire development.
 - a. Flashover.
 - b. Backdraft.

C. First Responder Observations.

1. Initial call.
2. En route to scene.

3. Arrival at scene.
 4. During fire suppression.
 5. Postfire suppression.
- D. Fire Causes.
1. Accidental.
 2. Incendiary structure fire.
 3. Incendiary vehicle fire.
- E. Scene Security and Preservation of Evidence.
1. Scene security techniques.
 2. Notification of findings.
 3. Evidence preservation.
 4. Chain of custody.
- F. Legal Considerations.
1. *Michigan v. Tyler* (legal right to enter scene).
 2. Fourth Amendment (legal right to collect evidence).
 3. Court demeanor.
- G. Reporting of Findings.
1. Scene report to supervisor.
 2. Oral and written notes of findings.
 3. Personal notes and drawings.

	Slide 1-11 Social Cost of Fire
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V. SOCIAL COST OF FIRE

- A. Social and economic cost to communities.
 - 1. Loss of tax base and jobs.
 - 2. Injuries and deaths, both to civilians and firefighters.
 - 3. The impact on public resources can put a burden on the community.

	Slide 1-12 Responses
--	----------------------

- B. Responses.
 - 1. A fire every 18 seconds.
 - 2. A structural fire every 62 seconds.
 - 3. A residential structure fire every 83 seconds.
 - 4. A vehicle fire every 90 seconds.
- C. Total fire calls for 2000 (*NFPA Journal*):
1,708,000

INTRODUCTION



Slide 1-13 Total fire calls for 2000

- D. Estimates of 2000 civilian deaths and injuries.
 - 1. Civilian deaths: 4,045.
 - 2. Number of civilian injuries: 22,350.
- E. Incendiary and suspicious fires.
 - 1. Incendiary fires: 45,500.
 - 2. Total Property loss: \$11,207,000,000.
 - 3. Loss from incendiary and suspicious fires: 792,000,000.
- F. Firefighter injuries and deaths.
 - 1. Firefighter deaths: 12.

VI. FIREFIGHTER SAFETY

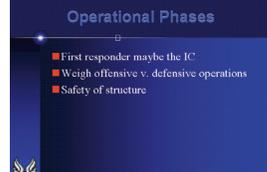
Emphasize firefighter safety during overhaul. The Incident Commander is responsible for the safety of all personnel. However, the first responder may be the Incident Commander, who must continually assess the risk and the potential benefit from the assigned tactical operation.



Slide 1-14 Firefighter safety

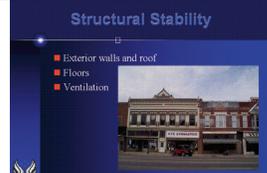
INTRODUCTION

A. Scene safety during operational phases.

 <p>Operational Phases</p> <ul style="list-style-type: none">First responder may be the ICWeigh offensive v. defensive operationsSafety of structure	Slide 1-15 Scene safety during operational phases
---	---

1. The first responder may be the Incident Commander.
2. Weigh offensive versus defensive operations.
3. Decide when roof operations are unsafe.

B. Other safety considerations.

 <p>Structural Stability</p> <ul style="list-style-type: none">Exterior walls and roofFloorsVentilation	Slide 1-16 Structural Stability
---	---------------------------------

1. Are the floors safe to work on?
 - a. How much burning of supports took place?
 - b. What is the floor load?
 - Heavy loads.
 - Water or water-soaked contents.
 - Extra loads from other portions being burned away.
 - c. Possibility of impact loads from items falling on weakened parts.
2. Are the walls safe to work near?

- a. Stability of bearing walls.
 - Deterioration of bearing walls may have shifted weight to nonbearing walls.
 - b. Have the lintels over doors and windows become weakened?
 - Loads above may not have support.
 - Large spans over picture windows and French doors are easily stressed.
3. Have the roof support members been compromised?
- a. Lightweight trusses and wooden I-beam elements are most vulnerable.

With the types of roof trusses commonly used today in many structures, explain how the perforated gusset plate holds the pieces of studding together in a rather flimsy manner. Under intense heat, these plates offer little support.

- b. Has the roof been burned through?
 - c. Was the roof opened for ventilation during the fire?
 - Were structural members cut or severed?
 - Was heavy roofing material (tile) stacked in one area, increasing the roof load?
4. Is the roof secure and still able to support heavy equipment?
- a. Heating and air conditioning units.

- b. Refrigeration units.
- c. Water storage tanks.
- 5. Basements.
 - a. Is there water in the basement?
 - b. Can it be pumped out?
 - c. Is there unstable stock or equipment?
 - Wet and unstable cardboard boxes.
 - Unbalanced shelving.
- C. Have the utilities been turned off or secured?

	Slide 1-17 Utilities
--	----------------------

- 1. Electricity.
 - a. Service terminated?
 - b. Small fire: Have branch circuits for the fire area been terminated?

Firefighters never should remove electrical meters or cut conductors leading to the building/house. Have electric company remove electrical meter and cut conductors at the pole.

- c. Watch for downed or hanging conductors.

2. Natural, propane, or butane gas.
 - a. Service terminated.
 - b. Tanks shut off.

Remind the students that it is the fire department's responsibility to shut off the utilities to make firefighting operations safe. It is not the department's responsibility to restore the utility service to normal operations after overhaul is completed.

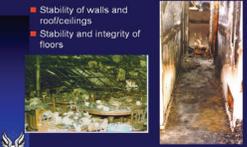
D. Fuel oil tanks.

1. Supply from aboveground oil tanks may need to be shut off.
 - a. Fuel may have damaged the fuel oil line or the appliance.
 - b. Oil may leak into the structure.
 - c. Most tanks are equipped with a shutoff valve at the lowest point, usually at the oil filler.
2. Underground tanks.
 - a. Usually do not have an accessible shutoff valve.
 - b. Valve may be located at the appliance.
 - c. Valve may be located near outside wall adjacent to a fuel filler.
 - d. If no shutoff valve is found, it is possible to squeeze, crimp, or bend the line to shut off the flow.

INTRODUCTION

- e. If fuel is spilled, use absorbent material or pad to pick up the oil.
 - Service terminated (locked out)?
 - Has tank valve been turned off?

E. Inside the fire building.

 <p>Interior Issues</p> <ul style="list-style-type: none">■ Stability of walls and roof/ceilings■ Stability and integrity of floors	Slide 1-18 Interior Issues
---	----------------------------

1. Burnt-out floor.
2. Holes that have been cut in floor.
3. Water-soaked ceilings that could collapse.
4. Contents being affected by the fire suppression activities.

 <p>Protective Clothing</p> <ul style="list-style-type: none">■ Full protective clothing■ SCBA	Slide 1-19 Protective Clothing
--	--------------------------------

- ### F. Protective clothing.
1. Full protective clothing.
 2. SCBA.

Full protective clothing is essential to prevent the firefighter from becoming one of the fire statistics.

 A small thumbnail of a presentation slide titled "Summary". It contains two bullet points: "First responder has simple but important responsibilities after suppression efforts end and overhaul and salvage operations begin." and "First responder plays an important part in assisting the fire investigator." There is a small logo in the bottom left corner of the slide. <p>Summary</p> <ul style="list-style-type: none">■ First responder has simple but important responsibilities after suppression efforts end and overhaul and salvage operations begin.■ First responder plays an important part in assisting the fire investigator.	<p>Slide 1-20 Summary</p>
---	---------------------------

VII. SUMMARY

- A. The first responder has simple but important responsibilities after suppression efforts end and overhaul and salvage operations begin.
 - 1. Determine the stability of the structure to ensure the safety of personnel.
 - 2. Establish control of the premises and ensure that all unauthorized persons are barred from the structure, and that authorized persons are escorted into the structure.

- B. The first responder owes it to the fire investigator to give him/her all possible help.
 - 1. Detailed observations which have been noted from the time of arrival.
 - 2. Physical evidence that has been noted--oral and/or written reports.
 - 3. In order to have a smooth investigation, the first responder must work with the investigator, not hinder him/her.

BIBLIOGRAPHY

The following is a list of materials that may assist you in furthering your knowledge of arson detection.

FEMA-FA-87, *Rural Arson Control*.

Fire Fighter's Responsibility in Arson Detection, NFPA.

Fire Protection In The Wildland/Urban Interface. Publication of the National Wildland/Urban Interface Fire Protection Program.

Fire Storm '91, Case Study, NFPA.

Oakland/Berkeley Hills Fire, NFPA.

APPENDIX

THE NIMS AND NRP

National Incident Management System/National Response Plan

Instructor Guide Background Synopsis

Homeland Security Presidential Directive 5

To prevent, prepare for, respond to, and recover from terrorist attacks, major disasters, and other emergencies, the United States Government shall establish a single, comprehensive approach to domestic incident management. The objective of the United States Government is to ensure that all levels of government across the Nation have the capability to work efficiently and effectively together, using a national approach to domestic incident management.

What is the National Incident Management System, or NIMS?

The NIMS is a

- core set of:
 - doctrine,
 - concepts,
 - principles,
 - terminology, and
 - organizational processes; and is
- applicable to all hazards.

The NIMS is **not**

- an operational incident management plan;
- a resource allocation plan;
- a terrorism/weapons of mass destruction (WMD)-specific plan; and
- designed to address international events.

The NIMS has Six Components

1. Command and Management.
2. Preparedness.
3. Resource Management.
4. Communications and Information Management.
5. Support Technologies.
6. Ongoing Management and Maintenance.

1. **Command and Management.** The NIMS standardizes incident management for all hazards and across all levels of government. The NIMS-standard incident command structures are based on three key constructs:

- Incident Command System;
- Multiagency Coordination Systems; and
- Public Information Systems.

INTRODUCTION

2. **Preparedness.** The NIMS establishes specific measures and capabilities that jurisdictions and agencies should develop and incorporate into an overall system to enhance operational preparedness for incident management on a steady-state basis in an all-hazards context.

The operational preparedness of our Nation's incident management capabilities is distinct from the preparedness of the individual citizens and private industry.

3. **Resource Management.** The NIMS defines standardized mechanisms to describe, inventory, track, and dispatch resources before, during, and after an incident; it also defines standard procedures to recover equipment once it is no longer needed for an incident.
4. **Communications and Information Management.** Effective communications, information management, and information and intelligence sharing are critical aspects of domestic incident management. The NIMS communications and information systems enable the essential functions needed to provide a common operating picture and interoperability for incident management at all levels.
5. **Supporting Technologies.** The NIMS promotes national standards and interoperability for supporting technologies to successfully implement the NIMS, as well as standard technologies for specific professional disciplines or incident types. It provides an architecture for science and technology support to incident management.
6. **Ongoing Management and Maintenance.** The Department of Homeland Security (DHS) has established a multijurisdictional, multidisciplinary NIMS Integration Center. This Center provides strategic direction for, and oversight of, the NIMS, supporting both routine maintenance and the continuous improvement of the system over the long term.

The NIMS Integration Center facilitates the development and promulgation of standards addressing components of the NIMS.

All users and stakeholders--including various levels of government, functional disciplines, and private entities--will be given the opportunity to participate in the NIMS Integration Center activities.

NIMS Timelines and Compliance Requirement

March 1, 2004--DHS Secretary Ridge announced the NIMS.

By October 1, 2004--the NIMS Integration Center will begin publishing standards, guidelines, and compliance protocols. Other components require additional development and refinement to enable future compliance (e.g., data and communications system interoperability).

By October 1, 2006--State and local organizations must adopt the NIMS to receive Federal preparedness assistance (through grants, contracts, and other activities). Specifically, during FY 2006, State, local, and Tribal organizations must

- incorporate NIMS into existing training programs and exercises;
- ensure that Federal preparedness funding (including DHS Homeland Security Grant Program, Urban Area Security Initiative (UASI) funds) support NIMS implementation at the State and local levels (in accordance with the eligibility and allowable uses of the grants);
- incorporate NIMS into Emergency Operations Plans (EOP);
- promote the development or updating of mutual-aid agreements; and

- institutionalize the use of the Incident Command System (ICS) by all agencies, particularly those that may be involved in the response to and/or management of any type of emergency incident, regardless of size, type, or complexity.

Impact of the NIMS on Local Agencies

The NIMS recognizes the National Wildfire Coordinating Group (NWCG) ICS training as a model for course curricula and materials applicable to the NIMS:

- ICS-100, Introduction to ICS;
- ICS-200, Basic ICS;
- ICS-200, Intermediate ICS; and
- ICS-400 Advanced ICS.

The U.S. Fire Administration's (USFA's) National Fire Academy (NFA), and Emergency Management Institute (EMI) both follow this model in their ICS training curricula. At the local level, agencies may contact the local emergency management office or the fire department for information and training on ICS.

There are two minor differences between the NIMS ICS and the FIRESCOPE or NFA Model ICS:

1. Under NIMS, the "intelligence and information function" may be organized in one of the following ways:
 - Officer within the Command Staff;
 - Unit within the Planning Section;
 - Branch within the Operations Section; or
 - Separate General Staff Section.
2. Under NIMS, the Command Staff position previously known as "Information Officer" will be known as "Public Information Officer."

Emergency response personnel and others involved in incident management will be required to comply with national qualification and certification standards. The NIMS Integration Center facilitates the development of these national qualification and certification standards.

Personnel that are certified for employment in support of an incident that transcends interstate jurisdictions will be required to meet national qualification and certification standards.

Mutual-aid agreements provide the means for one jurisdiction to provide resources, facilities, services, and other required support to another jurisdiction during an incident. Each jurisdiction should be party to a mutual-aid agreement with all neighboring or nearby jurisdictions, as well as relevant private sector and nongovernmental organizations. The NIMS Integration Center will facilitate the development of State and local mutual-aid agreements.

The full NIMS document is available for download from <http://www.fema.gov/nim/>

Additional information on the NIMS:

www.dhs.gov
www.fema.gov
www.usfa.fema.gov
State fire training agencies
State emergency management agencies
State emergency medical service agencies

THE NATIONAL RESPONSE PLAN

Instructor Guide Background Synopsis

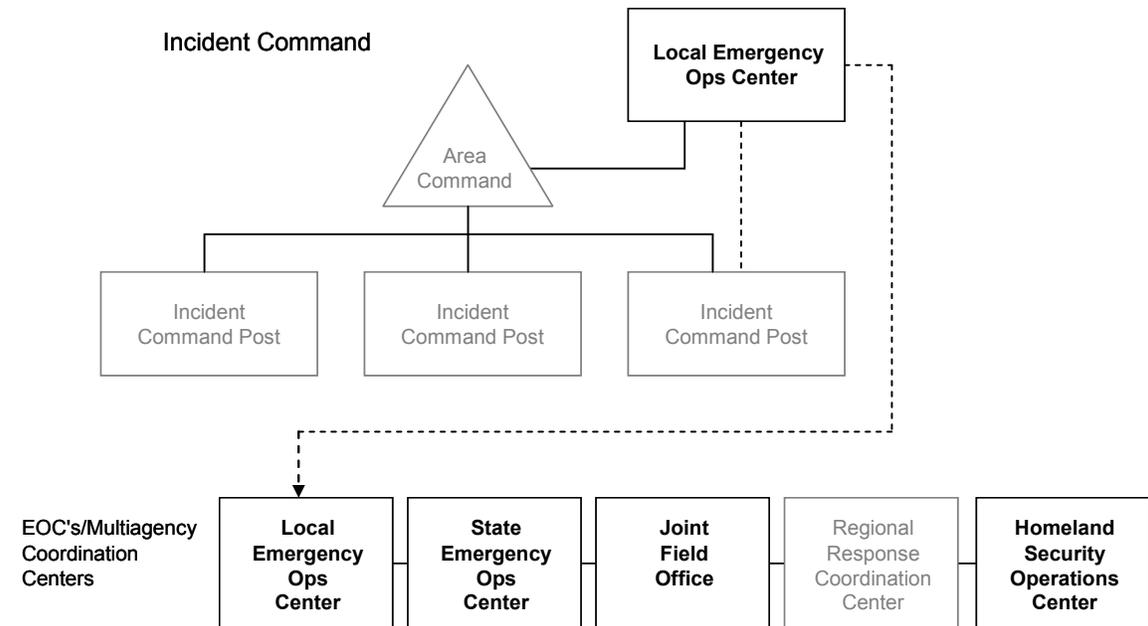
What is the National Response Plan?

A plan that consolidates individual Federal agency response plans into a single, comprehensive approach to the management of Federal resources and coordination of Federal agencies in response to a disaster, using the concepts of the National Incident Management System (NIMS).

The National Response Plan

- Activated upon actual or likely Federal declaration of disaster.
- Coordinates incident-related information with State Emergency Operations Centers (EOC's) through a "Regional Response Coordination Center."
- At incidents, all Federal agencies will be coordinated through a "Joint Field Office" (JFO), under the direction of a Federal Coordinating Officer or "Principal Federal Official." The JFO will include
 - Joint Operations Center,
 - Joint Information Center, and
 - Other Federal agency onsite command/coordination centers.

Structure for Federal NRP Operations



Additional information about the NRP:

www.dhs.gov
www.fema.gov

UNIT 2: FIRE BEHAVIOR

OBJECTIVES

The students will able to:

- 1. Define fire.*
 - 2. List and describe three methods of heat energy transfer.*
 - 3. Define flameover/rollover, flashover, and backdraft.*
 - 4. Classify the elements of the fire triangle and tetrahedron.*
 - 5. Identify basic building construction.*
-

POINTS FOR THE INSTRUCTOR

The intent of this unit is to provide a review of some basic principles that affect fire origin and spread. Because these principles have a bearing on making an origin determination, this material should have been covered in the basic firefighter essential courses that the students have taken previously. In this unit, encourage the students to participate, as many of them have had basic instruction, rather than use continuous lecture.

METHODOLOGY

This unit uses lecture with discussion, video, and questions.

(Total Time: 2 hr.)

120 min. Lecture/Discussion

I.	OBJECTIVES.....	IG 2-3
II.	INTRODUCTION	IG 2-4
III.	BASIC FIRE CONCEPTS.....	IG 2-4
IV.	FLASHPOINT.....	IG 2-7
V.	FLAMMABLE AND COMBUSTIBLE LIQUIDS.....	IG 2-8
VI.	IGNITION TEMPERATURE.....	IG 2-9
VII.	FLAMMABLE OR EXPLOSIVE LIMITS.....	IG 2-9
VIII.	SPECIFIC GRAVITY.....	IG 2-11
IX.	VAPOR DENSITY.....	IG 2-11
X.	SOLUBILITY.....	IG 2-12
XI.	RATE OF HEAT RELEASE (RHR).....	IG 2-12
XII.	REACTION OF FIRE TO WATER APPLICATION.....	IG 2-14
XIII.	HEAT TRANSFER AND TEMPERATURE FACTORS.....	IG 2-14
XIV.	FLASHOVER.....	IG 2-16
XV.	BACKDRAFT.....	IG 2-19
XVI.	CLASSES OF FIRE.....	IG 2-22
XVII.	NORMAL FIRE BEHAVIOR.....	IG 2-23
XVIII.	BUILDING CONSTRUCTION AND FIRE SPREAD.....	IG 2-26
XIX.	SUMMARY.....	IG 2-46
	BIBLIOGRAPHY.....	IG 2-48

AUDIOVISUAL

Slides 2-1 to 2-121
Videos: "Fire Test"
"Backdraft"

 A thumbnail for slide 2-1 titled "Unit 2 - Fire Behavior". It features a dark background with a glowing orange and yellow flame-like shape on the right side.	Slide 2-1 Fire Behavior
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Read the unit objectives with the class and emphasize the importance of the unit. This unit reviews the basic principles that affect fire origin and spread.

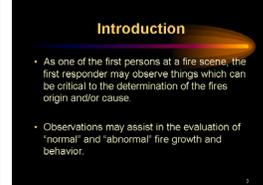
 A thumbnail for slide 2-2 titled "Objectives". It features a dark background with a glowing orange and yellow flame-like shape on the right side. Below the title is a bulleted list of objectives.	Slide 2-2 Objectives
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120 min.
Lecture/
Discussion

I. OBJECTIVES

The students will be able to:

- A. Define fire.
- B. List and describe three methods of heat energy transfer.
- C. Define flameover/rollover, flashover, and backdraft.
- D. Classify the elements of the fire triangle and tetrahedron.
- E. Identify basic building construction.

 <p>Introduction</p> <ul style="list-style-type: none">• As one of the first persons at a fire scene, the first responder may observe things which can be critical to the determination of the fire's origin and/or cause.• Observations may assist in the evaluation of "normal" and "abnormal" fire growth and behavior.	<p>Slide 2-3 Introduction</p>
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II. INTRODUCTION

This unit reinforces the basic concepts that first responders learned in previous firefighter essential courses. These basic principles are now applied to the first responder in his/her observations of the fire incident. As one of the first persons at the fire scene, the first responder may see things that are critical to determining the area of fire origin. A careful observation will help discriminate between normal and abnormal fire growth and behavior.

It is important that the first responder have an understanding of normal/abnormal fire behavior and travel as it relates to incendiary fires. Without a basic understanding of the various types of building construction, the first responder will not be able to recognize and respond to what appears to be a normal fire travel when in reality the fire may be abnormal. Example: Open shafts concealed in a wall.

III. BASIC FIRE CONCEPTS

 <p>Basic Fire Concepts</p>	<p>Slide 2-4 Basic Fire Concepts</p>
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- A. Definition of fire.
 - 1. Fire is a self-sustaining rapid oxidation process usually accompanied by the evolution of heat and light.



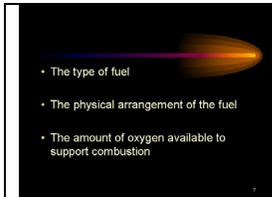
Slide 2-5 Definition of Fire

2. Produces products of combustion (toxic gases).



Slide 2-6 Amount of heat, color of flames and toxicity of products of combustion depend upon...

3. The amount of heat, the color of the flames, and the toxicity of the products of combustion depend upon three factors.



Slide 2-7 Type of fuel, physical arrangement, oxygen availability

- a. The type of fuel.
- b. The physical arrangement of the fuel.
- c. The oxygen available to support combustion.

B. Principles of combustion.

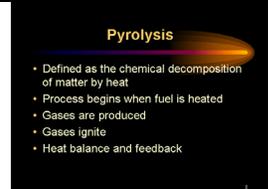
1. Elements of the fire triangle.
 - a. Sufficient heat to vaporize the material and ignite the vapor.
 - b. Fuels must be heated to their ignition temperature; gases are then produced that will ignite if combined with oxygen.
 - c. Oxygen above the minimum levels needed to sustain combustion.

- Air is an oxidizer.

- Air contains about 21 percent oxygen.

2. Fire tetrahedron.

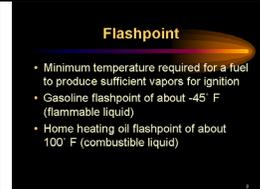
- a. Fourth element is the uninhibited chain reaction that allows for the continuous heating of the fuel mass, and the continuous production of flammable gases which then are ignited by the flame.
- b. Some extinguishing agents help insulate and isolate the molecules of the burning product and retard the burning process.

 <p>Pyrolysis</p> <ul style="list-style-type: none">• Defined as the chemical decomposition of matter by heat• Process begins when fuel is heated• Gases are produced• Gases ignite• Heat balance and feedback	<p>Slide 2-8 Pyrolysis</p>
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C. Pyrolysis.

1. Pyrolysis is defined as the chemical decomposition of matter through the action of heat.
 - a. Process begins when fuel is heated.
 - b. Gases are slowly formed during decomposition.
 - c. Combustibility increases with the material's decomposition.
 - d. Gases ignite when they reach their lower flammable limit (if an ignition source is available; ignition may be delayed if energy source is not available).

2. Heat from a secondary source starts the secondary pyrolysis reaction.
 - a. Heat balance and heat feedback are important to continued burning.
 - b. Positive heat balance occurs when more heat is produced than is lost to heat conduction, convection, or radiation and the fire continues to burn.
 - c. Negative heat balance occurs when most of the heat is lost to conduction, convection, or radiation.

 <p>Flashpoint</p> <ul style="list-style-type: none">• Minimum temperature required for a fuel to produce sufficient vapors for ignition• Gasoline flashpoint of about -45° F (flammable liquid)• Home heating oil flashpoint of about 100° F (combustible liquid)	Slide 2-9 Definition of flashpoint
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IV. FLASHPOINT

- A. Flashpoint is the minimum temperature required for a fuel to produce an ignitable vapor.
- B. Gasoline has a flashpoint of about -45°F (-43°C), making it a flammable liquid.
- C. Fuel oil #2 (home heating oil) has a flashpoint of 100°F (38°C) or greater, therefore making it a combustible liquid.

The flashpoint of a product often is used in fire codes to determine appropriate storage requirements and containers. Fuel oil can be stored in 275-gallon tanks in basements of dwellings; gasoline should not be.

V. FLAMMABLE AND COMBUSTIBLE LIQUIDS

Flammable and Combustible Liquids

- Flammable liquids have a flashpoint below 100 °F
- Combustible liquids have a flashpoint at or above 100 °F
- Flashpoint is determined under controlled laboratory conditions

Slide 2-10 Flammable and Combustible Liquids

- A. The flashpoint of a product determines if the product is classified as flammable or combustible.
1. A flammable liquid has a flashpoint below 100°F (38°C).
 2. A combustible liquid has a flashpoint at or above 100°F (38°C).
- B. The ability to discriminate between flammable and combustible is critical.

Ask the class for an example, or use the following:

A building owner informs you that she spilled fuel oil on the cellar floor near a gas burner and it exploded in flame. Is she telling the truth? A keen observation to report.

Ignition Temperature

- Minimum temperature required to ignite a material
- Auto ignition occurs without the presence of an open flame or spark
- Piloted ignition occurs with the presence of an open flame or spark

Slide 2-11 Ignition Temperature

VI. IGNITION TEMPERATURE

- A. The minimum temperature required to ignite the material.
- B. Autoignition is the temperature at which a product will ignite without the presence of an open flame.
- C. Common ignition temperatures.

<p>Common Ignition Temperatures</p> <ul style="list-style-type: none">• Soft Wood: 608 to 660° F• Kerosene: 410° F• Polystyrene: 1,063° F• Gasoline: 853° F• PVC: 945° F• Acetone: 869° F	<p>Slide 2-12 Common Ignition Temperatures</p>
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Material	°F	°C
Soft wood	608 to 660	320 to 349
Kerosene	410	210
Polystyrene	1,063	573
Gasoline	853	456 (100 octane)
PVC	945	507
Acetone	869	465

<p>Flammable or Explosive Limits</p> <ul style="list-style-type: none">• The concentration level of fuel vapors to the amount of air (oxygen) available for combustion• UEL - upper explosive limit• LEL - lower explosive limit	<p>Slide 2-13 Flammable or Explosive Limits</p>
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VII. FLAMMABLE OR EXPLOSIVE LIMITS

- A. The concentration level of fuel to the amount of air available that is required for combustion.
- B. Most flammable or combustible liquids have relatively close flammable limits.
- C. Other products have a wider range of flammable limits.
- D. Common flammable limits:

Gasoline	1.4 to 7.6%
Kerosene	0.7 to 5.0%
Ethyl alcohol	3.3 to 19.0%
Acetylene gas	2.5 to 99.9%

VIII. SPECIFIC GRAVITY

<p>Specific Gravity</p> <ul style="list-style-type: none">• Weight of a product compared to the weight of water• Water has a value of 1• Products with specific gravity of less than one will float• Products with specific gravity of more than one will sink	<p>Slide 2-14 Specific Gravity</p>
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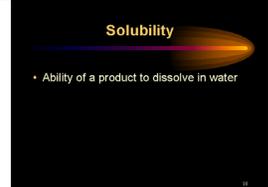
- A. The specific gravity of a product is the weight of the product compared to the weight of water (water = 1).
- B. Products with a specific gravity of less than 1 float on water.
 - 1. Gasoline--.73.
 - 2. Acetone--.93.
- C. Products with a specific gravity of more than 1 sink in water.
 - 1. Asphalt--1.39.
 - 2. Brick--1.79.

IX. VAPOR DENSITY

<p>Vapor Density</p> <ul style="list-style-type: none">• Weight of a product compared to air• Air has value of 1• Products with vapor density less than 1 will rise• Products with vapor density greater than 1 will sink• Air currents/ventilation affects	<p>Slide 2-15 Vapor Density</p>
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- A. Vapor density is the weight of the product compared to air (air = 1).
- B. Products with a vapor density of less than 1 will rise (natural gas is 0.8).
- C. Products with a vapor density of more than 1 will settle to low-lying areas.
 - 1. Gasoline--3.5.
 - 2. Acetone--2.0.

3. LP gas--1.6.

 <p>Solubility</p> <ul style="list-style-type: none">• Ability of a product to dissolve in water	<p>Slide 2-16 Solubility</p>
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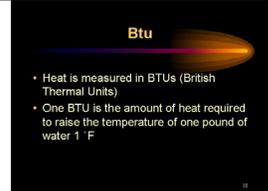
X. SOLUBILITY

- A. Solubility is the ability of a product to dissolve in water.
- B. Some products, such as acetone and ethyl alcohol, may dissolve readily in water.
- C. Others, such as gasoline and kerosene, will simply float on the top or sink to the bottom of the water.

XI. RATE OF HEAT RELEASE (RHR)

 <p>Rate of Heat Release (RHR)</p> <ul style="list-style-type: none">• Rate at which a material releases its energy (heat)• May directly relate to fire damage	<p>Slide 2-17 Rate of Heat Release (RHR)</p>
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- A. The heat released from a burning material may correlate directly to the amount of resulting fire damage.
- B. Today the fire load (amount of heat produced) has altered fire behaviors dramatically, so that fire patterns may appear different.
 - 1. Heat is measured in British thermal units (Btus).

 <p>Btu</p> <ul style="list-style-type: none">• Heat is measured in BTUs (British Thermal Units)• One BTU is the amount of heat required to raise the temperature of one pound of water 1 °F	<p>Slide 2-18 Btu</p>
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2. One Btu is the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit (measured at 60°F [15.5°C]).

<p>Examples of Btu values (Btu/pound)</p> <ul style="list-style-type: none">• Wood - 7,000• Polyurethane - 14,700• Polyvinyl chloride - 17,900• Polystyrene - 18,750• Polypropylene - 20,000• Polyethylene - 20,100	Slide 2-19 Examples of Btu values (Btu pound)
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3. Examples of Btu production.

Product	Btu/lb
Wood	7,000
Polyurethane	14,700
Polyvinyl chloride	17,900
Polystyrene	18,750
Polypropylene	20,000
Polyethylene	20,100

The Btu's generated from a single piece of furniture with foam padding may cause severe fire damage.

XII. REACTION OF FIRE TO WATER APPLICATION

<p>Reaction to Water Application</p> <ul style="list-style-type: none">• Initial fire attack team is in the best position to observe the reaction of the fire when water is applied• Water hitting a pool of ignitable liquid may cause the liquid to splatter and spread• Presence of ignitable liquid may result in flashback• Burning metals may cause violent reaction	Slide 2-20 Reaction of Fire to Water Application
--	--

- A. The initial fire attack team is in the best position to observe the reaction of the fire when water is applied.
- B. If the initial attack team is unsuccessful in extinguishing the fire, some unusual circumstance may have caused something other than a normal fire load.

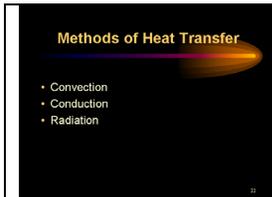
- C. Water hitting a pool of flammable liquid may cause the liquid to splatter and spread.
- D. Water contacting burning metals may cause a violent reaction with brilliant white flame.



Slide 2-21 Heat Transfer and Temperature Factors

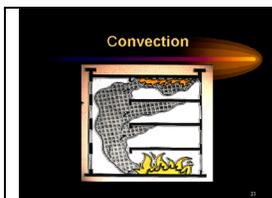
XIII. HEAT TRANSFER AND TEMPERATURE FACTORS

- A. Heat transfer from one location to another affects fire suppression activities.
- B. It also explains why a fire often spreads from one location to another in the way it did.



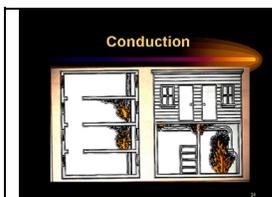
Slide 2-22 Convection, conduction, radiation

- C. Three methods of heat transfer.



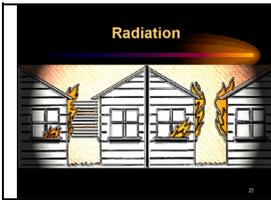
Slide 2-23 Convection

1. Convection involves the transfer of heat by a circulating medium--either a gas or liquid.



Slide 2-24 Conduction

2. Conduction is heat transferred by direct contact from one body to another, such as through a brick.
 - a. When heat is applied to one side of a brick, the brick will warm and the opposite side will be heated.
 - b. If this brick is in a fireplace and too close to combustible materials, it could cause a fire.



Slide 2-25 Radiation

3. Radiant heat is heat in the form of energy waves that are transmitted through the air. The person sitting in front of a roaring fireplace feels radiant heat.
- D. Observing fire spread may be vital to reconstructing where the fire started and how it traveled to another location.
 - E. Certain fire travel predictions also can be made for some classifications of buildings.

A wood-frame building of balloon construction has a fire that starts in the basement, and then appears in the attic. This may be a result of converted heat traveling up through open wall cavities to the attic level and igniting combustible materials. Many first responders may assume that the second fire was the work of an arsonist.



Slide 2-26 Definition of flashover

XIV. FLASHOVER

Flashover is defined as a transitional phase in the development of a contained fire, in which surfaces exposed to thermal radiation reach ignition temperature more or less simultaneously, and the fire spreads rapidly throughout the space.

- A. The stage of fire when superheated gases in a room or other open area ignite simultaneously.
- B. As a fire starts, convection carries the heated gases upward and outward from the fire.
- C. This results in thermal heat layers which may cause other combustibles in the room to heat to their ignition temperature.
- D. At this time (15 to 30 seconds) the entire portion of the room appears to ignite.
- E. Flashover can occur while firefighters are in the room.
- F. Because of the amount of heat and smoke generated in such a few seconds, it may appear that a flammable liquid is present.
- G. This phase of burning often is reported by observers as an explosion.
- H. Firefighters may feel strongly that a flammable liquid was used because of the speed of full fire involvement.
- I. Careful examination should help discriminate between flashover effects and flammable liquid fires.

- J. Four indications of flashover.
1. Burning over top of surface of materials.
 2. Lack of normal fire spread from point of fire origin.
 3. Lack of accelerant residue.
 4. Demarcation line of burning or high heat damage appears to be consistent around the room.

The demarcation line is the line that separates the burned area from the unburned area, or the areas of high heat damage from those of light or no heat damage and the banking down of smoke level on walls.

Slide 2-27 Video- Flashover



Show four-minute section of the video "Fire Test" (no sound) to demonstrate flashover. Watch the buildup of heat, rollover of unburned fire gases burning at the ceiling, and the full development of flashover. This video can assist in understanding the process of flashover, and the evidence it produces.

Point out:

- High heat level, probably over 1,000°F (538°C).
- Unvented area allows combustible vapors to accumulate and ignite.
- High level of heat damage.
- Even levels of char from top down toward floor.



Slide 2-28 Definition of backdraft

XV. BACKDRAFT

Backdraft is defined as an explosion resulting from the sudden introduction of air (oxygen) into an oxygen-deficient, confined space that contains superheated products of incomplete combustion.

- A. Conditions that contribute to backdraft.
 - 1. A structure remains closed during a fire.
 - 2. Limited amounts of air have entered the structure.
 - 3. As the fire consumes large amounts of oxygen and depletes the oxygen supply, the fire smolders.
 - 4. There is a sudden infusion of oxygen.
- B. Backdraft is a smoke explosion.
- C. The fire continues to produce large amounts of heat and carbon monoxide.
- D. Carbon monoxide (flammable limits of 12.5 to 74.0) and ignition temperature of 1,128°F (609°C) can become a highly volatile fuel.
- E. The missing component of the fire triangle is the oxygen.
 - 1. A window can break and allow oxygen to enter.
 - 2. A person can open a door and allow oxygen to enter.

3. The fire can burn through the structure, allowing oxygen to enter.
- F. The seat of the fire or the lowest level of burning is a critical factor in the backdraft potential.
1. The area above the fire will be in a positive pressure mode.

If an opening is made, the heated fire gases will push outward.
 2. The area below the fire will be in a negative pressure mode.

If an opening is made, the air will go rushing in.
 3. When a fire burns through the roof or exterior walls, and fresh oxygen is provided, the fire usually returns to a free-burning state.
 4. Occasionally it will occur in the negative pressure area (below the seat of the fire) and a backdraft may occur.
 5. Witnesses may report that the building was "smoking" and then just exploded.
- G. Critical observations for the first responder.
1. Window glass broken just prior to or during the backdraft normally will be heavily carbonized on the inside.
 2. The backdraft normally will not cause the localized structural damage anticipated from other types of explosions.
 3. Questions the first responder should ask.
 - a. What was the extent of smoke at the time of arrival?
 - b. Was there a lack of visible flame?

- c. What method was used to open or enter the structure?
- d. Did entry prior to venting provide oxygen and possibly produce a backdraft?
- e. Was there movement of smoke immediately preceding the explosion?
- f. Did smoke appear to change its direction of travel?
- g. Did structure appear to breathe?
- h. Were there sounds like a whistle, a jet, or a train prior to the explosion?



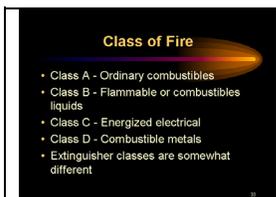
Slide 2-29 Video - Backdraft

Show the four-minute video clip. This video is taken from the Firefighter Safety video and will demonstrate the effect of oxygen within a heated area that has a limited oxygen supply. The fires show the continuing development of smoke.

Ask: How does a backdraft differ from a flashover?

Possible responses:

- Flashover results when superheated gases ignite in an oxygen-rich environment.
- A backdraft results when the oxygen supply is nearly depleted, a smoldering fire produces a high concentration of carbon monoxide, and oxygen is introduced.



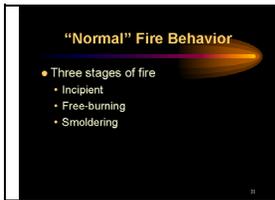
Slide 2-30 Classes of fire

- Class A - Ordinary combustibles
- Class B - Flammable or combustibles liquids
- Class C - Energized electrical
- Class D - Combustible metals
- Extinguisher classes are somewhat different

XVI. CLASSES OF FIRE

- A. Class A--Ordinary combustible materials such as wood, paper, cloth (natural fiber or synthetic fiber).
- B. Class B--Flammable or combustible liquids.
- C. Class C--Electrical energized equipment such as an electrical motor when it is operating.
- D. Class D--Combustible metal fires (aluminum, magnesium).

XVII. NORMAL FIRE BEHAVIOR

 <p>"Normal" Fire Behavior</p> <ul style="list-style-type: none">• Three stages of fire<ul style="list-style-type: none">• Incipient• Free-burning• Smoldering	<p>Slide 2-31 The three stages of fire</p>
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- A. Normally, fires go through at least two and possibly three stages of burning.

 <p>Incipient</p> <ul style="list-style-type: none">• Beginning stage• Limited to initial fuel involved• Heat in room is "normal"• Production of fire gases begins<ul style="list-style-type: none">> Carbon monoxide> Carbon dioxide> Hydrogen sulfide> Benzene> Others	<p>Slide 2-32 Stage One - Incipient</p>
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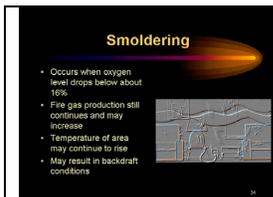
- B. Stage One--incipient or beginning stage.
 1. All fires start with a single point of ignition and expand from that point.
 2. A Class B fire (flammable liquid) expands rapidly while a Class A fire expands slowly.
 3. As a Class A fire starts, the fire gases and heat start to rise upward and outward.
 4. Class A fires can be accelerated with flammable liquids and also can have their normal fire pattern altered.

5. As the fire burns it also produces a wide variety of fire gases.
 - a. Carbon monoxide (CO).
 - Not the most toxic gas but the most abundant.
 - As the oxygen level goes down, the production of CO goes up.
 - b. Carbon dioxide (CO₂) is produced in every fire.
 - c. Hydrogen sulfide is produced when organic materials containing sulfur burn (hair and wool).
 - d. Benzene is produced when vinyl materials burn.



Slide 2-33 Stage Two – Free-Burning

- C. Stage Two--free-burning stage.
 1. Stage Two follows flashover of the area or building which appears to be fully involved.
 2. Normally, in accidental fires, this stage will occur in about three to five minutes from the time of ignition (may be sooner because of today's materials).
 3. The type of fuel or arrangement of the fuel may affect the time it takes to develop fully.



Slide 2-34 Stage Three – Smoldering

- D. Stage Three--smoldering stage.

1. When a fire has passed through Stages One (incipient) and Two (free burning) it will likely smolder (third stage) if the area or building is closed.
2. The oxygen level drops to 16 percent or lower.
3. The free-burning phase is reduced; the fire may threaten its area of origin (most heavily burned part) and will continue to smolder for a long period of time.
4. Results.
 - a. Carbon monoxide production rises.
 - b. The temperature of the area or building rises.
 - c. Large amounts of heavy black carbon are deposited on the walls and windows.
 - d. Moisture may appear on the inside of the window glass as the glass is cooled by the cool air outside.
 - e. The building may appear to be puffing and breathing.
 - f. Smoke may appear around windows, through siding, or through the roof material.
5. If the area or building remains tightly closed the fire eventually will go out because of a lack of oxygen.
 - a. In some instances fire departments have responded to an apparently significant fire which has gone out by itself after causing considerable heat and smoke damage.

- b. As buildings become more tightly insulated, the potential for Stage Three fires increases.

<p>Building Construction and Fire Spread</p> <ul style="list-style-type: none">• Correct classification needed for reporting purposes• Assists in determination of fire, heat and smoke spread• Affects appropriate suppression tactics	<p>Slide 2-35 Building Construction and Fire Spread</p>
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XVIII. BUILDING CONSTRUCTION AND FIRE SPREAD

The intent here is not to teach an indepth building construction course. This information is intended to provide an overview of building construction and highlight the concerns for the natural avenues of fire and smoke travel. Each classification of construction offers different avenues for fire travel; therefore, it is important for first responders to recognize normal fire and smoke travel to identify those situations where abnormal fire and smoke travel are observed. Stress that understanding the specific characteristics of different construction types is critical to determine fire progression, to pinpoint origin, and to determine cause.

- A. Understanding building construction features will help in determining several factors.
 - 1. Correctly classifying code in the Basic Fire Incident Report.
 - 2. Determining how heat, smoke, and fire may have traveled through the structure.
 - a. Voids.
 - b. Renovations/Alterations.
 - c. Vertical openings.
 - 3. Selecting the appropriate suppression tactics.
- B. Five classifications and distinctive spread patterns.

<p>Traditional Classifications</p> <ul style="list-style-type: none">• Fire Resistive• Noncombustible• Heavy Timber• Ordinary• Wood frame	<p>Slide 2-36 Traditional Classifications</p>
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1. Fire resistive.
2. Noncombustible.
3. Heavy timber.
4. Ordinary.
5. Wood frame.
 - a. Post and beam.
 - b. Balloon.

<p>Fire Resistive</p> <ul style="list-style-type: none">• No exposed structural steel• Structural elements have substantial fire resistive ratings• Maybe concrete, concrete encased steel, encased with gypsum board/plaster or steel with sprayed on protection• Exterior walls may be "curtain walls"	<p>Slide 2-37 Fire Resistive</p>
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- c. Platform.
- C. Fire-resistive construction.

<p>Fire Resistive Construction</p> 	<p>Slide 2-38 Fire Resistive Construction</p>
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<p>Spray Protection Applied to Column and Beam</p> 	<p>Slide 2-39 Spray protection applied to column and beam</p>
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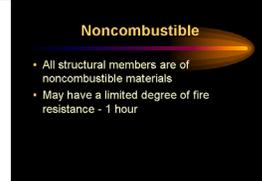
1. No structural steel is exposed and all vertical openings are protected with approved doors.

2. Bearing walls may be made of steel with a fire-resistive covering applied. Structural steel often is protected by encasing, sprayed-on protection, or membrane ceilings (three-hour rating).
3. Exterior walls generally will be curtain walls and not load bearing.

 <p>Spray Protection on Column</p>	<p>Slides 2-40 Spray Protection on Column</p>
 <p>Close-up View of Spray Protection</p>	<p>Slide 2-41 Close-up view of spray protection</p>
 <p>Loose Spray Protection From I-beam Due to Oil Residue on Beam</p>	<p>Slide 2-42 Loose Spray Protection from I-Beam due to oil residue on beam</p>

- a. May be precast, lightweight concrete, aluminum, glass, or other construction material.
 - b. Exterior wall supports also may be made of reinforced concrete.
 - c. Windows may be made of plastic or have a plastic sun shield attached.
4. Exterior or interior nonbearing walls will have varying degrees of fire resistance.
 5. Stairwells are enclosed in fire-resistive materials.
 6. Floors may be poured-in-place concrete, prefabricated slabs, or other material providing fire resistance.

7. Roof construction may be similar to that used for floors.
8. Fire spread via exterior of building is a prime concern.
 - a. From window to window above.
 - b. Through the gap between floor and exterior curtain wall.
 - c. Heating, ventilating, and air conditioning (HVAC) equipment may service several floors.
9. Typically, fire-resistive (highrise) buildings are constructed with a center core design.
 - a. This allows the outside walls to be used for offices, apartments, or other revenue-producing areas.
 - b. In office buildings there generally is little compartmentation, and open floor plans are common.
 - c. Fire, heat, and smoke spread.
 - Elevator shafts.

 <p>Noncombustible</p> <ul style="list-style-type: none">• All structural members are of noncombustible materials• May have a limited degree of fire resistance - 1 hour	<p>Slide 2-43 Noncombustible</p>
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- Electrical, telephone, and other communications shaft.
- Stairwells with doors blocked open.
- Mail chutes.
- Ventilation shafts.
- HVAC equipment.

- Plumbing shafts.

 <p>Non-Combustible Construction</p>	<p>Slides 2-44 Noncombustible building construction</p>
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D. Noncombustible construction.

1. A totally noncombustible building in which structural steel is exposed to the effects of fire.
 - a. Totally noncombustible refers only to structural materials, not to interior finish and contents.

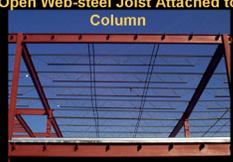
 <p>Support Column Attached to Base Plate and Bolted to Concrete Foundation</p>	<p>Slide 2-45 Support column attached to base plate and bolted to concrete foundation</p>
 <p>Bolted I-Beam to I-Beam</p>	<p>Slide 2-46 Bolted I – Beam to I - Beam</p>
 <p>View of Bolted Beam-to-column Flange Connection With Weld</p>	<p>Slide 2-47 View of bolted beam-to-column flange connection with weld</p>

- b. Structural framework is made of steel bolted, riveted, or welded together.

 <p>Bolted Column-to-column Flange Connection</p>	<p>Slide 2-48 Bolted column-to-column flange connection</p>
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 <p>Beam-to-beam Connection</p>	Slide 2-49 Beam-to-beam connection
 <p>View of Underside of Corrugated Steel Decking Attached to Steel Beam</p>	Slide 2-50 View of underside of corrugated steel decking attached to steel beam

- c. It is susceptible to expansion, distortion, or relaxation of steel members from heat, resulting in early distortion.
2. Wall enclosures may be masonry, steel, aluminum, glass, or other materials.
3. Once wall coverings are in place, it may be difficult to determine if structural elements are exposed or protected.

 <p>Open Web-steel Joist Attached to Column</p>	Slide 2-51 Open web-steel joist attached to column
 <p>Steel Framing With Open Web-steel Roof Joist</p>	Slide 2-52 Steel framing with open web-steel roof joist

4. The floor and roof support systems often will be lightweight bar joists, trusses, or other lightweight steel.

 <p>Exterior View of a Steel Frame Construction</p>	Slide 2-53 Exterior view of a steel frame construction
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FIRE BEHAVIOR



Slide 2-54 Reinforced concrete block wall construction. Grout is used to fill blocks

5. Structure may be multiple story with fire spread behavior similar to fire resistive.
6. Fire, heat, and smoke spread.



Slide 2-55 Tilt-Up Construction

Slide 2-56 Metal L-Plate bolted to wall panels to stabilize each panel

- a. Elevator shafts.
- b. Electrical, telephone, and other communications shafts.



Slide 2-57 Slots at top and midway of wall panels for attachment of open-web ceiling joist

Slide 2-58 Vertical view of two wall panels with wall spacers

- c. Stairwells with doors blocked open.
- d. Mail chutes.

 <p>Close-up View of Wall Spacers</p>	Slide 2-59 Close-up view of wall spacers
 <p>Exterior View of Tilt Construction for Warehouse</p>	Slide 2-60 Exterior view of tilt construction for warehouse

- e. Ventilation shafts.
- f. HVAC equipment.
- g. Plumbing shafts.

7. Weaknesses.

- a. Steel exposed to heat will expand approximately 1 inch for every 10 feet at 1,100°F (593°C). It loses 60 percent of its carrying capacity.
- b. Steel at 1,500°F (815°C) can collapse under its own weight in as little as 5 minutes.
- c. Steel members are subject to early distortion and relaxation.

 <p>Heavy Timber</p> <ul style="list-style-type: none">• Exterior walls of masonry materials• Interior walls, floors, roofs, columns, beams are of large dimensional lumber	Slide 2-61 Heavy-timber construction
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- E. Heavy-timber (mill-type) construction.



Slide 2-62 Heavy Timber Construction

Slide 2-63 Cross Beam Resting in masonry wall socket

1. Consists of masonry (noncombustible) exterior walls and structural members of substantial timber construction.
 - a. Minimum dimension of structural wood supports, eight inches for columns, beams, girders, and arches.



Slide 2-64 Beams with cross supports resting on masonry wall

Slide 2-65 Beam supported by sand mortar masonry wall

- b. All exposed wood has a minimum dimension of two inches.
- c. Commonly found in older factories and mills.



Slide 2-66 Beam supported by Portland mortar masonry wall



Slide 2-67 2" x 12" Boards Nailed Together to Form Beam Supported by a vertical pine beam

2. Wood floors generally will be a minimum thickness of three inches. May be oil soaked from years of supporting heavy machinery with lubricating oils.
3. Roof supports will be wood with minimum dimension of 4 inches by 6 inches and a minimum roof decking thickness of 1-1/8 inch.



Slide 2-68 Vertical and Horizontal beams attached by metal plate



Slide 2-69 Laminated Deck Beams

4. Exterior walls constructed of masonry, usually brick. As walls rise they diminish in size since they are supporting less load.
5. Support timbers of large mass will burn a long time before being destroyed.
6. Prefire planning should indicate critical construction features.



Slide 2-70 Pine Resin Dripping From Pine Beam



Slide 2-71 Tongue and Groove Flooring

- a. Heavy floor loads.
 - b. Fire load.
 - c. Capacity of stock for water absorption.
 - d. Building modifications.
7. Once they get away from initial efforts, fires in this classification tend to be spectacular.
- a. Large open interior area.
 - b. Unprotected vertical shafts.
 - c. Potential for rapid fire development.
8. Scuppers installed at floor level on exterior walls.
- a. This allows water to run off the floor via opening in a wall should sprinkler operate.
 - b. Generally, the floors were treated to prevent water from seeping to the floor below.

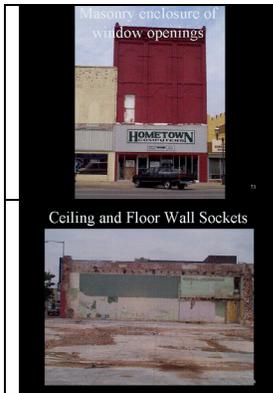


Slide 2-72 Ordinary Construction

F. Ordinary construction.

FIRE BEHAVIOR

1. The building will have masonry exterior walls (usually brick), and wooden structural members and interior construction.
2. Generally, the building will not exceed six stories; most often it will be two or three stories (Main Street USA).
3. Features.
 - a. Floor and roof supports are usually wood; other materials, such as steel bar joists may be found.



Slide 2-73 Masonry enclosure of window openings

Slide 2-74 Ceiling and Floor Wall Sockets

- b. Floor joists and roof rafters inserted in wall sockets were typically cut on an angle called a fire cut.



Slide 2-75 Closer view of wall sockets

- c. This allows the structural member to fall out of the wall socket without toppling the entire wall.
4. Floor and roof decking will most frequently be wooden boards, tongue-and-groove boards, plywood, or composition board.

5. A common wall between two buildings may share wall sockets for floor joists and roof rafters of both buildings.
6. Parapet walls, cornices, overhangs, loads on walls, signs, and marquees, or other heavy items must be considered for the safety of those working underneath.
7. Prefire planning should indicate critical construction features.
 - a. Signs of deterioration.
 - b. Floor loading.
 - c. Fire load.
 - d. Structural modifications.
 - e. Remodeling.

6"x6" Wall Socket. Note the Lath and Plaster on Inside of Wall



Slide 2-76 6"x6" wall socket. Note the lath and plaster on inside of wall.

Example of large apartment complex fire; large amounts of combustibles, wood-frame construction, and large open attics.

Wood Frame

- Walls, floors and roofs are partially or wholly made of wood
- Metal framing with plywood is also considered wood frame
- Balloon frame
- Post and Beam
- Platform

Slide 2-77 Wood Frame

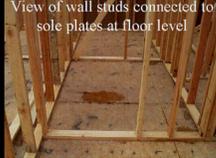
Wood Frame Construction



Slide 2-78 Wood Frame Construction

G. Wood-frame construction.

1. Walls, floors, and roof structure are of wood and metal framing.

 <p>View of wall studs connected to sole plates at floor level</p>	<p>Slide 2-79 View of wall studs connected to sole plates at floor level</p>
 <p>View of ceiling joists attached to top plate and headers</p>	<p>Slide 2-80 View of ceiling joists attached to top plate and headers</p>
 <p>View of 2" x 8" rafters connected to ridge plate</p>	<p>Slide 2-81 View of 2" x 8" rafters connected to ridge plate</p>
 <p>Wood floor joist with tooth connectors (gusset plates). Note large void area between the bottom and top of joist</p>	<p>Slide 2-82 Wood floor joist with tooth connectors (gusset plates). Note large void area between the bottom and top of joist</p>

2. Post-and-beam construction has a frame of substantial dimension wood and is sided with a lightweight covering (wood boards).
 - a. Commonly used for barns, sheds, and storage buildings.
 - b. Also may be used in dwellings and other occupancies.

 <p>Post and Beam Construction</p>	<p>Slide 2-83 Post and Beam Construction</p>
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 <p>Two story wood frame under construction</p>	Slide 2-84 Two-story wood frame under construction.
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- 3. In balloon-frame construction studs run from the foundation to the attic.
 - a. Used extensively in many parts of the country until the late 1930s for residential and light commercial construction.

 <p>Balloon Frame Construction</p>	Slide 2-85 Balloon-frame construction; floor joists are attached to studs within the wall
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 <p>View looking down from story into wall "stud cavity" with view of the sole plate at bottom of cavity. Paper backing still attached to outside wall</p>	Slide 2-86 View looking down from story into wall "stud cavity" with view of the sole plate at bottom of cavity. Paper backing still attached to outside wall
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- b. Floor joists are tied into the wall, allowing for fire extension in any direction.

 <p>Platform Construction</p>	Slide 2-87 Platform Construction
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 <p>View of Rear of a 3 Story Under Construction</p>	Slide 2-88 View of rear of a 3 story under construction
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- c. Firestopping was not a common practice and is rarely found.



Slide 2-89 End view of a 3 story platform under construction

4. In platform-frame construction the walls of each successive story are built on a platform formed by the preceding floor.
 - a. Modern wood-frame construction.
 - b. The joists for the deck may be full-dimension lumber or of lightweight construction.
 - c. Once the floor/deck is in place, walls are placed on it with a sill at the bottom of the wall and a plate at the top.
 - d. Platform-frame construction provides a natural fire barrier for vertical extension within walls.



Slide 2-90 Paths of fire spread



Slide 2-91 Floor Penetrations

5. Openings in walls for water, sewer, ventilation, or heating/air conditioning pipes can create a void for fire extension.
6. Multifamily dwellings frequently will have extensive vertical openings and void spaces.

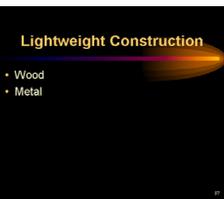
 <p>Chase opening through sub-floor for drainpipe from bathtub</p>	<p>Slide 2-92 Chase opening through sub-floor for drainpipe from bathtub</p>
 <p>Top view of a sole plate with pipe chases which has been plugged with foam</p>	<p>Slide 2-93 Top view of a sole plate with pipe chases which has been plugged with foam</p>

- a. Kitchen, bath, and dryer vents, plumbing, electrical, and heating/air conditioning ducts.

 <p>View of underside of sole plate showing foam insulation around pipe chases</p>	<p>Slide 2-94 View of underside of sole plate showing foam insulation around pipe chases</p>
 <p>View of Vertical Steel Pipe Through Metal Composite Decking</p>	<p>Slide 2-95 View of vertical steel pipe through metal composite decking</p>

- b. Double walls for deadening sound between dwelling units.

 <p>Top View of Vertical Steel Pipe Through Composite Decking and Concrete Floor Which Has Been Properly Plugged</p>	<p>Slide 2-96 Top view of vertical steel pipe through composite decking and concrete floor which has been properly plugged</p>
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 <p>Lightweight Construction</p> <ul style="list-style-type: none">• Wood• Metal	<p>Slide 2-97 Lightweight Construction</p>
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- H. Lightweight design can be found in many construction types.

FIRE BEHAVIOR

1. Lightweight wood or metal supporting members provide a substantial clear floor area when used to support floor and/or roof assemblies.
 - a. Steel bar joists.
 - b. Wood trusses.
 - c. Laminated wood I beams.

 <p>Lightweight Construction</p>	Slide 2-98 Lightweight Construction
 <p>Steel-Bar Joist Construction</p>	Slide 2-99 Steel-Bar Joist Construction
 <p>Wooden "I" Beam</p>	Slide 2-100 Wooden "I" Beam

2. Lightweight sandwiched beams or I joists are typically constructed of 3/8" plywood sandwiched into 2" x 3" top and bottom chords. This assembly typically is used for floor joist and roof rafters.

 <p>Metal frame work</p>	Slide 2-101 Metal frame work
 <p>Anchor bolt at sole plate</p>	Slide 2-102 Anchor bolt at sole plate

FIRE BEHAVIOR

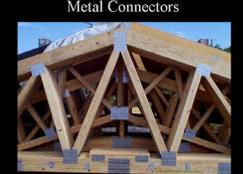
 <p>Sheet metal screws for attachment</p>	Slide 2-103 Sheet metal screws for attachment
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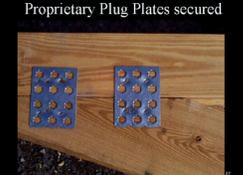
- 3. Floor joist hanger attached to bottom chord of parallel chord truss may experience early failure under fire conditions.

 <p>Flat plate attached with sheet metal screws</p>	Slide 2-104 Flat plate attached with sheet metal screws
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 <p>View of frame during construction</p>	Slide 2-105 View of frame during construction
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 <p>Brick veneer over metal frame with a composition roof</p>	Slide 2-106 Brick veneer over metal frame with a composition roof
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 <p>Metal Connectors</p>	Slide 2-107 Metal Connectors
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 <p>Proprietary Plug Plates secured</p>	Slide 2-108 Proprietary Plug Plates secured
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 <p>Gusset Plate Press</p>	Slide 2-109 Gusset Plate Press
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4. Floor joist is toe-nailed into position. Entire load is being supported by three or four nails.

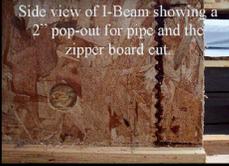
<p>Attaching “plug” plates (toenail) with an air nail gun</p> 	<p>Slide 2-110 Attaching “plug” plates (toenail) with an air nail gun</p>
<p>End view of joist showing plates which have been pressed into wood</p> 	<p>Slide 2-111 End view of joist showing plates which have been pressed into wood</p>
<p>Top view of gusset plate attached into a 2” x 8” wood. (Note nails for additional attachment).</p> 	<p>Slide 2-112 Top view of gusset plate attached into a 2” x 8” wood. (Note nails for additional attachment).</p>

5. Floor joist or roof rafters held by metal joist hangers could be subject to early collapse under fire conditions. Entire load is supported by lightweight metal bracket.

<p>View of a gusset plate indicating depth of teeth of plate into wood.</p> 	<p>Slide 2-113 View of a gusset plate indicating depth of teeth of plate into wood</p>
<p>Wooden “I” Beam</p> 	<p>Slide 2-114 Wooden “I” Beam</p>
<p>View of different types of building materials: 2” x 4” mill cut lumber on top, waferboard I-Beams in center, and waferboard and particleboard beams on bottom.</p> 	<p>Slide 2-115 View of different types of building materials. 2” x 4” mill cut lumber on top, waferboard I-Beams in center, and waferboard and particleboard beams on bottom.</p>

6. Lightweight construction is subject to early collapse when structural supports are involved.

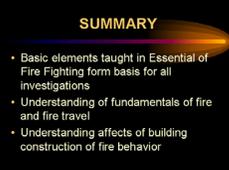
FIRE BEHAVIOR

 <p>Length view of 12" proprietary I-Beam attached to top plate of wall.</p>	Slide 2-116 Length view of 12" proprietary I-Beam attached to top plate of wall
 <p>Waferboard I-Beams installed with fire stops of same material.</p>	Slide 2-117 Waferboard I-Beams installed with fire stops of same material
 <p>Side view of I-Beam showing a 2" pop-out for pipe and the zipper board cut.</p>	Slide 2-118 Side view of I-Beam showing a 2" pop-out for pipe and the zipper board cut

Stress that trusses may collapse in less than five minutes when involved in fire.

 <p>Joist Hangers</p>	Slide 2-119 Joist Hangers
 <p>Joist hangers for I-Beams attached to cantilevered beam held in place by post cap on metal column.</p>	Slide 2-120 Joist hangers for I-Beams attached to cantilevered beam held in place by post cap on metal column.

XIX. SUMMARY

 <p>SUMMARY</p> <ul style="list-style-type: none">• Basic elements taught in Essential of Fire Fighting form basis for all investigations• Understanding of fundamentals of fire and fire travel• Understanding affects of building construction of fire behavior	Slide 2-121 Summary
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- A. The basic elements taught in Essentials of Firefighting form the basis for all investigations.
- B. Understanding the concept of the fundamentals of fire and fire travel gives the first responder the insight to recognize that the spread of the fire may not have been normal.
- C. Building construction either will help to confine the fire, or will assist in spreading it throughout the building.
- D. Proper protection of structural members, the rating of shafts and firewalls, fire assemblies, and the proper equipment are installed to maintain the proper fire resistance rating.
- E. Holes in the floors and walls can contribute to the spread of fire, giving the appearance of multiple fires when, in fact, one fire has spread through an unprotected opening.

BIBLIOGRAPHY

DeHaan, John D. *Kirk's Fire Investigation*, 3rd Ed. New Jersey: Brady, 1991.

Egan, David M. *Concepts in Building Fire Safety*. Florida: Robert Krieger Publishing Company, 1986.

Fire Dynamics. Emmitsburg MD: National Fire Academy, Open Learning Fire Service Program, 1992.

Fire Protection Handbook, 16th Ed. Quincy, MA: National Fire Protection Association, 1991.

UNIT 3: FIRST RESPONDER OBSERVATIONS

OBJECTIVES

The students will be able to:

- 1. Obtain and evaluate the appropriate information from the reporter(s) of the fire.*
 - 2. Identify critical observations made while en route to the fire scene and explain their importance.*
 - 3. Identify critical observations made upon arrival at the fire scene and explain their importance.*
 - 4. Identify critical observations made during fire suppression activities and explain their importance.*
 - 5. Identify critical observations made during postsuppression operations and explain their importance.*
-

POINTS FOR THE INSTRUCTOR

This unit will stress the earliest possible role of the first responder in arson detection. This begins with the receipt of the fire call and continues with observations while en route to the scene, upon arrival on the scene, and during fire suppression and overhaul operations. It ends when the first responder reports his/her observations to the appropriate authority.

The unit emphasizes all the items a first responder and other firefighters can observe that may assist in pinpointing the indicators of incendiaryism or determining the origin and cause of a fire.

METHODOLOGY

This unit uses lecture and discussion.

(TOTAL TIME: 3 HR.)

180 min. Lecture/Discussion

I. OBJECTIVES.....	3
II. INTRODUCTION	4
III. INITIAL CALL	5
IV. EN ROUTE TO THE SCENE	8
V. ARRIVAL AT THE SCENE	14
VI. FIRE SUPPRESSION	22
VII. POST SUPPRESSION.....	26
VIII. SUMMARY.....	36

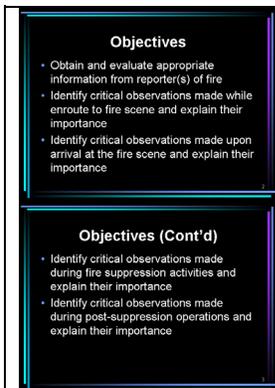
AUDIOVISUAL

Slides 3-1 to 3-61



Slide 3-1 First Responder Observations

Read the unit objectives with the class and emphasize the importance of the unit. This unit is the core of the course and the basis for the detection of arson by first responders.



Slide 3-2 Objectives

Slide 3-3 Objectives (Cont'd)

180 min.
Lecture/
Discussion

I. OBJECTIVES

The students will be able to:

- A. Obtain and evaluate the appropriate information from the reporter(s) of the fire.
- B. Identify critical observations made while en route to the fire scene and explain their importance.
- C. Identify critical observations made upon arrival at the fire scene and explain their importance.

- D. Identify critical observations made during fire suppression activities and explain their importance.
- E. Identify critical observations made during postsuppression operations and explain their importance.

II. INTRODUCTION

- A. The first responder is often in the best position to make critical observations regarding a fire.
 - 1. The first responder can compare this fire to other similar fires and draw parallels between them for similar fire-behavior patterns.
 - 2. The observations of a firefighter during various stages of an incident are extremely critical.
 - 3. From the moment of the receipt of the initial call reporting the fire through the overhaul phase, the first responder's senses are exposed to countless stimuli, many of which can assist in detecting the indicators of incendiarism or making a determination of fire origin and cause.
 - 4. The scenes observed can never be duplicated in a courtroom, and the first responder may be the critical link in the prosecution of an accused arsonist by convincing a judge or jury that the fire was unusual or unnatural.
- B. During the incident the first responder will see thousands of images and make hundreds of decisions, many of them instantaneous.
 - 1. The many phases of the operation will provide the first responder the opportunity to make particular observations that may be critical to fire cause determination.

FIRST RESPONDER OBSERVATIONS

2. The first responder may note something casually that later will emerge from memory and also may be a critical piece of information.
- C. In this unit we will discuss some of the observations that may be pertinent to the discovery of an incendiary fire and what to do with that information.
- D. We will consider five phases during which critical observations are possible:

<p>Five Phases</p> <ul style="list-style-type: none">• At the time of the initial call• While en route to the fire scene• Upon arrival at the fire scene• During fire suppression activities• During post-suppression activities	<p>Slide 3-4 Five Phases</p>
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1. At the time of the initial call.
2. While en route to the fire scene.
3. Upon arrival at the fire scene.
4. During fire suppression activities.
5. During postsuppression activities.

Encourage student participation during this unit of instruction. Let the students attempt to add information regarding the slide.

<p>Initial Call</p> <ul style="list-style-type: none">• Source of call• Caller• Information to be obtained	<p>Slide 3-5 Initial call</p>
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III. INITIAL CALL

FIRST RESPONDER OBSERVATIONS

A. Sources of calls.

<p>Source of Call</p> <ul style="list-style-type: none">• 911 center• Fire dispatch• Local Law enforcement agencies• Automatic fire alarm• Private alarm company• Neighbors	<p>Slide 3-6 Sources of call</p>
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1. 9-1-1 centers.
2. Fire department dispatchers.
3. Local law enforcement agencies.
4. Homes of fire chief or department dispatchers.
 - b. Private alarm companies.
 - c. Neighbors.

B. Caller.

<p>Caller</p> <ul style="list-style-type: none">• Discoverer of fire?• Owner/Occupant of property?• Passer-by who observed fire?• Law enforcement patrol?• The arsonist?	<p>Slide 3-7 Callers</p>
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1. Discoverer of fire.
2. Occupant/Owner of property.
3. Passer-by who observed fire.
4. Police patrol car.
 - b. The arsonist.

<p>Information to Be Obtained by Operator</p> <ul style="list-style-type: none">• Identification - name, address, phone number• Location from where call is being made• Voice identification• Emotional state• Background noises• Exact location of fire	<p>Slide 3-8 Information to be obtained by operator</p>
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C. Information to be obtained by operator.

Enhanced 911 systems will provide caller ID and telephone number automatically.

1. Identification of caller.
 - a. Name.
 - b. Address.
 - c. Home telephone number.
2. Location from where call was initiated may establish delay in alarm if caller had to find pay phone.
3. Voice identification.
 - a. Accents or speech impediments.
 - b. Gender of caller.
 - c. Indication of intoxication or drug usage.
4. State of person: excited or calm.
5. Background noises may establish area where call was made such as restaurants, bars, etc., industrial areas, business offices, or an outside pay phone near heavy traffic area.
6. Exact location of fire.
 - a. Address.
 - b. Closest intersection.
 - c. Landmarks.

<p>Private Alarm (Central Stations)</p> <ul style="list-style-type: none">• When alarm received?• Source of alarm signal?• Any recent reports of trouble with system?• Any recent false alarms?• Required to maintain written records of all alarm and test signals.	<p>Slide 3-9 Private Alarm (Central Stations)</p>
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7. Private alarm company.
 - a. When was alarm received?
 - b. Any alarm signals by customer prior to fire?
 - c. Any recent reports of trouble with system?
 - d. Any recent false alarms?

<p>En-route to the Scene...</p> 	<p>Slide 3-10 En route to scene</p>
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IV. EN ROUTE TO THE SCENE

<p>Weather Conditions</p> <ul style="list-style-type: none">• Clear or stormy• Snow or ice• Wind speed and direction• Temperature and humidity• Affect response time or access to scene• Affect fire behavior/burn patterns	<p>Slide 3-11 Weather Conditions</p>
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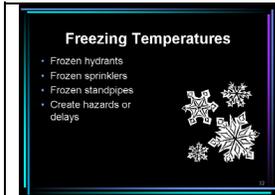
- A. Weather conditions.
 1. Clear or stormy.

May discredit story of owner/occupant.
 2. Snow or ice storms.

May delay fire department response.
 3. Wind speed and direction.

May explain fire spread.

4. Temperature and humidity readings.



Slide 3-12 Freezing Temperatures

5. Freezing temperatures may create hazards or delays.
- a. Frozen hydrants.
 - b. Frozen sprinklers.
 - c. Frozen standpipes.
6. Note changes in weather from time of arrival to time of departure.



Slide 3-13 Time Periods

B. Time periods.



Slide 3-14 Record all Times

1. Record all times.
- a. Each alarm received.
 - b. Fire company dispatched.
 - c. First-arriving equipment or personnel.
 - d. When fire was brought under control.

- e. Equipment back in service.
- 2. Usually automatically recorded if at dispatch center.
- 3. May establish delays that explain irregularities in fire spread and growth.
- 4. Frequently, fire victims will claim exaggerated response times.
- 5. Box alarms require neighborhood canvass.
May identify who turned in alarm.
- 6. Identify any patterns from previous fires.
Serial arsonists often set fires in same time periods.



Slide 3-15 Spectators and Vehicles

C. Spectators/Vehicles.

- 1. Disasters attract crowds (a normal human reaction).



Slide 3-16 Spectators

- 2. It is unusual to observe spectators or vehicles **leaving** the scene of a fire while first response is en route.
 - a. Obtain description of spectators:
 - Gender.

FIRST RESPONDER OBSERVATIONS

- Height.
- Build.
- Clothing.
- Glasses.
- Hair length/color.
- Facial hair.

<p>Description of Vehicle</p> <ul style="list-style-type: none">• Make• Color• Size• Domestic or foreign• Style• License number• Driver/Occupants• Direction of travel 	<p>Slide 3-17 Description of Vehicle</p>
--	--

- b. Obtain description of vehicle.
 - Make.
 - Color.
 - Size (compact, midsize, full size).
 - Domestic or foreign.
 - Style (sedan, station wagon, convertible, etc.).
 - License plate number (if possible).

- 3. Identify any vehicles damaged by fire, heat, or smoke.

Why were vehicles at scene?

<p>Delays in Reaching Scene...</p> <ul style="list-style-type: none">• Detours• Railroad crossings• Lift or drawbridge• Trees, debris• Rush hour	<p>Slide 3-18 Delays in reaching scene</p>
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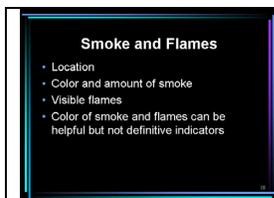
- D. Delays.

FIRST RESPONDER OBSERVATIONS

1. Did any obstacles delay fire department response?
 - a. Road detours.
 - Often reported by radio stations or newspapers.
 - b. Railroad crossings.
 - A clever arsonist will time his/her fire for times when railroad crossings will be blocked.
 - c. Lift or drawbridges.
 - Frequently, these are set to raise at appointed times.
2. Branches, brush, snow.

Was entry to fire scene blocked by the intentional placement of branches, brush, or snow?
3. Access to driveway or entrance road blocked.
 - a. Narrowness of entrance prevents entry.
 - Masonry pillars placed too close together.
 - Trees or shrubs make driveway too narrow.
 - Fences that narrow the width of road or driveway.
 - b. When were pillars, fences, trees, or shrubs placed there?
4. Fires during "rush hour" traffic.

Intentionally planned to delay response time.



Slide 3-19 Smoke and Flames

- E. Smoke and flames.
 - 1. Color and amount of smoke.
 - a. May indicate size and intensity of fire.
 - b. May indicate type of material burning.

Explain to students that caution must be taken when dealing with color of smoke. It was once believed that heavy black smoke in the early stages of a fire indicated that an accelerant was present. Although this is still a possibility, consideration must be given to the contents of the structure, as well as roofing materials if they are involved. Caution: Some roofing materials may contain polychlorinated biphenals (PCB).

- 2. If flames are visible as you approach the scene.
 - a. Why is there so much fire?
 - b. Note colors of flame; may indicate what materials burning.
- 3. Experience will enable the first responder to identify color of smoke and flame with associated burning materials.

SM p. 3-11
IG pp. 3-19
and 3-20

A list of materials and their smoke and flame colors can be found later in this unit.

	Slide 3-20 Arrival at scene
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V. ARRIVAL AT THE SCENE

- A. Fire scene provides greatest opportunity for observation of indicators of incendiaryism.

	Slide 3-21 Spectators
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- B. Spectators.
1. Large numbers of spectators are usually present at fire scene.
 2. Videotape or photograph crowds. Later analysis of video or photos may
 - a. Identify arsonist.
 - b. Discredit story (alibi) of arsonist who denies presence at scene.
 3. Be aware of familiar faces or individuals seen at other fires.

	Slide 3-22 Actions of spectators
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4. Actions of spectators can cause suspicion.
 - a. Too concerned.

FIRST RESPONDER OBSERVATIONS

- b. Too eager to help.
- c. Too vocal about incident.
- d. Critical of fire, police, or EMS personnel.
- e. Displays animosity against neighbors, society, or government.

<p>Actions of Spectators (Cont'd)</p> <ul style="list-style-type: none">• Too excited, overly brave, helpful or curious• Hindering of fire fighting activities• Construction or repair crews	<p>Slide 3-23 Actions of Spectators (Cont'd)</p>
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- 5. Individuals who are too quiet or too withdrawn.
- 6. Individuals who appear overly frightened about fire.
- 7. Individuals who appear too excited, overly brave, helpful, or curious.
- 8. Individuals hindering firefighting activities.
 - a. Placing trash containers over hydrants.
 - b. Parking vehicles to block hydrants.

<p>Appearance of Spectators</p> <ul style="list-style-type: none">• Appropriate for time of day, weather• Signs of smoke or burns• Odors• Injuries• Have special items like toys, pets, fur coats, jewelry, insurance policy or other important papers 	<p>Slide 3-24 Appearance of spectators</p>
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- 9. Appearance of spectators.
- 10. Construction or repair crews.
 - a. May indicate renovation or demolition of involved building.

FIRST RESPONDER OBSERVATIONS

- b. May indicate some involvement by crews.
- 11. Manner of dress. Are occupants dressed for time of day?
 - a. Night clothes at 3:00 a.m.?
 - b. Shoes/Boots tied?
 - c. Winter coats in cold weather?
- 12. Clothing. Look for indications of burns or singeing.
 - a. Accelerant fire may have flashed back on them.
 - b. May indicate their attempts to extinguish fire.
 - c. May indicate attempts to reenter burning structure for rescues or retrieval of property or pets.
- 13. Odors.
 - a. Are any ignitable liquid odors detected on spectators or victims?
 - b. Use of accelerant detection dogs to "sniff" a crowd is legal.
- 14. Injuries. Be observant for indications of burns to spectators/victims.
 - a. Soot around mouth/nose.
 - b. Singed hair, eyebrows, beard, or mustache.
 - c. Redness of skin on face, arms, or hands from first-degree burn.
- 15. Behavior of occupants.

FIRST RESPONDER OBSERVATIONS

- a. Excessive calmness may result from shock (trauma) or from a planned event.
- b. Excitement or incoherence can indicate apprehension.
- c. Did family members seem to have special items with them?
 - Toys, pets.
 - Fur coats, jewelry.
 - Insurance policy or other important papers.

<p>Environmental Considerations</p> <ul style="list-style-type: none">• Other fire activity in area• Areas with high transient occupants• Areas of high crime activity• Other crimes in area or community	<p>Slide 3-25 Environment Considerations</p>
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- C. Environmental considerations.
 1. Area has had a great deal of fire activity.
 - a. Similar to other fires in the area?
 - b. Timing about the same as other fires in the area?
 2. Areas with highly transient occupants.
 3. Areas of high crime activity (drugs, vandalism, etc.).

<p>Property For Sale</p> 	<p>Slide 3-26 Property for Sale</p>
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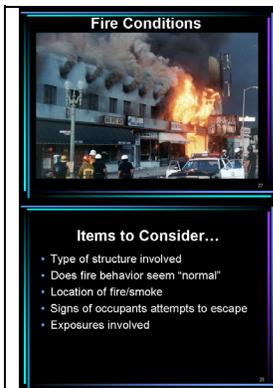
4. Property for sale.
 - a. How long has it been for sale?

The condition of the "For Sale" sign might be a good indication of the length of time the property has been on the market.



Slide 3-27 Other Considerations

- b. Is the building a residential structure in an area zoned for commercial?
 - c. Would the property be worth more without the structure?
 - d. Is the property condemned?
5. Property located in an area where people are not normally out and about at the time of the fire.
- a. Warehouse area.
 - b. Industrial park.
 - c. Waterfront or riverfront.
 - d. Depressed area.



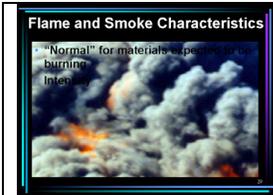
Slide 3-28 Fire Conditions

Slide 3-29 Items to consider...

- D. Fire conditions. Structure and location of fire.

FIRST RESPONDER OBSERVATIONS

1. Type of structure on fire?
2. Does fire spread seem normal for this type of building?
 - a. Vertical fire spread in a fire-resistive building is usually slow.
 - b. Vertical fire spread on dry wooden porches is usually fast.
 - c. Is this fire very different from others seen before for this type of structure?
- E. Fire location.
 1. On what level/floor is the fire?
 2. Had the fire spread to other areas before firefighters arrived?
 3. Had the fire been burning for a long time prior to arrival?
 4. Was there a delayed alarm?
 5. Could an accelerant have been used?
 6. Are structural members weakened or have they collapsed?
 7. Are there any signs of occupant attempts to escape?
 - a. Ladders against building.
 - b. Escape ladders hanging from windows.
 - c. Broken windows.
 - d. Ropes or bed sheets tied together.
 8. Are there exposures involved?
 - a. Which side of the structure?
 - b. Proximity of fire?



Slide 3-30 Flame and Smoke Characteristics

F. Flame and smoke characteristics.

1. Is the flame color normal for the material burning?

Ask the class to tell the flame colors for the following substances:

- Wood: yellow to red
- Cloth: yellow to red
- Gasoline: yellow to white
- Vinyl siding: orange to red
- Tires: dark red

2. Flame intensity.

- a. Lazy and rolling?
- b. Heavy and soaring?

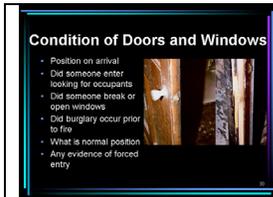
3. Is the smoke color normal for material that is burning?

Ask the class to provide the smoke colors for the following substances:

- Wood: gray to brown
- Cloth: gray to brown
- Gasoline: black
- Vinyl siding: black
- Tires: black

FIRST RESPONDER OBSERVATIONS

4. Smoke intensity.
 - a. Light.
 - b. Heavy.
5. Is the smoke showing in areas remote from the fire location?
 - a. Were there modifications to the building?
 - b. Is it wood frame-balloon construction?
 - c. Are there doors and/or windows open?



Slide 3-31 Condition of doors and windows

- G. Condition of doors and windows.
 1. Were any doors ajar upon arrival?
 - a. Did occupants leave them open when escaping?
 - b. Did witnesses or police enter looking for occupants?
 - c. Did the occupant or witnesses open doors or break windows to allow the smoke to escape?
 - d. Did a burglary occur prior to the fire?
 - e. Was it normal for doors to be unlocked or open?
 2. Discovery of forced doors or broken windows does not prove the fire was incendiary, but it can be an indicator.

FIRST RESPONDER OBSERVATIONS



Slide 3-32 Prior damage to hydrants, standpipes, Post Indicator Valve (PIV)

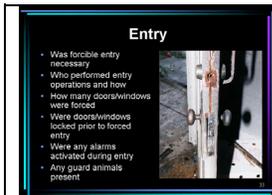
H. Prior damage to hydrants, standpipes, Post Indicator Valve (PIV).

1. Items stuffed in openings.
2. Stripped threads.
3. PIV in "CLOSED" position.
4. Tampering with alarm switch on PIV.



Slide 3-33 Fire suppression

VI. FIRE SUPPRESSION



Slide 3-34 Entry

A. Entry.

1. Was forcible entry necessary?
2. Who performed entry operations and how?
3. How many doors and/or windows were forced?
4. Were any alarms activated during entry?
5. Were any guard animals present?

6. Were any other security devices used?

<p>Obstacles</p> <ul style="list-style-type: none">• Doors barricaded from interior• Stock piled in front of doors• Panic bars chained closed• Security bars on doors and/or windows	<p>Slide 3-35 Obstacles</p>
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B. Obstacles.

1. Note any obstructions in entryways.
 - a. Doors barricaded from the interior.
 - b. Stock piled in front of exits.
 - c. Panic bars chained closed.
 - d. Holes cut in floor at entrances.
 - e. Security bars on doors and/or windows.
2. These conditions may be normal for the occupancy.

<p>Location and Extent of Fire</p> <ul style="list-style-type: none">• Fire found where it was expected• Anything unusual about location• Evidence of unusual fire travel• Evidence of "trailers"• Color of flames and smoke• Fire spread from area of origin• Evidence of separate fires	<p>Slide 3-36 Location and Extent of Fire</p>
--	---

C. Location and extent of fire.

1. Is the fire found where it was expected?
2. Is there anything unusual about the location?
3. Is there evidence of unusual fire travel?
4. Is there evidence of "trailers"?
5. Color of flames and smoke.
 - a. Is the color normal for material burning?

FIRST RESPONDER OBSERVATIONS

- b. Is there anything unusual about the flames or smoke?
6. Has the fire spread from its area origin?
7. Was fire spread connected to the point of origin by normal means?
8. Is there any evidence of separate fires?

<p>Difficulty in Extinguishment</p> <ul style="list-style-type: none">• Did room darken when water was applied• Any unusual reactions to water• Did fire flashback• Was fire floating on top of water• Was amount of water used for extinguishment similar to other fires	<p>Slide 3-37 Difficulty in extinguishment</p>
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D. Difficulty in extinguishment.

1. Did the room darken when water was applied?
2. Did the amount of water used for similar fires extinguish the fire?
3. Were there any unusual reactions to the fire when water was applied?
4. Did the fire flash back as soon as water application ended?
5. Was the fire floating on top of water?

<p>Alarm/Detection/Suppression</p> <ul style="list-style-type: none">• Smoke alarms present and operational• Fire alarm system present and operational• Fire sprinkler system present and operational• Any evidence of tampering	<p>Slide 3-38 Alarm/Detection/Suppression systems</p>
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E. Alarm/Detection/Suppression systems.

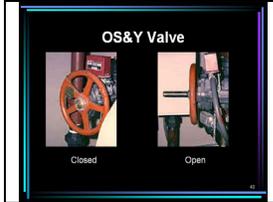
1. Smoke/Heat detectors functional and working?
2. Suppression equipment (sprinklers) functional and working?

FIRST RESPONDER OBSERVATIONS



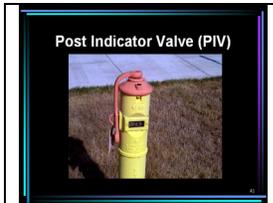
Slide 3-39 Evidence of Tampering with Equipment

3. Any evidence of tampering with the equipment?



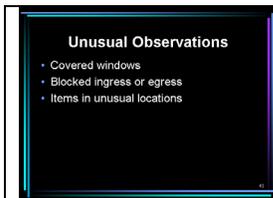
Slide 3-40 OS&Y Valve

4. OS&Y valve open or closed? If stem extends from wheel, valve is open.



Slide 3-41 Post Indicator Valve (PIV)

5. PIV open or closed?



Slide 3-42 Unusual Observations

- F. Unusual observations.
 1. Frequently, vacant commercial buildings will cover windows.
 2. Were windows or doors intentionally covered to hide the fire?
 - a. Shades drawn at 10:00 a.m. may be unusual.
 - b. May be explained later by owner/occupant.

FIRST RESPONDER OBSERVATIONS

3. Are means of egress blocked or locked?

Occupants who just escaped may not have locked door behind them.

4. Did observations include anything unusual or unnatural?

- a. Candles in unusual locations.
- b. Heat-producing appliances in unusual locations.
- c. Combustibles placed too close to heaters.
- d. Unusual storage of flammable/combustible liquids.
- e. Cooking fires at unusual times.
- f. Unusual fire spread.
- g. Excessive amount of fire for room contents.
- h. Furniture stacked in one area of room.
- i. Less-than-normal room contents.

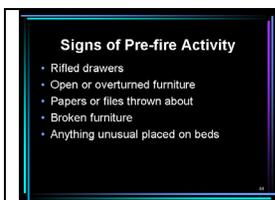
 <p>Post Suppression</p>	Slide 3-43 Post suppression
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VII. POST SUPPRESSION

 <p>Delay of Overhaul</p> <ul style="list-style-type: none">• If an investigator is going to be used for origin and cause determination, delay overhaul• Overhaul may destroy some evidence	Slide 3-44 Delay of Overhaul
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FIRST RESPONDER OBSERVATIONS

- A. Delay of overhaul.
1. If an investigator is going to be used for origin and cause determination, delay any overhaul procedures.
 2. When overhaul is conducted indicators such as burn patterns can be destroyed.
 3. Oftentimes evidence is removed from the scene and destroyed.
 4. All attempts should be made to preserve the scene.
- B. Removal of items.
1. Do any items appear to be missing or out of place?
 - a. Items of sentimental value (Bibles, family photos, statues, china, paintings, etc.).
 - b. Documents (business records, birth certificates, marriage licenses, diplomas, etc.).



Slide 3-45 Signs of Pre-fire activity

2. Signs of unusual prefire activity.

Point out that fire can be a convenient way to cover actions associated with theft, burglary, etc.

- a. Signs of burglary.
 - Rifled drawers.

FIRST RESPONDER OBSERVATIONS

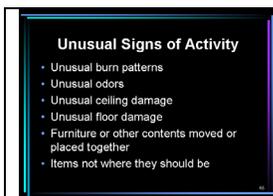
- Open or overturned files.
- Papers or files strewn about.

- b. Broken furniture.
- c. Forced entry into closets.



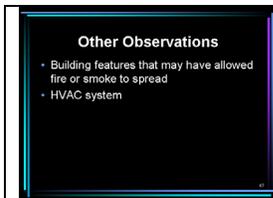
Slide 3-46 Contents

- 3. Pictures removed from walls.
- 4. Clothes removed from dressers or closets.
- 5. Anything unusual placed on beds?
 - a. Clothing of a spouse or lover.
 - b. Treasured items of spouse or someone else (photos, records, tapes, CDs, videos, or collectibles).
 - c. Sports or hobby equipment, including trophies.
- 6. Appliances.
 - a. Are any appliances missing?
 - b. Do the appliances fit into the built-in spaces?
 - c. Are there indentations in the flooring from the adjustable foot pegs? Do they match the appliances that are there?



Slide 3-47 Unusual signs of fire activity

- C. Unusual signs of fire activity.
 - 1. Any unusual burn patterns?
 - a. Running type.
 - b. Holes burned downward.
 - c. Narrow or tapered "V" patterns.
 - 2. Any unusual odors?
 - 3. Any significant ceiling damage?
 - a. Does the damage correspond with fire damage below?
 - b. Is it consistent with what should have been burning in the area?
 - 4. Furniture or equipment moved or placed conveniently for the fire?
 - a. Pulled close together.
 - b. Piled up.
 - c. Drawers opened.
 - 5. Evidence of items that may have caused fire or spread fire.
 - a. Items not where they should be (flammable liquid containers, timing devices, etc.).
 - b. Items missing or moved that should be present (electric outlet or light switch covers, etc.).
 - c. Doors blocked in an open position (especially fire doors).
 - d. Windows opened on a cold day.



Slide 3-48 Other Observations

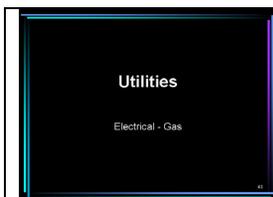
D. Other observations.

1. Structure.

a. Building features that may have allowed fire or smoke to spread.

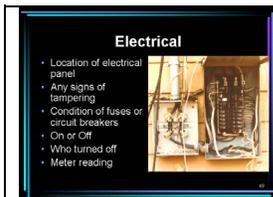
- Open stairways.
- Vents (clothes dryer, kitchen, bathroom).
- Plumbing or electrical shafts.
- Heat ducts/Cold air returns.
- Laundry chutes.

b. Abnormalities that may have caused fire spread (e.g., fans operating).



Slide 3-49 Utilities

2. Utilities.



Slide 3-50 Electrical

a. Electric panel.

- Fuses or breakers.

- Condition of protection.
- Signs of tampering.

<p>Gas</p> <ul style="list-style-type: none">• On or Off• Who turned off• Location of meter or tank• Volume of tank• Signs of tampering• Meter reading 	<p>Slide 3-51 Gas</p>
--	-----------------------

- b. Gas service.
 - On or off.
 - Natural gas.
 - Propane or butane.
 - Did fire department turn the service off?
- c. Electrical equipment in area of fire origin.
 - Signs of malfunction.
 - Signs of overheating.
 - Signs of misuse.
 - "Victim" or cause of fire?

<p>Behavior of Occupants/Owners</p> <ul style="list-style-type: none">• Eager to enter structure after under control• Agreeable to be escorted by fire fighter• Immediately do to area of origin• Overly critical of fire department operations	<p>Slide 3-52 Behavior of occupants/owners</p>
---	--

- 3. Behavior of occupants/owners.
 - a. Eager to enter structure after fire brought under control?
 - b. Agreeable to being escorted by a firefighter?

- May want to see damage they caused.

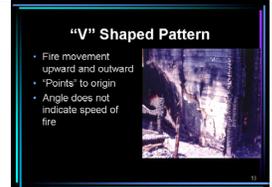
- May want to attempt to remove evidence.

c. Did they go immediately to the area that could have been area of fire origin?

d. Were they overly critical of fire department operations?

 A slide titled "Fire Patterns" with a black background and white text.	Slide 3-53 Fire Patterns
--	--------------------------

E. Fire patterns.

 A slide titled "'V' Shaped Pattern" with a black background. It contains a list of bullet points and a photograph of a fire scene. The bullet points are: "Fire movement upward and outward", "'Points' to origin", and "Angle does not indicate speed of fire".	Slide 3-54 "V" shaped pattern
---	-------------------------------

1. "V" shaped pattern.

a. Lateral spread of the sides of this pattern caused by radiated heat from above and upward, and outward movement of flames and hot gases when encountering horizontal surface.

b. Angles of the lines often can be traced back to the point or area of origin.

c. Misconception.

- It was long believed that a narrow-angle "V" was produced by a fast-burning fire, while a wide-angle "V" was the result of a slow-burning fire.

- d. Factors that affect the angle of the "V."
 - Size of the fire.
 - Burning rate (RHR).
 - Ventilation.
 - Combustibility of the walls.
- e. Angle of "V" is not caused by RHR alone.



Slide 3-55 Inverted cone patterns

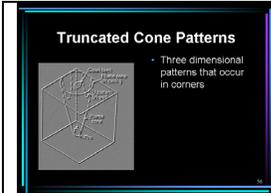
- 2. Inverted cone patterns.
 - a. Also called inverted "V" patterns.
 - b. The result of relatively short-lived fires which do not fully evolve into floor-to-ceiling flame plumes or that are not restricted by ceilings.
 - c. Can be caused by any fuel burning.
 - d. Misconception.
 - Since they often appear on noncombustible surfaces it was thought they were caused by fast burning fires, e.g., accelerants.



Slide 3-56 Hourglass pattern

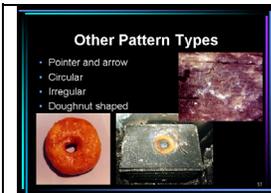
- 3. Hourglass patterns.

- a. A combination of a plume of hot gases and the flame zone.
- b. The plume of hot gases causes a "V" pattern, while flame zone is shaped like an inverted "V."
- c. Resulting pattern is in the shape of an hourglass.



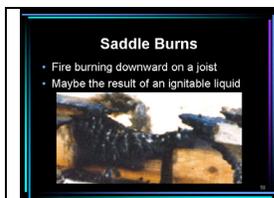
Slide 3-57 Truncated cone pattern

4. Truncated cone patterns.
 - a. Three-dimensional patterns that occur in corners.
 - b. Cone-shaped patterns are the result of the natural expansion of the fire plume as it rises and the horizontal spread of the heat's energy when the plume encounters a horizontal surface such as a ceiling.



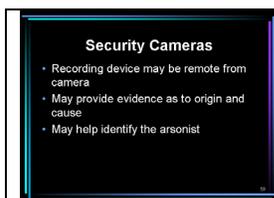
Slide 3-58 Other Pattern Types

5. Other pattern types.
 - a. Pointer and arrow.
 - b. Circular.
 - c. Irregular.
 - d. Doughnut shaped.



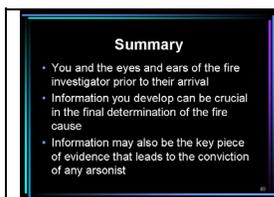
Slide 3-59 Saddle Burns

6. Saddle burns.
 - a. Occurs when flammable or combustible liquid seeps into cracks of floor and causes downward burning.
 - b. Usually found between floorboards or on wooden joists.
 - c. So named because resulting pattern resembles shape of a saddle.
 - d. Possible indicator of presence of ignitable liquids.



Slide 3-60 Security Cameras

- F. Security cameras.
 1. Examine area for security cameras. Recording device may be remote from camera.
 2. May provide evidence of fire cause.
 3. May identify arsonist.
 4. Even if camera or film is heat damaged, it may still be enhanced and usable.



Slide 3-61 Summary

VIII. SUMMARY

- A. As a first responder, your observations are very critical in identifying the indicators of incendiary fires.
 - 1. You become the eyes and ears of the fire investigator prior to his/her arrival.
 - 2. Information that the first responder observes and obtains can be very crucial in the final determination of the fire cause.
 - 3. This information also may be the key piece of evidence that can convict an arsonist in a court of law.

- B. Be thorough, be professional, and be sure to report any unusual or unnatural observations to both the Incident Commander/Supervisor and the fire investigator.

UNIT 4: FIRE CAUSES

OBJECTIVES

The students will be able to:

- 1. List and describe numerous causes of accidental fires.*
 - 2. Identify the most common incendiary methods used by firesetters.*
 - 3. List and explain the most common types of incendiary devices.*
-

POINTS FOR THE INSTRUCTOR

This unit will describe the various causes of fires, but will focus on incendiary-caused fires. The beginning of the unit lists numerous causes for accidental fires; however, each accidental cause will not be discussed at length. The next portion of the unit discusses the various indicators of incendiary structure fires and various incendiary devices that may be encountered by the first responder. The final section will discuss indicators of incendiarism relating to vehicle fires. Incendiary fire indicators are the basis of this course and the first responder must have a basic knowledge of these indicators.

METHODOLOGY

This unit uses lecture and discussion.

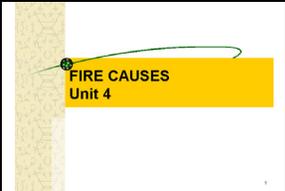
(TOTAL TIME: 3 HR., 30 MIN.)

210 min. Lecture/Discussion

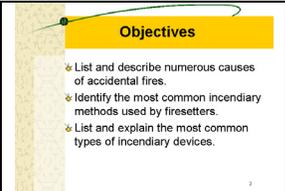
I.	OBJECTIVES	3
II.	INTRODUCTION	4
III.	TWO CAUSES.....	5
IV.	ACCIDENTAL FIRE CAUSES.....	7
V.	INCENDIARY STRUCTURE FIRES.....	8
VI.	COMMON EQUIPMENT/APPLIANCES USED AS INCENDIARY DEVICES	21
VII.	REMOVAL OR SUBSTITUTION OF CONTENTS PRIOR TO FIRE	22
VIII.	ABSENCE OF PERSONAL ITEMS OR IMPORTANT PAPERS	24
IX.	UNNATURAL FIRE SPREAD, EXCESSIVE DAMAGE, AND/OR EXTREME HEAT	26
X.	LIMITED ENTRY OR VIEW.....	29
XI.	EXCESSIVE TIME BETWEEN EXIT OF OCCUPANT AND FIRE	30
XII.	TIMING OF INCENDIARY FIRES	30
XIII.	INCENDIARY DEVICES.....	32
XIV.	INCENDIARY VEHICLE FIRES	40
XV.	SUMMARY	52
	BIBLIOGRAPHY	53

AUDIOVISUAL

Slides 4-1 to 4-82

 A thumbnail for slide 4-1 titled 'FIRE CAUSES Unit 4'. It features a yellow background with a green arrow pointing to the right.	Slide 4-1 Fire Causes
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Read the unit objectives with the class and explain to them that because this course emphasizes arson detection, the main focus of this unit will be based on the indicators of incendiarism.

 A thumbnail for slide 4-2 titled 'Objectives'. It lists three bullet points: 'List and describe numerous causes of accidental fires.', 'Identify the most common incendiary methods used by firesetters.', and 'List and explain the most common types of incendiary devices.'.	Slide 4-2 Objectives
---	----------------------

210 min.
Lecture/
Discussion

I. OBJECTIVES

The students will be able to:

- A. List and describe numerous causes of accidental fires.
- B. Identify the most common incendiary methods used by firesetters.
- C. List and explain the most common types of incendiary devices.

II. INTRODUCTION

<p>Introduction</p> <ul style="list-style-type: none">✦ Many accidental fires are result of equipment or appliance malfunctions beyond control of owner/occupant.✦ Carelessness or neglect on part of owner/occupant also causes accidental fires.	<p>Slide 4-3 Introduction</p>
--	-------------------------------

- A. There are several reasons why a fire may start accidentally, and the first responder should be familiar with them.
1. Many accidental fires are the result of equipment or appliance malfunctions that are beyond the control of the victim.
 2. Carelessness or neglect on the part of the owner/occupant also cause accidental fires, but this does not make the cause incendiary.
 3. The first responder must realize that for a fire to be incendiary, most states require that intent or recklessness on the part of the firestarter be proved.

<p>Incendiary Fires...</p> <ul style="list-style-type: none">✦ Usually leave behind some type of indicator.✦ Most arsonists are not very clever.✦ Common ignitable liquid used is gasoline.	<p>Slide 4-4 Incendiary Fires</p>
--	-----------------------------------

- B. Fires of incendiarism usually leave behind some type of indicators that are indicative only to this fire cause.
1. Most arsonists are not very clever, and will use the most commonly available materials to initiate the fire.
 2. Most arsonists use gasoline to accelerate the fires because it is the most readily available flammable liquid.

3. Most arsonists leave behind telltale indicators and evidence that the first responder must be able to identify.

C. Some firesetters are quite clever and construct elaborate devices to initiate a fire.

<p>Some Fire Setters Are Quite Clever...</p> <ul style="list-style-type: none">✦ May use device of an electrical, mechanical or chemical nature.✦ Device is as elaborate as the imagination of the arsonist.✦ Most devices leave behind some type of residual evidence.	Slide 4-5 Clever Arsonists
--	----------------------------

1. These devices include electrical, mechanical, and chemical components, and the device is as elaborate as the imagination of the arsonist.
2. Most devices leave some type of residual evidence after the fire, and the first responder must be aware of these while performing such duties as fire suppression and overhaul.

<p>Two Causes</p> <p>Accidental - Incendiary</p>	Slide 4-6 Two Causes
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III. TWO CAUSES

A. There are only two causes for a fire:

<p>Accidental</p> <ul style="list-style-type: none">✦ Does not involve a deliberate human act to ignite the fire where the fire should not be✦ Some place "natural" into this category✦ Natural fires are those without any direct human intervention such as lightning, earthquake, wind and the like	Slide 4-7 Accidental
---	----------------------

1. Accidental, including all fires of a natural cause ("Acts of God").
 - a. Floods.

FIRE CAUSES

- b. Earthquakes.
- c. Hurricanes.
- d. Tornadoes.
- e. Lightning.

<p>Incendiary</p> <p>✦ Deliberately ignited under circumstances in which the person knows that the fire should not be ignited.</p>	Slide 4-8 Incendiary
---	----------------------

- 2. Incendiary.
 - a. All fires that are intentionally started.
 - b. In some states, may include recklessness.

<p>Undetermined</p> <p>✦ Under investigation ✦ Used whenever cause cannot be determined</p>	Slide 4-9 Undetermined
--	------------------------

- B. Sometimes a fire cause cannot be determined.
 - 1. Total destruction of building or vehicle.
 - 2. No evidence remains after fire.
 - 3. These fires should be classified as undetermined.
 - a. This is not an official cause.
 - b. The job can be classified as "under investigation."

May require "leaving the file open pending further information" to reopen the investigation.

<p>Suspicious</p> <ul style="list-style-type: none">Should not be used as a determination of fire causeSimply reflects the presence of indicators of possible incendiariismAt the "end of the day", the cause must be listed as "accidental", "incendiary", or "undetermined"	<p>Slide 4-10 Suspicious</p>
--	------------------------------

C. The term "suspicious" should not be used as a fire cause determination.

If indicators of incendiariism are present, but further investigation is required before a proper determination is made, refer to the fire as "under investigation."

<p>Accidental Fire Causes</p>	<p>Slide 4-11 Accidental Fire Causes</p>
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IV. ACCIDENTAL FIRE CAUSES

The following is a list of various fire causes that are frequently linked with fires that are determined to be accidental in cause:

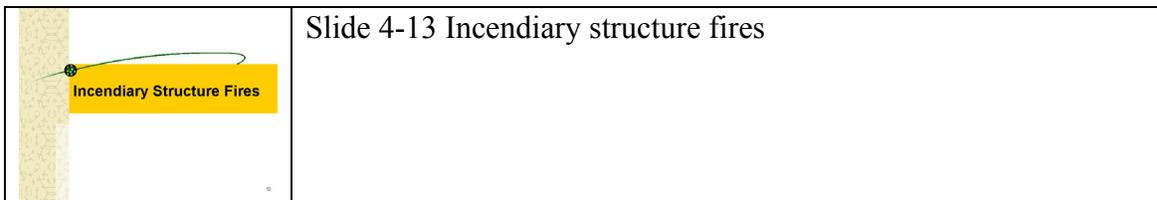
- A. Heating equipment.
 - 1. Electric space heaters.
 - 2. Fireplaces/Wood-burning stoves.
 - 3. Furnaces/Water heaters/Boilers.

<p>Some Accidental Fire Causes</p> <ul style="list-style-type: none">Heating equipmentCooking equipmentSmoking and related firesElectrical systems and equipmentFlammable & combustible liquidsOpen flames and sparksSpontaneous heatingGas fires and explosionsFireworks and explosivesDust explosionsLow temperature ignitionLightning	<p>Slide 4-12 Some Accidental Fire Causes</p>
--	---

- B. Cooking equipment.
- C. Smoking and related fires.

FIRE CAUSES

- D. Energized electrical equipment.
- E. Flammable and combustible liquids.
- F. Open flames and sparks.
- G. Spontaneous heating leading to ignition.
- H. Gas fires and explosions.
- I. Fireworks and explosives.
- J. Dust explosions.
- K. Low-temperature ignition.
- L. Lightning.
- M. Rural area fires.
- N. Wildland fires.
- O. Sunlight.
- P. Chemical spills.
- Q. Christmas trees.



V. INCENDIARY STRUCTURE FIRES

Advise the students that the following study of indicators of incendiaryism is not complete, since there are many situations which help to identify the set fire. However, indicators discussed here are common in many set fires and frequently are used as evidence of incendiaryism.

<p>Trailer Materials</p> <ul style="list-style-type: none">Any combustible or flammable material used to spread fire from one point to anotherUsually leave char or burn pattern on surface where usedMay be found through doors, windows, or wall openings	<p>Slide 4-14 Trailer Materials</p>
--	-------------------------------------

A. Trailers.

1. "Any combustible or flammable material used to spread fire from one point to another."
2. Trailers usually leave char or burn pattern on surfaces where used.
 - a. Floors.
 - b. Carpets.

<p>Steps</p> 	<p>Slide 4-15 Steps</p>
<p>Steps</p> 	<p>Slide 4-16 Steps</p>

- c. Steps.
- d. Ceilings.
- e. Furniture.

<p>• May Have Existing Openings Made for Fire Spread</p>  <p>17</p>	<p>Slide 4-17 May have existing openings or openings made for fire spread</p>
--	---

- f. Through doors, windows, or wall openings. (May have existing openings or openings made for fire spread).

<p>Common Trailer Materials</p> <ul style="list-style-type: none">• Newspaper• Rope, string, twine• Fuse cord• Clothing, bedclothes, drapes, or other similar materials• Tissue paper• Waxed paper• Bounce fabric softener sheets• Ignitable liquids• Building contents <p>18</p>	<p>Slide 4-18 Common Trailer Materials</p>
---	--

- 3. Common trailer materials.
 - a. Newspapers (flat, rolled, or bunched).
 - b. Rope, string, twine, etc.
 - c. Fuse cord.
 - May produce "skip" char pattern.
 - May leave asphalt-like residue.
 - d. Clothing, bedclothes, drapes, or other household materials.
 - e. Tissue paper.
 - f. Waxed paper.
 - g. Bounce™ fabric softener sheets.
 - This brand is one of few that will not self-extinguish.
 - h. Flammable accelerant.

<p>Ignitable Liquids</p> <ul style="list-style-type: none">✦ Flammable or combustible liquids✦ Often normally found in many areas of buildings✦ May be "foreign" or out of place in an occupancy 	<p>Slide 4-19 Ignitable Liquids</p>
---	-------------------------------------

- Gasoline.
 - Kerosene.
 - Fuel oils.
 - Alcohol. May be difficult to detect as it evaporates quickly, is water soluble, and is usually consumed by the fire. May be scented.
 - Charcoal or cigarette lighter fluid.
 - Any other common or readily available flammable liquid fuel.
- i. Building contents may occasionally be arranged to form a trailer.
 - j. Trailers often are used with incendiary devices such as candles.

B. Presence of flammable liquids.

1. Often found in areas where they would not normally be in a given occupancy.

Flammable liquids may be common to some occupancies or to certain areas within the occupancy. Lead a discussion on situations or locations where the presence of a flammable liquid may not indicate incendiarism.

<p>Common Indicators...</p> <ul style="list-style-type: none">✦ Heavy, isolate floor damage✦ "V" burns or grooves between floorboards✦ Unusual patterns on flooring materials✦ Unusual low burning✦ Holes burned through floors✦ Spalling of concrete <p>20</p>	<p>Slide 4-20 Common Indicators</p>
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2. Suspect flammable liquids when:
 - a. No sign of container explosion.
 - b. No sign of container leakage.

<p>Common Indicators (cont'd)</p>  <p>21</p>	<p>Slide 4-21 Common Indicators (cont'd)</p>
<p>Common Indicators (cont'd)</p>  <p>22</p>	<p>Slide 4-22 Common Indicators (cont'd)</p>

3. Probable cause when found above floor level and there are other factors.
 - a. Not caused by an explosion.

<p>Common Indicators (cont'd)</p>  <p>23</p>	<p>Slide 4-23 Common Indicators (cont'd)</p>
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<p>Common Indicators (cont'd)</p>  <p>24</p>	<p>Slide 4-24 Common Indicators (cont'd)</p>
--	--

- b. On or in furniture.

<p>Common Indicators (cont'd)</p> 	<p>Slide 4-25 Common Indicators (cont'd)</p>
<p>Common Indicators (cont'd)</p> 	<p>Slide 4-26 Common Indicators (cont'd)</p>

c. Inside drawers, cabinets, boxes, etc.

<p>Common Indicators (cont'd)</p> 	<p>Slide 4-27 Common Indicators (cont'd)</p>
---	--

d. Inside files, desks, books, etc.

4. Common indicators of the presence (or use) of some flammable/combustible liquid accelerants (fuels).

<p>Common Indicators (cont'd)</p> 	<p>Slide 4-28 Common Indicators (cont'd)</p>
<p>Common Indicators (cont'd)</p> 	<p>Slide 4-29 Common Indicators (cont'd)</p>

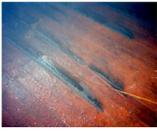
a. Charring of floor surface.

<p>Common Indicators (cont'd)</p> 	<p>Slide 4-30 Common Indicators (cont'd)</p>
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 <p>Common Indicators (cont'd)</p>	<p>Slide 4-31 Common Indicators (cont'd)</p>
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- Usually, most accidental fires produce very little floor charring.

- Temperatures at floor level are usually below ignition temperature in most fires.

 <p>Common Indicators (cont'd)</p>	<p>Slide 4-32 Common Indicators (cont'd)</p>
 <p>Common Indicators (cont'd)</p>	<p>Slide 4-33 Common Indicators (cont'd)</p>

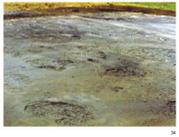
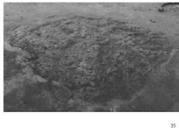
- b. "V" burns or grooves between floorboards may indicate the presence of a liquid fuel.

Point out that flammable liquids may soak between floorboards, burn, and develop small, sharp "V" patterns between edges of floorboards.

- Flammable liquids may run through flooring. Produces burning under the floor.

- Charring must not have come from below.

- Evidence (residue) may be recovered from between floor and subfloor.
- Settling of flammable liquids.
- Lowest parts of the floor surface.
- Corners of rooms and along base of walls.
- Areas of heavy occupant travel or use such as doorways, in front of sink or stove, halls, etc.
- Flammable liquids produce charring in puddle or running patterns. They also may splash on doors and walls (appearance of small black spots).
- Flammable liquids may soak into absorbent material.
- Carpets--leaves distinct pattern. Residue in carpet and pad on edge of burned area or in remaining charred pad.
- Floor-length drapes act like wicks and will absorb liquid pours from floor.
- Porous materials such as plaster walls also will absorb liquids.

	<p>Slide 4-34 Spalling</p>
	<p>Slide 4-35 Spalling (cont'd)</p>

- c. Spalling of concrete or masonry.
 - Spalling is a result of concrete or masonry being heated and then rapidly cooled by water. It also can result from the heating of moisture trapped within the concrete or masonry.
 - Causes surface to crack and loosen. It can produce a pitted appearance or large cracks.
 - Can indicate possible use of accelerants. However, must not be used as a sole indicator.
 - Other possible causes of spalling: age of concrete, and concrete mixture.
 - Chemical reactions.
 - Mechanical breaks.
 - Extreme hot or cold temperatures.
- d. Blistering or destruction of floor tiles.
 - Asphalt and vinyl tiles may be blistered or destroyed in an area where flammable liquids spread.

- e. Flammable liquids may produce unusual burning of contents or building components.

- Charring on bottom surface of the doors is often an indicator of flammable liquids at floor level.

- Burning of floor surface along its edge or at contact with walls may be due to the presence of flammable accelerants.

Corners and wall-to-floor edges may be dead air spaces which suffer little, if any, fire damage unless flammable accelerants are present.

- Flammable liquids may carry flame behind baseboards or moldings. These should be removed and examined.

- The charring of the undersides of furniture usually indicates that the fire was burning below the furniture, possibly fed by an accelerant. However, this can be misleading because of the various types of foam padding.

- f. Firefighters may have witnessed flashbacks in areas saturated with flammable accelerants.

- g. The burning of combustible building components (wood) produces char in a broken pattern.

Advise the students to avoid using the term "alligator char," as this is an incorrect term and not really defined in any text. When describing a char pattern resulting from a flammable liquid, simply describe the appearance of the char.

h. Misconceptions about char.

<p>Charring</p> <ul style="list-style-type: none">✦ No such thing as alligator char (old firefighters' tale)✦ Misconceptions about appearance✓ Large shiny blisters = ignitable liquid✓ Dullness, shininess or colors = ignitable liquid✓ Depth of char = accurate estimate of duration of fire	<p>Slide 4-36 Charring</p>
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<p>Charring (Cont'd)</p> 	<p>Slide 4-37 Charring</p>
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- The appearance of the char and cracks has been given meaning by the fire investigation community beyond what has been substantiated by controlled experimentation.

- It has been widely stated that the presence of large shiny blisters (alligator char) is proof that a liquid accelerant was present during the fire. This is a misconception.

- These types of blisters can be found in many different types of fires.

- There is no justification that the appearance of large, curved blisters is an exclusive indicator of an accelerated fire.

- It is sometimes claimed that the surface appearance of the char, such as dullness, shininess, or colors, has some relation to the use of a hydrocarbon accelerant.

- There is no scientific evidence of such a correlation, and the investigator is advised not to claim indications of accelerant on the basis of the appearance of the char alone.

- Depth of char is often used to estimate the duration of a fire.

- The rate of charring of wood varies widely depending upon such variables as:

-- Rate and duration of heating.

-- Ventilation effects.

-- Surface area to mass ratio.

-- Direction, orientation, and size of wood grain.

-- Species of wood (pine, oak, fir, etc.).

-- Moisture content.

-- Nature of surface coating.

- The investigator is cautioned that no specific time of burning can be determined based solely on depth of char.

- i. Burning in a "downward" direction is considered unnatural and may have resulted from flammable liquids that may have run and carried flames down.
- j. Flammable liquids may soak into floors and cause burn holes in the flooring.

- Holes produced by flammable accelerants on floor surfaces are often irregularly shaped.
- Such holes may even follow the direction of the flooring joints.
- Flammable liquid accelerants may produce a "flashover" appearance in the involved area.

k. Floor is unevenly burned when a flammable liquid is used and usually evenly burned if due to flashover.

 The slide contains a yellow title bar at the top left that reads "Ignitable Liquid Containers". Below the title bar are four small, square photographs. The top-left photo shows a person in a dark jacket and light-colored pants standing next to a dark-colored vehicle. The top-right photo shows a close-up of a white surface with a dark, irregular stain. The bottom-left photo shows a blue and white container, possibly a fuel tank or a canister. The bottom-right photo shows a close-up of a white surface with a dark, irregular stain, similar to the one in the top-right photo.	Slide 4-38 Ignitable liquid containers
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- l. Discovery of flammable liquid containers.
- May provide comparison sample for lab analysis.
 - If the container is not damaged, it may help to prove that spread of accelerant was not due to explosion.
 - Often, latent fingerprints can be obtained. Let lab personnel remove prints.
- m. First responders may have noticed flammable liquid odors. Odors often remain after extinguishment. Sometimes during overhaul, when debris is removed, a pocket of accelerant is exposed.
- n. Indicators of flammable liquids that may have been involved during early stages of fire.

- Color of smoke.

- Color of flame.

Caution: Due to the composition of the newer furnishings (plastics, polyfoams, etc.) in both residential and commercial structures, this is not as true as it once was.

 <p>Common Equipment/ appliances Used As Incendiary Devices</p>	<p>Slide 4-39 Common Equipment/Appliances Used as Incendiary Devices</p>
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VI. COMMON EQUIPMENT/APPLIANCES USED AS INCENDIARY DEVICES

 <p>Common Equipment/Appliances</p> <ul style="list-style-type: none">* Heating and cooking equipment* Lighting* Small appliances* Smoking materials 	<p>Slide 4-40 Common Equipment Appliances</p>
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- A. Heating and cooking equipment.
 - 1. Check control settings.
 - 2. Tool marks on fuel lines.
 - 3. Tampering with fuel supply lines, wiring, etc.

- B. Lighting equipment.
 - 1. Check for tampering.
 - 2. Check for evidence of lighting equipment in unnatural locations.
 - 3. Check for evidence of combustible fuel being arranged nearby.

<p>Toasters</p> 	<p>Slide 4-41 Toaster</p>
<p>Coffee Makers</p> 	<p>Slide 4-42 Coffee Maker</p>

- C. Small appliances or equipment.
 - 1. Appliance/Equipment being used in unnatural locations.
 - 2. Appliance/Equipment being used at unusual time.
 - 3. Evidence of tampering or modification.

D. Cigarettes.

Often difficult to prove intent.

<p>Removal or Substitution of Contents</p> <ul style="list-style-type: none">✦ Expensive objects, antiques, or objects with sentimental value✦ Substitution with "junk"✦ Maybe witnessed by neighbors✦ Contents out of place or not assembled✦ Major appliances removed or replaced	<p>Slide 4-43 Removal/Substitution of contents</p>
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VII. REMOVAL OR SUBSTITUTION OF CONTENTS PRIOR TO FIRE

- A. Expensive objects, antiques, or objects with sentimental value may be removed.
- B. Substitution of contents.
 - 1. Owner may remove original contents and replace them with junk furnishings.

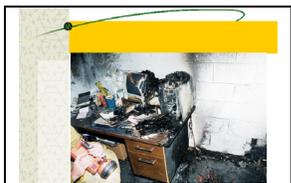
- a. Arsonist may hope firefighters will not be able to identify quality of contents.
 - b. Arsonist thinks total destruction by fire will cover switch of furnishings.
 2. Neighbors may have witnessed exchange of contents or the presence of a truck or trailer.
 3. Source of junk contents may be identified.
 - a. Used furniture stores.
 - b. Salvation Army, Volunteers of America, etc.
- C. Contents out of place or not assembled.
 1. The owner or occupants may stack or pile combustible contents to provide fuel for the fire.
 2. Used or junk furniture may be brought into structure, but left unassembled.
 - a. Arsonist believes evidence will be destroyed.
 - b. Evidence usually can be located.
 3. Locking plates from beds should show locking surfaces clear of smoke stains and/or heat damage if the units were assembled at time of fire.
 4. Drawers, when in closed position, usually burn late in the fire.
 5. Evidence of empty storage containers (boxes, drawers, etc.) is unusual and suspicious.
- D. Major appliances removed prior to fire.

1. Major cost items may be removed and substituted items may or may not be used.
2. Substitute appliances may not be connected to power outlets or fuel lines.
3. Substitute appliances may be empty, in bad repair, or in poor condition.
4. Substitute appliances may not fit area of installation.
 - a. Check floor or cabinet cutout area for indications that unit does not fit.
 - b. Check for indentations of leveling or leg buttons in floor covering.

 <p>Absence of Personal Items or Important Papers</p> <ul style="list-style-type: none">✦ Hand tools✦ Power tools✦ Work clothing✦ Business machines✦ Guns✦ Petty cash✦ Expensive clothing✦ Jewelry✦ Photographs✦ Family records✦ Hobby/sports equipment✦ Insurance policies✦ Marriage and church records✦ Checking and savings account records✦ School records✦ Wills	<p>Slide 4-44 Absence of personal items/important papers</p>
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VIII. ABSENCE OF PERSONAL ITEMS OR IMPORTANT PAPERS

- A. Most homes and businesses contain personal items.

	<p>Slide 4-45 Absence of Personal Items or Important Paper</p>
	<p>Slide 4-46 Absence of Personal Items or Important Paper</p>

- B. Absence of personal items may indicate that only basic contents were left to burn.

1. Business, commercial, or industrial occupancies.



Slide 4-47 Absence of Personal Items or Important Paper

- a. Hand tools.
 - b. Portable power tools.
 - c. Work clothing (uniforms).
 - d. Business machines (typewriter, checkwriter, calculators, copiers, fax machines, etc.).
 - e. Guns.
 - f. Petty cash.
2. Residential occupancies.
 - a. Expensive clothing (furs).
 - b. Jewelry.
 - c. Family photographs/wedding albums.
 - d. Family records (birth and/or marriage certificates, family Bible, etc.).
 - e. Hobby equipment.
 - f. Guns and/or fishing equipment.
 - g. Sports equipment and/or trophies.
 - h. Tools.
- C. Important papers are frequently removed prior to a set fire.

1. Insurance policies.

Some people continue to believe it is necessary to have their copy of an insurance policy in order to collect on the loss.

2. Marriage and church records.
3. Checking and savings account books.
4. Titles and deeds.
5. School records (diplomas).
6. Wills.

<p>Unnatural Fire Spread, Excessive Damage and/or Extreme Heat</p> <ul style="list-style-type: none">• "Unnatural" fire spread may be due to an ignitable liquid• Excessive or unusual fire damage compared to similar fires• Excessive or unusual heat levels compared to similar fires	<p>Slide 4-48 Unnatural Fire Spread, Excessive Damage, and/or Extreme Heat</p>
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IX. UNNATURAL FIRE SPREAD, EXCESSIVE DAMAGE, AND/OR EXTREME HEAT

- A. Unnatural fire spread may be due to some accelerant.
 1. What appears to be unnatural fire spread by itself proves nothing.
 2. But such situations should cause the first responder to conduct an extensive scene examination.

- B. Excessive fire damage as compared to similar fires in similar occupancies.

Fire damage may have been increased due to the presence of an accelerant.

- C. Evidence of extreme heat may be unnatural and may be due to an accelerant.

<p>Heat Levels</p> <ul style="list-style-type: none">Structural fires can produce temperatures up to and above 1,900 degrees FSuch temperatures usually occur in later stages of fireMelting of metals may indicate unusual temperatures	<p>Slide 4-49 Heat Levels</p>
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1. Structural fires may produce extreme temperatures up to and above 1,900°F (1,037.7°C).
 - a. Usually occurs during later stages of fire, or when structure is fully involved.
 - b. During earlier stages of the fire, and at ceiling levels of the structure, temperatures may not exceed 1,400°F (760°C).
2. The melting of metals within the structure may indicate an extremely hot fire.

<p>Melting Temperature</p> <table border="1"><thead><tr><th>Metal</th><th>Temperature (F)</th></tr></thead><tbody><tr><td>Solder</td><td>361</td></tr><tr><td>Lead</td><td>618</td></tr><tr><td>Zinc</td><td>878</td></tr><tr><td>Aluminum</td><td>1220</td></tr><tr><td>Copper</td><td>1981</td></tr><tr><td>Iron</td><td>2781</td></tr><tr><td>Chrome</td><td>3407</td></tr></tbody></table>	Metal	Temperature (F)	Solder	361	Lead	618	Zinc	878	Aluminum	1220	Copper	1981	Iron	2781	Chrome	3407	<p>Slide 4-50 Melting Temperature</p>
Metal	Temperature (F)																
Solder	361																
Lead	618																
Zinc	878																
Aluminum	1220																
Copper	1981																
Iron	2781																
Chrome	3407																

Melting temperatures given are for metals in a pure state. Most common metals are alloys, and melting temperatures will vary from those shown.

- a. The discovery of an aluminum storm window frame which melted during the fire might not indicate excessive heat if the fire vented through that window opening.
- b. Additionally, since the upper portion of the window frame extends into the upper portion of the involved room, one could expect the aluminum frame to melt.

- c. Finding the aluminum threshold of a doorway melted may indicate excessive heat, since the floor surface generally stays much cooler than the upper portions of an involved room. This also may indicate the possible use of an accelerant. Samples should be taken.

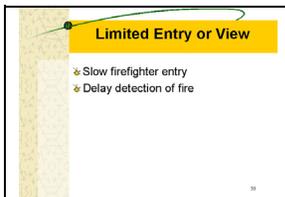
APPROXIMATE MELTING TEMPERATURES NFPA 921		
Metal	Temperature	
	F	C
Solder	361°	183°
Tin	449°	232°
Lead	618°	326°
Zinc	878°	470°
Magnesium	1,202°	650°
Aluminum	1,220°	660°
Silver	1,761°	960°
Gold	1,945°	1,063°
Copper	1,981°	1,082°
Iron	2,781°	1,527°
Chromium	3,407°	1,875°

Discuss other situations (comparisons) where melted metals may or may not be an indication of excessive heat.

- 3. Occasionally chromium or other shiny metal surfaces may become discolored from extreme heat.
 - a. Consider the extent to which the object has been affected.
 - b. Consider the level (height) at which the object was located.

- c. Guide in attempting to determine actual temperatures.

NFPA 921		
	F	C
Yellow	450°	232°
Brown to purple	550°	287°
Blue	600°	315°
Faint red	900°	482°
Dark cherry	1,100°	593°
Full cherry	1,400°	760°
Salmon	1,600°	871°
Lemon	1,800°	982°
White	2,000°	1,093°
Sparkling white	2,400°	1,315°



Slide 4-51 Limited Entry or View

Limited Entry or View

- ✦ Slow firefighter entry
- ✦ Delay detection of fire

X. LIMITED ENTRY OR VIEW

- A. Methods used to slow firefighter entry.

Must be able to prove that blocking doors/windows was done prior to fire in order to be able to slow entry/extinguishment.

1. Removal of door hardware.
2. Doors or windows nailed, bolted, or wired shut.
3. Contents moved to block doors or windows.

- B. Occasionally, the view into the structure will be blocked or obscured to delay detection of the fire.

XI. EXCESSIVE TIME BETWEEN EXIT OF OCCUPANT AND FIRE

- A. Long delay may indicate arson.

	Slide 4-52 Time Between Occupant and Fire
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- B. Questions to be answered by the first responder:
Are the time factors in this incident:

1. Reasonable?
2. Appropriate?
3. Believable?

XII. TIMING OF INCENDIARY FIRES

	Slide 4-53 Timing of Incendiary Fires
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- A. Fires on holidays or weekends at commercial and/or industrial complexes.

1. Provides the arsonist the necessary setup time while workers are away.
2. Provides excuse for owner to be out of town.
3. Fewer people in the area often causes a delayed detection, and more burn time.
4. Arsonist believes there is less chance of injury to others.

- B. Time of day.
 - 1. Determine if fire cause or occupant's explanation of fire fits the time of the fire.
 - 2. Kitchen fire (food on stove) at odd times may (or may not) be an indication of incendiarism.
 - 3. Sofa fire (cigarettes dropped into sofa) during daytime hours.
 - 4. Sofa/Furniture fires caused by cigarettes often are discovered early in fire's progress if occupants are in the area.

- C. Convenient ignition source.
 - 1. A convenient heat source such as a water heater is available.
 - 2. Many appliances which at one time may have had a history of causing fires are often used as an "invented" fire cause to cover incendiarism.
 - 3. The possibility of an accidental fire always exists.
 - 4. Critical factors.
 - a. Examine the appliance for evidence of tampering.
 - b. Examine the area for indicators of liquid accelerants.

- D. Fires during renovations/remodeling.
 - 1. Causes.
 - a. Poor housekeeping.
 - b. Temporary electrical wiring.
 - c. Presence of flammable liquids.

2. Owner may decide to sell the property to the insurance company.
 - a. The structure was in worse condition than originally thought.
 - b. The would-be renovator found the job to be too much.
 - c. Money ran out before the job was completed.

- E. Fires during electrical storms or bad weather.
 1. The arsonist may believe lightning is a convenient "cover" for the set fire.
 2. Snow/Ice storms will delay response by fire department.

<p>Incendiary Devices</p> <ul style="list-style-type: none">✦ Incendiary device is an electrical, mechanical, or chemical device used to initiate combustion✦ Delay mechanism is any element that provides delay✦ Incendiary material is one which burns with a hot flame for a period of time <p>13</p>	<p>Slide 4-54 Incendiary devices</p>
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XIII. INCENDIARY DEVICES

- A. Definitions.
 1. Incendiary device. Any electrical, mechanical, or chemical device used to initiate combustion intentionally.
 2. Delay mechanism. Chemical, electrical, or mechanical elements that provide a time delay.

Elements may be used singly or in combinations.
 3. Incendiary material. A material that burns with a hot flame for a period of time.

Its usual purpose is to set fire to other materials or structures.

<p>Construction</p> <ul style="list-style-type: none">✦ Often made from readily available materials✦ When used separately, materials may be harmless✦ Materials may be found in everyday use or materials normal to occupancy	<p>Slide 4-55 Construction</p>
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B. Construction.

1. Incendiary devices often are constructed from readily available materials.

It is sometimes very difficult to conclude that some of these materials were meant to be used in a criminal way.

2. When used separately, materials may be harmless.
3. They may be materials found in everyday use, or materials normal to a given occupancy.

C. Electrical incendiary devices.

<p>Electrical</p> <ul style="list-style-type: none">✦ Almost any electrical device can be used as part of an incendiary device✦ Used to produce spark, heat or activate some other device	<p>Slide 4-56 Electrical</p>
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1. Almost any electrical equipment or appliance may be used as part of an incendiary device.
 - a. To produce a spark.
 - b. To produce heat.
 - c. To activate some other device (timer).

2. Electrical incendiary devices also may be classified by some other action.

A dry cell battery could be used to heat a coil which would ignite nearby chemicals. This device could be classified as both electrical and chemical.

 <p>Common Examples</p> <ul style="list-style-type: none">✦ Light bulbs placed close to combustibles✦ Heating equipment✦ Coffeemakers✦ Toasters✦ Toaster ovens✦ Clothes irons✦ Telephone devices	<p>Slide 4-57 Common Examples</p>
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3. Examples of common electrical incendiary devices.

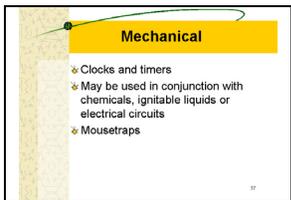
- a. Light bulbs placed in or on combustibles.
- b. Electrical appliances.
 - Space heaters.
 - Heating coils.
 - Soldering irons.
 - Coffeemakers.
 - Toasters.
 - Toaster ovens.
 - Any appliance that produces heat.

4. Radio-controlled devices designed to operate other incendiary devices.

- a. Garage-door openers.
- b. Controller for model airplanes/boats.

5. Telephone devices.

- a. Device may be attached to bell terminals.
- b. May use action of striker against bell.
 - Attach sandpaper and/or emery cloth to inside of bell, and a match to striker. When bell rings, matchhead scratches against abrasive material and ignites trailer material stuffed into interior of phone.

 <p>Mechanical</p> <ul style="list-style-type: none">✦ Clocks and timers✦ May be used in conjunction with chemicals, ignitable liquids or electrical circuits✦ Mousetraps <p>17</p>	<p>Slide 4-58 Mechanical</p>
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D. Mechanical incendiary devices.

- 1. Clocks and timers.
 - a. Used to pull, trip, strike, or break.
 - b. Many designs are used.
 - In conjunction with chemicals.
 - In conjunction with liquid accelerants.
 - In conjunction with electrical circuits.
 - c. Remaining evidence includes burned clocks with evidence of modifications.
- 2. Mousetraps or other trip-type devices.
- 3. Mechanical devices are designed to activate upon some action of persons (devices wired to doors, etc.).

<p>Chemical</p> <ul style="list-style-type: none">Granulated sugar and potassium chlorate ignited by sulfuric acidGranulated sugar and sodium peroxide ignited by water or sulfuric acidAluminum powder and sodium peroxide ignited by water or sulfuric acidPotassium permanganate ignited by glycerinSilver nitrate and magnesium powder ignited by water or sulfuric acidWhite phosphorous ignited by contact with airHTH chlorine ignited with brake fluid or glycerin	<p>Slide 4-59 Chemical</p>
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E. Chemical incendiary devices.

1. Granulated sugar and potassium chlorate (ignited by concentrated sulfuric acid).
2. Granulated sugar and sodium peroxide (ignited by water or sulfuric acid).
3. Aluminum powder and sodium peroxide (ignited by water or sulfuric acid).
4. Potassium permanganate (ignited by glycerin).
5. Silver nitrate and magnesium powder (ignited by water or sulfuric acid).
6. White phosphorous (ignited by contact with air).
7. Magnesium powder and barium peroxide (ignited by fuse cord or open flame).

Caution: The class should not attempt to make these devices as they are extremely dangerous and serious injury could result.

<p>Common Devices</p> <ul style="list-style-type: none">Cigarette and match delayHighway flaresMolotov cocktails	<p>Slide 4-60 Common Devices</p>
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F. Common incendiary devices.

1. Cigarette and match delay.
 - a. Delay depends on length of cigarette, tightness of tobacco, and whether or not the match is fully inserted into the cigarette.
 - b. Filter-tip cigarettes limit delay to approximately seven minutes.
 - c. Matches bundled around cigarette provide additional fire intensity.

2. Highway flares.
 - a. Flares produce temperatures up to 1,200°F (649°C).
 - b. Flares usually burn for 15 to 30 minutes.
 - c. Flares are available in various colors, shapes, sizes, etc.
 - d. Ignition of flares may be delayed by use of model rocket fuse, cigarette, and match. Such fuses are available in most hobby shops for approximately \$1.

3. Molotov cocktails consist of:
 - a. Fuel (usually gasoline).
 - b. Breakable container (bottle).
 - c. Igniter (wick).
 - d. Standard Molotov cocktail.
 - Thin-walled bottle filled with gasoline and wicked with rag, paper towel, or sanitary napkin.

- Arsonist (bomber) ignites wick and throws "cocktail" against hard object.
 - Cocktails often fail to function properly.
 - Thick glass bottle fails to break upon contact.
 - Bottle does not strike target.
 - Cocktail is thrown too soon and self-extinguishes in flight.
 - Wick is not properly secured and falls away during flight. May produce small fire over long flight path.
- e. Highway flare as cocktail fuse.
- Standard highway flare taped to outside of bottle filled with accelerant.
 - Flare is ignited and cocktail is thrown.
- f. Cocktails and other ignition devices.
- Tampon used as a wick.
 - Several strike-anywhere matches taped to neck of bottle.
 - Bottle scraped across rough surface lighting matches, which, in turn ignites the tampon wick.
- g. Sparklers and Molotov cocktail.
- Sparklers lit and bottle thrown.
- h. Thickened accelerant.

- Various materials frequently added to accelerant.

- Kerosene, fuel oil, Ivory Snow™ flakes.

- Produces limited spread of accelerant.

- Causes sticking of accelerant to target.

i. British Molotov cocktail.

- Bottle filled with mixture of gasoline and concentrated sulfuric acid.

- Bottle then capped and may be stored for long periods of time.

- The liquid turns dark when aged.

- 50/50 mixture of sugar and potassium chlorate is combined with water to form a paste.

- Rag is soaked in paste and wrapped around exterior of bottle and allowed to dry.

- Bottle is thrown and ignition occurs upon impact. (Ignition may be delayed after impact while heat of ignition is produced.)

- This type of cocktail may fail to operate in subfreezing temperatures.

j. Remaining evidence.

- Target area and bottle fragments may be covered with brown, wet, oily beads of decomposed sulfuric acid.

- A brown track may be left on brick walls.

- A black track may be left on concrete walls.

G. Availability of directions/plans for design and construction of incendiary devices.

<p>Availability of Information</p> <ul style="list-style-type: none">✦ Internet✦ Poor Man's James Bond✦ Anarchist's Cookbook✦ Military Ordnance Manuals✦ Mercenary magazine✦ Mail order companies	<p>Slide 4-61 Availability of Information</p>
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1. Underground movements.
2. Bookstores.
 - a. *Poor Man's James Bond.*
 - b. *Anarchist's Cookbook.*
 - c. Military Ordnance Manuals.
3. "Mercenary" magazines.
4. Mail-order companies.

<p>Incendiary Vehicle Fires</p> <ul style="list-style-type: none">✦ Vehicles fire can and do occur accidentally✦ Accidental fires can and do result in total destruction of the vehicle 	<p>Slide 4-62 Incendiary Vehicle Fires</p>
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XIV. INCENDIARY VEHICLE FIRES

Explain to the class that only indicators of incendiaryism will be covered in this section and accidental vehicle fire causes will not be covered.

<p>Factors</p> <ul style="list-style-type: none">✦ Economic conditions✦ Ownership✦ Financed✦ Insured✦ Injuries✦ Time✦ Location	<p>Slide 4-63 Factors</p>
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- A. Probability of accidental vehicle fires.
 - 1. Vehicle fires can and do occur accidentally, and vehicles may be destroyed by fires of various causes.
 - a. Improper or careless use of lighted smoking materials.
 - b. Leaking flammable/combustible liquids in contact with some ignition source.
 - c. Most accidental vehicle fires cause only localized damage.
 - d. Most total-loss vehicle fires are thought to be of incendiary cause.
 - 2. Uncertain economic periods affect the number of vehicle fires.
 - 3. Ownership of the vehicle has an effect on the burning of the vehicle.
 - a. Company-owned (fleet, public, etc.) vehicles seldom are destroyed by fire.
 - b. Privately owned vehicles do suffer total destruction.
 - 4. Financed vehicles burn while those owned outright seldom burn.
 - 5. Insured vehicles burn while uninsured vehicles seldom suffer total fire loss.
 - 6. Fire injuries to owners/operators may indicate incendiarism.

FIRE CAUSES

- a. Injuries may have been caused by throwing accelerants onto a burning vehicle.
 - b. Stories often are developed by injured operator/passenger to cover incendiarism.
7. Other facts that point to incendiarism.
- a. Time of the fire is related to possible incendiarism.
 - Most incendiary vehicle fires occur late at night.
 - b. Location of vehicle fire is important.
 - Most incendiary vehicle fires occur on remote roads, back alleys, vacant lots, utility company right-of-ways, railroad right-of-ways, etc.

Ask students where most of their incendiary vehicle fires occur.

- c. Area of the country may affect the number of total-loss vehicle fires.
 - May be related to regional standard of living.

Example--Highly populated area where standard of living is important, compared to a rural or farm area where status may be less important.

8. Conclusions.

- a. Some total-loss vehicle fires do occur from accidental causes.
- b. Most total-loss vehicle fires are thought to be from incendiary cause.

<p>Indicators of Incendiarism</p> <ul style="list-style-type: none">✦ Trailers✦ Containers✦ Shoeprints✦ Skid marks✦ Gas cap✦ Doors and window positions✦ Keys✦ Locks✦ Steering column✦ Accessories✦ Tires✦ Contents of trunk, glove compartment	<p>Slide 4-64 Indicators of incendiarism</p>
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B. Indicators of incendiarism.

- 1. Materials often used for trailers.
 - a. Flammable liquid.
 - b. Available combustibles.
- 2. Shoeprints can place the owner at the scene.
 - a. May contradict story of vehicle being stolen.
 - b. May help to identify accomplices.
 - c. May indicate direction of departure from the incident scene.
- 3. Skid marks or absence of skid marks.

A sudden fire and panic stop usually produces skid marks. The lack of skid marks may contradict the driver's story.

	<p>Slide 4-65</p>
	<p>Slide 4-66</p>

- 4. Gas cap missing.
 - a. Examine for evidence of explosion damage.

	Slide 4-67
	Slide 4-68

- Driver may claim missing gas cap was "blown off."

- b. Discovery of gas cap may destroy owner/occupant's story.
 - c. Plastic gas caps may melt if fire in area of filler tube.
- 5. Accelerant container inside vehicle.
 - a. Arsonists often believe the container will be destroyed.
 - b. Most containers leave some evidence.

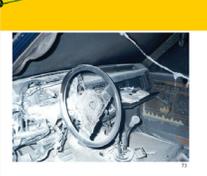
	Slide 4-69
	Slide 4-70

- Glass jugs--search for neck and/or carrying ring.
- Plastic jugs--search for melted plastic. Plastic milk-type containers may be totally consumed by fire.

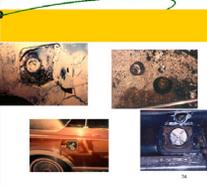
	Slide 4-71
	Slide 4-72

- Metal cans.

c. Container may provide accelerant sample for investigator.

	Slide 4-73
	Slide 4-74

d. Container may provide fingerprints.

	Slide 4-75
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6. Ashtrays.

- a. May contain accelerant residue.
 - b. May establish habits of owner or operator.
 - Cigarette butts may indicate a heavy smoker.
 - Gum and candy wrappers may indicate poor "housekeeping."
 - Drug paraphernalia may be found in ashtray.
7. Loss of spring temper (annealing) in seats.
- a. Extreme heat is required.
 - May be due to the burning of foam or synthetic cushion or padding materials.
 - May be due to the presence of a flammable accelerant.
 - b. Caution: loss of spring temper indicates a hot fire, but does not prove the fire was incendiary.
8. Position and condition of windows.
- a. Open windows during cold weather.
 - b. Closed windows during extremely hot weather. However, air conditioning must be considered.
 - c. Fire may self-extinguish if windows closed.
 - d. If glass is melted, check window liftarm to determine window position at time of fire.
 - e. Melted glass indicates a hot fire, but does not prove incendiarism.
9. Position of doors.

FIRE CAUSES

- a. Vehicle doors are often left open when fire is intentional.
 - Allows oxygen supply.
 - b. Note if doors had to be forcibly opened by first responders.
 - c. Note if doors opened by witnesses.
 - d. Note if operator left door ajar when exiting vehicle.
10. Steering lock assembly.
- May discredit claim of stolen vehicle.
11. Evidence of attempt to extinguish fire.
- a. Presence of sand, dirt, or extinguishing agent.
 - b. An arsonist would not extinguish his/her own fire.
12. Ignition key.
- a. Keys may fall to the floor when ignition switch melts, and remain imbedded in the white metal of the ignition assembly.

Ask one student for his/her car keys. Note that there are several other keys on the key ring or in the key case. It is very unusual to have only the car keys on a key ring.

- b. Finding a single key is not normal. Most people carry more than a single key.

13. Glove compartment.

- a. An empty glove box is unusual.

Ask students to name various articles expected to be found in a glove box.

b. Glove box may contain records, repair orders, or receipts revealing mechanical problems with vehicle.

14. Accessories.

a. Owner often removes accessories for sale or later use prior to burning vehicle.

b. Most vehicle accessories do not totally burn or melt.

c. Most vehicle accessories will leave melted metal in mounting holes or brackets.

d. Empty mounting brackets/holes should be considered suspicious.

15. Roof.

a. At one time, the sagging of a vehicle's roof was thought to indicate the presence of an accelerant.

b. On newer vehicles, because of the use of much thinner metals, a sagging roof can be the result of the application of water during suppression.

c. A sagging roof also can be the result of an intense fire from the burning of some types of seat padding.

d. A sagging roof does not prove the fire was incendiary.

	Slide 4-76 Bald tire
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16. Tires.

	Slide 4-77 Tire pads
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- a. Pads usually will remain under vehicle wheels (rims).
- b. Check tires/pads for odd treads, lack of treads, or uneven wear, which may indicate the tires were changed prior to the fire.
- c. Belts from steel-belted radials remain after fire.

17. Wheels (rims).

- a. Check for missing lugs.
- b. Check to see if color of rims match on all four wheels.
- c. Check for jack impressions on ground around vehicle.

18. Fuel system.

- a. Is fuel tank drain plug still intact?
- b. Are there any punctures in fuel tank?
- c. The arsonist may have used fuel from the vehicle for his/her accelerant.

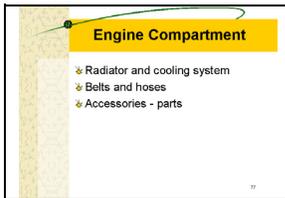
19. Trunk area.

- a. An empty trunk is suspicious.

Ask class to name articles/tools usually found in a vehicle's trunk.

- b. Items normally found in a trunk.

- Spare tire or "doughnut" tire.
- Tire jack and tire iron.
- Flares.
- Jumper cables.



Slide 4-78 Engine compartment

20. Engine compartment.



Slide 4-79

- a. Radiator system.
 - Solder in radiator joints usually does not melt out during an accidental fire.

Exception: When an accidental fuel leak occurs.

- b. Fan, alternator, power steering belts.
Seldom destroyed in accidental fires.
- c. Missing accessories.
 - Battery.
 - Carburetor.
 - Generator/Alternator.
 - Starter assembly.

<p>VIN Plate</p> <ul style="list-style-type: none">• Prior to 1969 VIN plates were located in various places• 1969 and later located on left side of dash inside windshield• May also be "hidden" locations• Look for evidence of removal or alteration 	<p>Slide 4-80 VIN Plate</p> <p>Slide 4-81</p>
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- 21. Vehicle Identification Numbers (VINs).
 - a. Prior to 1969, VINs were located in various places on vehicle.
 - b. 1969 and later, VIN is located on left side of dash by windshield.
 - Visible from outside.
 - Also hidden in other locations on vehicle.
 - c. Altered or missing VINs.
 - May indicate stolen vehicle.
 - d. Look for grinding, filing, sanding, or over stamping of VIN plate.

<p>Summary</p> <ul style="list-style-type: none">✦ Discussed numerous indicators of incendiariism✦ Remember to report anything that is unusual or unnatural✦ Observations by first responder play an important role in arson detection, and the arrest and successful conviction of an accused fire setter <p>11</p>	<p>Slide 4-82 Summary</p>
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XV. SUMMARY

- A. This unit discussed numerous indicators of incendiariism in both structure and vehicle fires.
 - 1. If any of the indicators we have discussed are observed at a fire scene, do not overlook them.
 - 2. Report them to an Incident Commander/ Supervisor or investigator.

- B. Remember, anything that is unusual or unnatural should be reported.
 - 1. The first responder may not be responsible for conducting the fire origin and cause investigation, but notification of findings may cause the request for response of a qualified fire investigator.
 - 2. Based on your information, the investigator's job will be a little easier and it probably will aid him/her greatly in bringing the arson case to a successful conclusion.

- C. The observations of incendiariism by the first responder play an important role in arson detection, and the arrest and conviction of an accused firesetter.

BIBLIOGRAPHY

Bates, Edward B. *Elements of Fire and Arson Investigation*. Santa Cruz, CA: Davis Publishing Co., 1975.

Kirk, Paul L. *Fire Investigation*. New York: John Wiley & Sons, Inc., 1969, p. 84.

NFPA 921, *Guide for Fire & Explosion Investigations*. Quincy, MA: National Fire Protection Association, 1992.

Ricketts, John. *Electricity and Fire: The Role of the Investigator*. Private publication by John Ricketts, 1977.

Stickney, C.W. "Recognizing Where Arson Exists," *Selected Articles for Fire and Arson Investigators*. International Association of Arson Investigators, 1976.

Vliet, H.R. "What to Look For in T.V. Fires," *Selected Articles for Fire and Arson Investigators*. International Association of Arson Investigators, 1976.

UNIT 5: SCENE SECURITY AND PRESERVATION OF EVIDENCE

OBJECTIVES

The students will be able to:

- 1. Describe the proper procedures for securing the fire scene.*
 - 2. Describe the procedure for allowing the owner, occupant, or building manager to re-enter the burned structure.*
 - 3. Explain the importance of evidence preservation at the fire scene.*
 - 4. Identify proper evidence collection techniques.*
-

POINTS FOR THE INSTRUCTOR

This unit will describe the various methods recommended for securing a fire scene from unwanted or unnecessary personnel. The second portion of the lecture will discuss the first responder's role in preserving and, if necessary, collecting evidence.

Scene security and the proper handling of evidence are very crucial aspects in obtaining a successful conviction in arson cases. The first responder must be aware of their importance.

METHODOLOGY

This unit uses lecture and discussion with the assistance of visual aids.

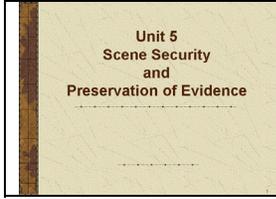
(TOTAL TIME: 1 HR., 30 MIN.)

90 min. Lecture/Discussion

I. OBJECTIVES.....	3
II. INTRODUCTION	4
III. RESTRICTING ENTRY INTO THE SCENE	5
IV. RELEASE OF FIRE SCENE	8
V. EVIDENCE PRESERVATION	12
VI. SUMMARY.....	17

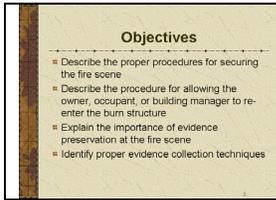
AUDIOVISUAL

Slides 5-1 to 5-19

 <p>Unit 5 Scene Security and Preservation of Evidence</p>	<p>Slide 5-1 Scene Security and Preservation of Evidence</p>
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90 min.
Lecture/
Discussion

Read the objectives to the class and elaborate if you think necessary. Explain that there may be times when the first responder becomes the Incident Commander and needs to be aware of the importance of scene security. The second portion of the section will deal with the preservation and, in certain circumstances, the proper handling of evidence.

 <p>Objectives</p> <ul style="list-style-type: none">• Describe the proper procedures for securing the fire scene• Describe the procedure for allowing the owner, occupant, or building manager to re-enter the burn structure• Explain the importance of evidence preservation at the fire scene• Identify proper evidence collection techniques	<p>Slide 5-2 Objectives</p>
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I. OBJECTIVES

The students will be able to:

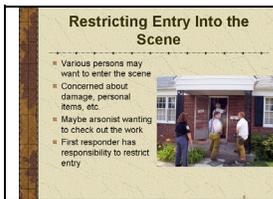
- A. Describe the proper procedures for securing the fire scene.
- B. Describe the procedure for allowing the owner, occupant, or building manager to re-enter the burned structure.
- C. Explain the importance of evidence preservation at the fire scene.
- D. Identify proper evidence collection techniques.

<p>Introduction</p> <ul style="list-style-type: none">▪ Important factor in arrest and conviction is properly securing the scene▪ Only persons who should be allowed to enter fire scene prior to its release are fire fighters and fire investigators▪ Proper preservation and handling of evidence is critical to it being able to be used in a criminal proceeding	<p>Slide 5-3 Introduction</p>
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II. INTRODUCTION

- A. Up to this point the primary focus of this course has been observations to be made at fire scenes and indicators of both structure and vehicle incendiary fires.
- B. Another important factor necessary in order to obtain arson arrests and convictions is properly securing the scene against contamination by owners/occupants, building managers, concerned family members, politicians, or even the arsonist.
- C. The only people who should be allowed to enter a fire scene prior to its release are firefighters who have a need to be in the structure, the fire investigator(s), or evidence technician(s).
 - 1. Any other entry into the structure could be construed as scene contamination.
 - 2. This could result in crucial evidence being disallowed in court proceedings.
 - 3. There have been documented incidents of arsonists re-entering the fire scene during overhaul activities and walking off with their own incendiary device.
 - 4. Scene security is a crucial part of the first responder's responsibility.
- D. The second section of this unit will deal with the preservation of any evidence found at a fire scene and the proper methods to handle it when it becomes necessary.

1. An important point that must be considered when dealing with evidence is the "chain of custody."
2. When chain of custody is broken, the evidence can be ruled inadmissible in court.
3. To have an arsonist acquitted because a first responder mishandles evidence is totally unacceptable.



Slide 5-4 Restricting Entry Into the Scene

III. RESTRICTING ENTRY INTO THE SCENE

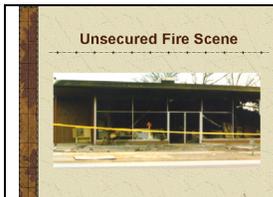
- A. Postsuppression reasons to enter a scene.
 1. Owners, occupants, building managers, or others with an interest in the building may need to enter.
 2. They may want to assess the extent of fire damage.
 3. They may want to retrieve personal items.
 - a. Jewelry or other valuables.
 - b. Medicine, glasses, false teeth, prosthetic devices.
 - c. Insurance documents.
 - d. Items that may help children to feel secure.
 - Favorite book or toy.
 - Favorite blanket or stuffed animal.
 - e. Clothing.

4. Examine the fire scene for appliances left on.

Remind the students that fire victims may be asking themselves if they did something to cause the fire. They wonder if they may have left an appliance on, such as a stove, iron, curling iron, soldering gun, etc. Candles, especially around holidays, are the cause of many fires.

Ask the students for other examples from their own experiences.

- B. It is necessary to restrict entry until the fire department is ready to release the property.
 1. The first responder has a responsibility to determine, or have someone determine, the cause of the fire.
 2. If a fire investigator has been requested, no unauthorized persons should be allowed entry into the fire scene under any circumstances.



Slide 5-5 Unsecured fire scene

3. Restrict entry to everyone except those who need to be present.
4. Suggested methods of preventing unauthorized access include
 - a. Place barrier tape or rope around the perimeter of the scene.
 - b. Secure access and egress areas if possible.

<p>Who Should Be Allowed to Enter?</p> <ul style="list-style-type: none">▪ Only those who need to be present▪ Post guards at all entrances▪ Barrier tape	<p>Slide 5-6 Who should be allowed to enter?</p>
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- c. Post a guard at each door to restrict entry.
- d. If firefighters are at the scene to assist the fire investigator, keep them on standby at a staging area until needed.
 - For lifting, shoveling, etc.
 - To provide lighting for the incident area.

<p>Entry Procedures</p> <ul style="list-style-type: none">▪ Verify person has right to enter▪ Determine purpose for entry▪ Escort when appropriate for safety and control▪ Document any items removed▪ Don't allow tampering with any controls, switches, etc.▪ Sign in sheet is good idea	<p>Slide 5-7 Entry Procedures</p>
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- 5. Procedures for allowing authorized entry.
 - a. Verify that the person(s) has a right of access to the building or fire area.
 - Unauthorized persons have been known to enter a structure and loot.
 - b. Determine their purpose for entry.
 - c. Advise them that firefighters or investigators are still working in the building or fire area.
 - d. After entry is allowed, advise them that they will be escorted for their own safety.
 - e. Record name of each person who enters the scene.

- f. If property is removed by persons, record items removed, and by whom.
 - g. Show compassion for victims.
 - h. Assist them as much as possible to find what they need.
6. Instructions for those who enter prior to investigation.
- a. Do not tamper with items that may become evidence.
 - b. Do not move controls, change the position of switches, etc.
 - c. Do not remove items that may be critical to the investigation.

<p>Release of Scene</p> <ul style="list-style-type: none">▪ Release scene only after fire origin and cause has been determined▪ Escort them through building for safety purposes▪ Explain fire damage and fire suppression efforts▪ Explain origin and cause▪ Explain resources available for recovery	<p>Slide 5-8 Release of the fire scene</p>
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IV. RELEASE OF FIRE SCENE

- A. Accidental fires.
 - 1. Release the scene to the owner or occupant only after fire origin and cause determination has been completed.
 - 2. Escort the owner and/or occupant.
 - 3. Explain the safety considerations relative to the stability of the building.
 - 4. Explain the extent of the fire damage.
 - 5. Explain the fire suppression efforts.
 - a. Ventilation holes in roof.

- b. Broken windows.
 - c. Forced entry.
 - d. Holes cut into floor, ceiling, walls.
6. Explain findings on origin and cause.
- a. Preferably by investigator.
 - b. Explain the reasoning and conclusions.
 - c. Point out the indicators used.
 - Burn patterns.
 - Smoke travel.
 - Cracked window glass.
7. State that an official report will be prepared.
- a. Available to owner or occupant.
 - b. Available to insurance company.
8. State that information is available to make property habitable and to salvage personal items.

Advise the class that several insurance companies have pamphlets for fire victims that explain what they have to do and the procedures of the insurance company once the claim is made.

9. Advise the fire victim(s) of available assistance from other organizations.
- a. Red Cross.
 - b. Salvation Army.

10. Advise the victims to keep all expense receipts for lodging, food, clothing, cleaning, etc.
 - a. Most costs reimbursable by insurance companies.
 - b. Must be accompanied by receipts.

<p>Undetermined, or fires that appear unusual in origin</p> <ul style="list-style-type: none">▪ Call for investigator▪ Secure scene until arrival▪ Inform owner/occupant of actions taken▪ Do not offer opinions to ANYONE	<p>Slide 5-9 Undetermined, or fires that appear unusual in origin</p>
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- B. Undetermined, or fires that appear unusual in origin.
 1. Need to evaluate fires whose cause cannot be determined with a degree of certainty.
 - a. Fires that leave unexplainable burn patterns.
 - b. Fires for which the cause has no logical explanation.
 - c. Fires that you think were not accidental.

<p>Arrival of Investigator</p> <ul style="list-style-type: none">▪ Briefed on facts collected▪ Explain observations▪ Explain fire suppression activities	<p>Slide 5-10 Arrival of investigator</p>
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2. Call for the investigator.
 - a. Secure the scene until the investigator's arrival.
 - b. If arrival will be delayed, have a law enforcement official secure the scene and ensure that no one enters.
 - c. Leave barrier tape in place.

- d. Inform owner or occupant of actions taken.
- e. Do not offer opinions about the fire to anyone.

Stress to the class that today's opinion may be tomorrow's headline and that it could come back to haunt them.

The Incident Commander or Information Officer should make all statements to the news media; however, if the responder needs to say something, state only that the fire is under investigation and that additional assistance has been requested for determining the origin and cause of the fire.

- 3. Arrival of the investigator.
 - a. Briefed on all facts collected.
 - b. Explain observations.
 - En route.
 - Upon arrival.
 - During suppression.
 - During overhaul.
 - c. Explain fire suppression efforts that may have changed normal burning or smoke patterns.
 - Ventilation tactics.
 - Hoseline tactics.
 - Defensive or offensive operations.

Explain that there may be conflicts between the first responder's observations and the final conclusion of the fire investigator. Remember, the investigator has been educated in his/her field, and has experience in determination of fire cause. If the investigator's findings disagree with the initial observations of the first responder, deference should be given to the expertise of the investigator.

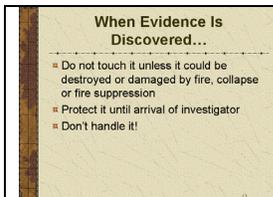
Example: The first responder's observations indicated the careless use of smoking materials in bed as a possible cause, yet the fire investigator's report states that after careful examination of the bed there was no evidence of careless smoking. However, the polyurethane pillow created an unusual burn pattern at the head of the bed.



Slide 5-11 Evidence preservation

V. EVIDENCE PRESERVATION

Emphasize to the class the importance of proper handling of evidence and that, if at all possible, found evidence should not be handled by anyone but the investigator or evidence technician; however, it does need to be protected. This will be reinforced in the following section.



Slide 5-12 When evidence is discovered...

- A. When evidence is discovered, do not touch it.

Exceptions.

1. When fire will destroy it.
2. When collapse of building will destroy it.
3. When fire suppression activities will cause destruction.

B. Protect found evidence.

1. Place a guard (another firefighter) by evidence.
2. Cover evidence with box or tarp.
 - a. Protects it from water.
 - b. Protects it from weather.
 - c. Protects it from firefighters.

<p>Collection of Evidence</p> <ul style="list-style-type: none">▪ Responsibility of investigator or evidence technician▪ Must be properly collected, packaged and preserved	<p>Slide 5-13 Collection of Evidence</p>
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C. Collection of evidence is the responsibility of the fire investigator or evidence technician who

1. May work with a photographer and/or a sketch artist.
2. Maintains an evidence log and numbering system to package and preserve evidence collected.
3. Maintains custody, transportation, and laboratory analysis requests for all evidence.

<p>Chain of Custody</p> <ul style="list-style-type: none">■ Proves the item is in fact what it has been identified to be■ Courts require a log of custody■ Lack of proper custody can make or break a case	<p>Slide 5-14 Chain of custody</p>
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D. Chain of custody.

1. The chain of custody of evidence proves that the exhibit (item) offered as evidence is, in fact, what it has been identified to be.
2. Courts require a log of custody.
 - a. Who found evidence.
 - b. Who collected evidence.
 - c. Who transported evidence.
 - d. Who accepted evidence for storage.
 - e. How evidence was transported to lab.
 - f. Chemist who conducted analysis testing.
 - g. How evidence was returned to storage facility.
 - h. Who transported evidence to court.
3. If there are any unexplainable breaks in the chain of custody, courts will rule evidence inadmissible.
 - a. Can make or break case.
 - b. Can be grounds for acquittal of defendant.
4. If the first responder must collect evidence:

<p>If a First Responder Must Collect Evidence</p> <ul style="list-style-type: none">▪ Photograph prior to moving▪ Photograph area after removal▪ Record date and time found▪ Place in appropriate container▪ Secure evidence▪ Maintain chain of custody	<p>Slide 5-15 If a first responder must collect evidence</p>
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- a. Place it in proper container.
 - Clean, unused, unlined, airtight metal containers are recommended.
 - Glass jars can be used if nothing else is available; however they will break if dropped, thereby contaminating evidence.
 - Some approved plastic bags are acceptable.
- b. Photograph evidence prior to moving it.
- c. Photograph area after removal.
- d. Record date and time found.

<p>Comparison Sample</p> <ul style="list-style-type: none">▪ Is not control sample▪ May be used by the lab during analysis	<p>Slide 5-16 Comparison Sample</p>
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- e. Obtain comparison sample for lab.
- f. Person who finds evidence should collect it.
- g. Transport to Incident Commander's vehicle and lock in trunk.
- h. Transfer evidence to investigator or technician.
 - Record name, date, and time.

<p>Contamination of Evidence</p> <ul style="list-style-type: none">▪ Evidence can be very susceptible to contamination▪ Contamination can occur during suppression, overhaul and investigation▪ By unwanted persons in scene▪ Improper containers	<p>Slide 5-17 Contamination of Evidence</p>
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- E. Contamination of evidence.
 - 1. Evidence of arson is often very susceptible to contamination.
 - 2. Evidence can be contaminated even before it is discovered and collected.
 - a. By fire personnel during extinguishment and overhaul.
 - b. By returning occupants.
 - Wanting to view damaged area.
 - Attempting to salvage belongings.
 - c. Unofficial persons should be accompanied by a member of the fire department.
 - 3. Evidence may be contaminated and/or lost if exposed to atmosphere.

Some accelerants (alcohol, etc.) evaporate quickly.
 - 4. Evidence may be contaminated by the storage container.
 - a. Residue in containers from previous use.
 - b. Vapors may cause portions of container to deteriorate.

<p>Cross-Contamination</p> <ul style="list-style-type: none">▪ Transfer of any ignitable liquid residue from one fire scene or location to another evidence collection site▪ Tools▪ Turnout gear▪ Evidence containers▪ Portable generators and power tools	<p>Slide 5-18 Cross Contamination</p>
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F. Cross-contamination.

1. Cross-contamination is the transfer of any liquid or solid accelerant residue from one fire scene or location to another evidence collection site.
2. Cross-contamination must be considered at any and all fire scenes.
3. There are four potential sources of cross-contamination:
 - a. Tools used in collection of evidence.
 - b. Turnout gear.
 - c. Evidence containers.
 - d. Portable generators and power tools.

<p>Summary</p> <ul style="list-style-type: none">▪ Scene security is extremely important▪ Proper preservation of evidence is critical▪ Recommended that evidence be collected and handled by the investigator or evidence technician	<p>Slide 5-19 Summary</p>
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VI. SUMMARY

- A. Incident scene security is extremely important to convict an accused arsonist successfully.
1. First responders must know what actions to take on behalf of fire department, and ensure that no unauthorized persons enter the fire scene.

2. Persons who gain unauthorized access can remove or contaminate crucial evidence that will be needed for the successful prosecution of the accused arsonist.
- B. Proper preservation and/or collection of evidence is probably the most critical aspect of the first responder's responsibilities.
1. Without properly collected evidence, an arson case will rarely make it into court.
 2. Legally, the confession of the accused is not sufficient to obtain a conviction. There must be some other evidence that corroborates the statements obtained from the accused.
 3. When improperly handled evidence is ruled inadmissible by a judge, a conviction will not be obtained based solely on the confession.
- C. When dealing with evidence, it is recommended that the investigator or technician take responsibility. However, if the first responder must handle and remove evidence from the fire scene, he/she must follow all proper procedures.

UNIT 6: LEGAL CONSIDERATIONS

OBJECTIVES

The students will be able to:

- 1. Explain the United States Supreme Court's Michigan v. Tyler decision that grants fire departments the right to enter property forcibly under exigent circumstances.*
 - 2. Describe the applicability of the Fourth Amendment that allows for search and seizure of property.*
 - 3. Describe proper courtroom demeanor when called upon to testify.*
-

POINTS FOR THE INSTRUCTOR

This unit will explain the legal considerations regarding the rights of fire departments to enter property legally under exigent circumstances as outlined in the U. S. Supreme Court decision, *Michigan v. Tyler*. The Fourth Amendment to the U. S. Constitution also will be discussed, explaining the right to seize property legally as evidence for criminal prosecution purposes.

In the final section of this unit, the students will learn that first responders are frequently called upon to testify in arson prosecution cases. Since many firefighters have never had to testify in court, this section will give them a brief lesson in proper courtroom demeanor.

You should be knowledgeable of the Fourth, Fifth, Sixth, and Fourteenth Amendments when teaching this unit.

METHODOLOGY

This unit uses lecture and discussion.

(Total Time: 45 min.)

45 min. Lecture/Discussion

I.	OBJECTIVES.....	3
II.	ARSON LAWS IN THE UNITED STATES	4
III.	CONSTITUTIONAL LAW.....	6
IV.	LEGAL REQUIREMENTS RELATED TO ARREST, SEARCH, AND SEIZURE	8
V.	MICHIGAN V. TYLER.....	11
VI.	MICHIGAN V. CLIFFORD.....	13
VII.	CONSENT TO SEARCH.....	13
VIII.	COURTROOM DEMEANOR.....	14
IX.	SUMMARY.....	19
	APPENDIX A.....	21
	APPENDIX B.....	27

AUDIOVISUAL

Slides 6-1 to 6-25

 UNIT 6 Legal Considerations	Slide 6-1 Legal Considerations
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45 min.
Lecture/
Discussion

Read the unit objectives with the class and advise students that Section IV, Legal Requirements Related to Arrest, Search, and Seizure, is for information. It allows a basic understanding of why firefighters are permitted to enter property forcibly under emergency conditions, and why firefighters are permitted to collect evidence of criminal activity legally at fire scenes.

The last section of the unit discusses courtroom demeanor. First responders frequently are called upon to testify to their initial observations at the scene of an incendiary fire.

 Objectives <ul style="list-style-type: none">■ Explain the relevance of United States Supreme Court decision of Michigan v. Tyler■ Describe the applicability of the 4th amendment to search and seizure■ Describe proper courtroom demeanor when called to testify	Slide 6-2 Objectives
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I. OBJECTIVES

The students will be able to:

- A. Explain the United States Supreme Court's *Michigan v. Tyler* decision that grants fire departments the right to enter property forcibly under exigent circumstances.
- B. Describe the applicability of the Fourth Amendment that allows for search and seizure of property.
- C. Describe proper courtroom demeanor when called upon to testify.

<p>Arson Laws in the United States</p> <ul style="list-style-type: none">■ Supreme court decision affect fire investigation■ Certain amendments to the U.S. Constitution affect fire investigation	<p>Slide 6-3 Arson laws in the United States</p>
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II. ARSON LAWS IN THE UNITED STATES

- A. U.S. Supreme Court decisions have a direct impact on the fire department's daily activities. The first responder must understand how local and state courts fit into the entire judicial system.
- B. Certain amendments to the U.S. Constitution define the rights of all individuals and limit the powers of the government.
- C. Three individual elements must be proved in court to obtain an arson conviction.

<p>Three Elements of Proof</p> <ul style="list-style-type: none">■ A fire did occur■ The fire was incendiary■ The accused is guilty of the crime	<p>Slide 6-4 Three Elements of Proof</p>
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- 1. A **fire** did occur.
- 2. The fire was **incendiary**.
- 3. The accused is **guilty** of the crime.
- D. Specific requirements have been developed to control the activities of the firefighter and investigator regarding arrest, search, and seizure.

<p>Common Law Offense</p> <ul style="list-style-type: none">Common law is court made lawBased on accepted standards of communityOriginated in EnglandWas the "burning of the dwelling of another"	<p>Slide 6-5 Common Law Offense</p>
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- E. Originally, arson was a common-law offense.
1. Common law is court-made law.
 2. Based on accepted standards of the community.
 3. Originated in England.
 4. "Arson at Common Law" was "The burning of the dwelling of another."

<p>Arson Statutes</p> <ul style="list-style-type: none">Each state has enacted specific laws dealing with "arson"	<p>Slide 6-6 Arson statutes</p>
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- F. Arson law in recent years.
1. Most states have revised laws dealing with arson.
 2. A few states still may have arson at common law (Louisiana uses the Napoleonic Code).
 3. The old "arson at common law" did influence the way some state statutes were written (e.g., some state statutes still refer to arson as the "burning of the dwelling of another").

Ask the students if they know which "arson law" is enforced in their state.

<p>Constitutional Law</p> <ul style="list-style-type: none">▪ Constitution limits the power of government and defines the rights of its citizens▪ Amendments further defines the rights of individuals	<p>Slide 6-7 Constitutional Law</p>
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III. CONSTITUTIONAL LAW

- A. The Constitution of the United States limits the power of government and defines the rights of its citizens. The Amendments to the Constitution further define the rights of individuals. The following amendments are pertinent to the subject of arson investigation. Therefore, the first responder should be familiar with their content.

- B. Pertinent constitutional amendments.

<p>Fourth Amendment</p> <ul style="list-style-type: none">▪ Search and Seizure▪ People secure in their persons, houses, papers, and effects against unreasonable searches and seizures	<p>Slide 6-8 Fourth Amendment</p>
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- 1. Fourth Amendment. "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath, or affirmation, and particularly describing the place to be searched, and the persons or things to be seized."

<p>Fifth Amendment</p> <ul style="list-style-type: none">▪ Self-incrimination▪ No person shall be compelled to be a witness against himself	<p>Slide 6-9 Fifth Amendment</p>
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2. Fifth Amendment. "No persons shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury ... nor shall any person be subject for the same offense to be twice put in jeopardy of life or limb; nor shall be compelled in any Criminal Case to be witness against himself; nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation."

<p>Sixth Amendment</p> <ul style="list-style-type: none">▪ Right to counsel and speedy trial▪ Accused shall enjoy the right to speedy and public trial by impartial jury▪ Confront witnesses against him▪ Assistance of counsel	<p>Slide 6-10 Sixth Amendment</p>
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3. Sixth Amendment. "In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining Witnesses in his favor, and to have the Assistance of Counsel for his defense."

<p>Search and Seizure</p> <ul style="list-style-type: none">■ Governed by the 4th amendment■ To be lawful must be reasonable under the circumstances	<p>Slide 6-11 Search and Seizure</p>
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IV. LEGAL REQUIREMENTS RELATED TO ARREST, SEARCH, AND SEIZURE

A. Constitutional provisions.

1. The Fourth Amendment governs searches and seizures (otherwise known as arrests) of persons and searches and seizures of property.
2. The Fifth Amendment directly applies to persons acting under federal law.
3. The "due process of law" language of the Fourteenth Amendment makes the Fourth and Fifth Amendments applicable to the states.
4. To be lawful, any search and seizure must be reasonable under the circumstances.
5. Conditions for a lawful search or arrest warrant.
 - a. Based on probable cause.
 - b. Made under oath or affirmation.
 - c. With particularity, name any and all persons, places, or things to be seized.

Remind students that state statutes differ greatly. Advise students to obtain guidance from their prosecuting attorney with regard to the materials presented in this unit.

- B. Search and seizure of property.
1. In 1914, the U.S. Supreme Court held that evidence obtained unlawfully could not be used against the accused.
 - a. This is the "exclusionary rule," which states that evidence gained unlawfully would be excluded from court.

<p>Exclusionary Rule</p> <ul style="list-style-type: none">■ Evidence gained unlawfully is excluded■ Applies not only to evidence directly found, but to any further evidence based on the improperly collected evidence – "Fruit of the Poisonous Tree"	<p>Slide 6-12 Exclusionary Rule</p>
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- b. This rule applies not only to evidence directly found by the unlawful search, but also to any evidence obtained as a result of the improperly collected evidence-- called the "Fruits of the Poisonous Tree."
2. U.S. Supreme Court rulings in 1961 required that all courts observe the same rules of evidence.
 - a. All searches are not prohibited.
 - b. Only unreasonable or unlawful searches are prohibited.
3. In relation to fire investigations, "search" is subdivided.
 - a. Investigation (search) for origin and cause of the fire.

<p>Fire Scene Searches</p> <ul style="list-style-type: none">■ Origin and cause investigation required by most state laws/codes■ Ability to search due to exigency or emergency circumstances■ Right to privacy applies to fire scenes and follow up investigations	<p>Slide 6-13 Fire Scene Searches</p>
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- Origin-and-cause investigations are required by most state codes.

- Often these codes are vague.

- Possible problems in court are due to vagueness of authority.

- Authority to search due to exigency or emergency circumstances.

b. Investigation (search) as to the circumstances of the fire (the follow up investigation).

- After incendiarism is discovered.

- Same as any other criminal investigation.

- Must observe all rules of search and seizure.

Point out that this is usually when the fire investigator takes over.

4. Right to privacy.

a. Real and personal property is protected by the Constitution.

b. Owners of fire-damaged property may object to a search of the property. Courts vary in rulings on this type of search.

<p>Michigan v. Tyler</p> <ul style="list-style-type: none">■ 1978 U.S. Supreme Court Decision■ Commercial property■ Set down minimum requirements for post fire searches■ Recognizes time when search warrant is not necessary■ Emergency conditions■ Plain view doctrine	<p>Slide 6-14 Michigan v. Tyler</p>
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V. MICHIGAN v. TYLER

In 1978, the U.S. Supreme Court laid down minimum constitutional requirements for post fire searches. (*Michigan v. Tyler*, 436 U.S. 499, 98 S. Ct. 1842 56L. Ed. 2d 486.)

SM p. 6-11

The citations refer to published collections of decisions. Refer to the Student Manual, Appendices A and B of this unit for the complete decision.

- A. At times, no search warrant is necessary.
 - 1. When investigation at the scene takes place within a reasonable period of time after the fire department has left; or when a reentry is a continuation of an initial search which is considered a valid search.
 - 2. Under the plain-view and exigent circumstances doctrine, evidence gained is admissible in court to convict a person of arson.
- B. A return to the scene for additional examination is permissible with the consent of the owner/occupant. Abandoned property still is protected and permission is required.
- C. Conditions when administrative (inspection) search warrants are necessary.

Administrative Search Warrant

- Re-entry of premises is not a continuation of the initial valid search for origin and cause

Slide 6-15 Administrative Search Warrant

1. When the reentry of the premises is not a continuation of an initial valid search, and when the purpose of a search is to determine the cause of the fire.
2. Evidence gained from such searches would be admissible to convict a person of arson under the plain-view doctrine.

D. Conditions when criminal search warrants are necessary.

Criminal Search Warrant

- Re-entry is not for fire suppression or administratively for fire origin and cause and when entry is for the purpose of developing evidence for possible criminal prosecution

Slide 6-16 Criminal Search Warrant

1. When reentry is not for fire suppression or administratively for fire cause; and when the reentry is for the purpose of gaining evidence to be used in criminal prosecution.
2. Assuming a proper criminal search warrant has been obtained, the evidence gained from such a search would be admissible in court to convict a person of arson.

<p>Michigan v. Clifford</p> <ul style="list-style-type: none">■ 1984 U.S. Supreme Court Decision■ Reaffirmed Michigan v. Tyler■ Residential case (single family dwelling)	<p>Slide 6-17 Michigan v. Clifford</p>
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VI. MICHIGAN v. CLIFFORD

- A. In 1984, the U.S. Supreme Court held that postfire investigations must adhere to stringent requirements with respect to the constitutional rights of owners/ occupants. (*Michigan v. Clifford*, Cert. to the Court of Appeals of Michigan, 82-pp. 357.)

- B. In doing so, the court reconfirms its *Tyler* decision and further redefines the rights of citizens in private dwellings (residential occupancies).
 - 1. The court reconfirmed the need to investigate to determine the origin and cause of the fire.
 - 2. The "reasonable time" approach, as defined in *Tyler* remains in place.
 - 3. Certain occupancies may involve a greater "expectation of privacy" than other occupancies.

<p>Consent to Search</p> <ul style="list-style-type: none">■ Person who controls property can give consent to search■ Best way■ Should be done in writing	<p>Slide 6-18 Consent to search</p>
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VII. CONSENT TO SEARCH

- A. There is a responsibility to conduct the investigation as to the cause of the fire. (*Michigan v. Tyler, et al.*)

- B. As soon as the fire has been suppressed and overhaul has started, the owner should be located and needed information gathered.

LEGAL CONSIDERATIONS

1. During discussion of circumstances of the fire, attempts should be made to obtain a signed "consent to search" form.
 2. If occupant is not the owner, occupant also should sign a permission form.
- C. While there is an administrative duty to conduct fire cause determination, the consent form provides additional coverage during a trial.
1. Owner/Occupant was aware of your activities.
 2. Impossible for owner/occupant to charge that your activity was not legally performed.

<p>Courtroom Demeanor</p> <ul style="list-style-type: none">■ First responder may be required to testify in criminal and/or civil proceedings■ Review case/notes thoroughly■ Uniform v. civilian dress	<p>Slide 6-19 Courtroom demeanor</p>
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VIII. COURTROOM DEMEANOR

- A. Often the first responder is required to testify in court.
1. Criminal court if arson arrest is made.
 - a. Observations.
 - b. Evidence discovery.
 2. Civil court if insurance refuses to pay claim or attempts liability subrogation from manufacturer.
- B. Few first responders have had opportunity to testify.
- C. Review case thoroughly before testifying.
1. Know date of fire, victim, and address.

LEGAL CONSIDERATIONS

2. Observations made to include means of entry and conditions.

D. Uniform versus civilian dress.

Follow local policy and/or advice of prosecuting attorney.

<p>Courtroom Conduct</p> <ul style="list-style-type: none">■ Follow prosecutor's directions■ Impression on jury is important■ Appear professional■ You are a professional, not a crusader	<p>Slide 6-20 Courtroom Conduct</p>
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E. Courtroom conduct.

1. Follow prosecutor's directions.
2. Impression on the jury is vital.
3. Appear professional. Do not attempt to sway the jury with manner.
4. Duty ends with jury verdict.
5. You are a professional, not a crusader. No vendettas are allowed.

<p>While on the stand...</p> <ul style="list-style-type: none">■ Sit upright■ Speak to the jury■ Keep hands in natural position – avoid gesturing■ Do not play with pen, pencil, etc■ Refer to the defendant as Mr., Mrs.■ Courtesy and patience at all times	<p>Slide 6-21 While on the Stand</p>
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F. While on the stand.

1. Sit upright with both feet on the floor. Speak to the jury, not to the attorneys.
 - a. It is the jury to whom you are presenting your case.
 - b. The attorneys are only asking the questions.

LEGAL CONSIDERATIONS

2. Keep hands in a natural position and avoid gesturing.
3. Do not play with pen or pencil. This makes you appear nervous.
4. When referring to the defendant, refer to him/her as "the defendant" or "Mr. (or Ms.)."
5. Exercise courtesy and patience at all times.
6. **Never** argue with the defense counsel.

<p>While on the Stand</p> <ul style="list-style-type: none">■ Never argue with defense counsel■ Take time to understand questions■ Be alert and listen to all questions, remarks or statements by counsel or judge■ Do not guess or speculate■ Tell the truth■ Avoid slang	<p>Slide 6-22 While on the Stand</p>
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7. Testify with the confidence gained by the complete and full knowledge of the facts of the case.
8. Do not hesitate or fail to answer questions; however, take enough time to understand the question fully.
 - a. Defense attorneys will ask lengthy questions that are not understood when they complete the question. If the question is not understood, ask to have it repeated.
 - b. They will also ask two or three questions in one. Inquire as to which question they want answered, or in what order.
9. Be alert at all times and listen attentively to all questions, remarks, or statements by counsel or the court (judge).
10. An accurate statement of facts is desired, and there should be no guesswork or speculation.

LEGAL CONSIDERATIONS

- a. If the facts are not known, say so.
 - b. If exact times, distances, etc., are not known, qualify the statement with the words "about" or "approximately."
 - c. If the exact words of a statement or conversation are known, use them; if not, qualify the statement with the phrase, "In sum and substance he/she said."
11. Tell the truth. You are obligated by your oath, and more importantly, by your personal integrity.
- a. Your integrity as a firefighter and expert witness is your most valuable possession.
 - b. **Never lie to obtain a conviction.** The loss of your reputation and integrity are not worth a conviction.
12. Avoid slang or improper language unless it is a direct quote and necessary to the evidence.
13. Remember, the jury is composed of lay people. Avoid the use of technical language. If technical terms are used, follow them up with an explanation.

If the jury members do not understand what you are saying, you lose their interest and rarely regain it.

While on the Stand

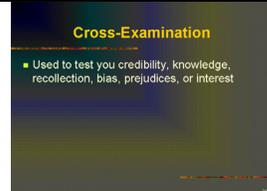
- Speak clearly and loudly enough to be heard
- Do not hesitate to correct mistakes or errors
- Do not volunteer information
- Wait when objections are made

Slide 6-23 While on the Stand

14. Speak clearly and loudly enough to be heard, and do not hesitate to correct mistakes or errors.

LEGAL CONSIDERATIONS

15. Do not give the impression that the conviction of the accused is a personal desire of yours.
16. Do not volunteer information. Answer only what is asked of you.
17. If either attorney makes an objection during a question, do not answer until the court has made a ruling on the objection and until the question has been repeated. If the objection is to your answer, do not complete the answer until directed to do so by the court.
18. Notes may be used to refresh your memory; however, the permission of the court must be obtained before the notes may be used. The defense has the absolute right to be provided with a copy of all your notes.

 <p>Cross-Examination</p> <ul style="list-style-type: none">Used to test you credibility, knowledge, recollection, bias, prejudices, or interest	<p>Slide 6-24 Cross Examination</p>
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19. The object of cross-examination is to test credibility, knowledge, recollection, bias, prejudices, or interest of a witness relative to his/her testimony on direct examination.
20. Do not introduce any criminal record or previous convictions of the defendant during your testimony.

This will be grounds for the court to order an immediate mistrial.

<p>Summary</p> <ul style="list-style-type: none">▪ Basic knowledge of legal authority to enter property is critical to successful prosecution▪ Courtroom demeanor is important▪ Prepare before testifying	<p>Slide 6-25 Summary</p>
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IX. SUMMARY

- A. A basic knowledge of your legal authority to enter property under exigent circumstances, to reenter property for purposes of determining origin and cause of a fire, and the right to confiscate evidence has been discussed in this unit. For the most part, it is only for your information and knowledge, and may be more pertinent to the fire investigator.

- B. The section on courtroom demeanor is very important to you, as the first responder.
 - 1. More and more prosecutors are using first responder testimony in an attempt to obtain the arson conviction.

 - 2. Not only are the first responder's senses the initial "official" observations at a fire scene, but his/her testimony to the fire conditions and dangers faced by the firefighters weighs heavily on the minds of a jury.

 - 3. Juries are sympathetic to the dangers of a firefighter's job, and even more so with intentionally set fires.

- C. If requested to testify in court, be prepared by thoroughly reviewing the case prior to the court date.
 - 1. Be the professional you are when on the stand.

 - 2. This will be the last segment of that particular fire incident, and a conviction that you, as the first responder, helped obtain will be a very satisfying moment.

APPENDIX A
MICHIGAN V. TYLER

Michigan v. Tyler

- A. Facts.
1. Fire starts shortly before midnight, January 21, 1970.
 2. Chief See arrives at scene on January 21, 1970, at 0200.
 3. Chief See's responsibility: "to determine the cause and make out all reports."
 - a. Chief See is informed by Lieutenant Lawson that two plastic containers of flammable liquid were found in the building.
 - b. Chief See determines the fire "could possibly have been an arson" and calls for Detective Webb.
 - c. Chief See "looked throughout rest of building to see if there was any further evidence, to determine what the cause of the fire was."
 4. Detective Webb arrives at scene at 0330.
 5. Fire is extinguished and firefighters depart at 0400.
 6. Webb takes several pictures but abandons efforts because of smoke and steam.
 - a. Webb takes containers to fire station for safekeeping.
 - b. Neither Webb nor See had consent or a warrant for entries, nor for the removal of the containers.
 7. See returns with Assistant Chief Somerville around 0800.
 - a. Somerville's job is to determine the "origin of all fires that occur within the township."
 - b. Fire was extinguished and building empty when they arrived.

8. Webb returns around 0900.
 - a. Webb discovers suspicious "burn marks in the carpet which he could not see earlier because of heat, steam, and darkness."
 - b. Webb also discovers "pieces of tape, with burn marks, in the stairway."
 - c. Webb removes the carpet and sections of the stairs to preserve as evidence.
 - d. Somerville searches through rubble "looking for any other signs of evidence that showed how this fire was caused."
 9. Sergeant Hoffman of Michigan State Police Arson Section arrived on February 16, 1970, to take photos at scene.
 - a. Hoffman checked circuit breakers.
 - b. Hoffman had television repairmen examine remains of television sets found in ashes.
 - c. Hoffman's entries were without warrants or consent.
 - d. Hoffman's purpose was "of making an investigation and seizing evidence."
- B. Michigan Supreme Court holding.
1. Once firefighters leave the premises, a warrant is required to reenter and search premises, unless there is consent, or premises have been abandoned.
 2. All evidence collected after fire was extinguished at 0400 was excluded in violation of Fourth and Fourteenth Amendments.
- C. State of Michigan's position.
1. Entry to investigate cause of fire is outside protection of Fourth Amendment because no individual privacy interests are threatened.
 - a. If occupant set blaze, then his "actions show he has no expectation of privacy."
 - b. If fire has other causes occupants are treated as victims.

2. No purpose would be served by requiring warrants to investigate cause of fire.

D. Majority opinion.

1. Recognizes people still have protected privacy interests in burned property.
2. Courts specifically held that it is impossible to justify warrantless search on grounds of abandonment by arson.
3. Fourth Amendment applies to firefighters.
4. Both administrative searches and searches for evidence of crime are encompassed by the Fourth Amendment.
 - a. Probable cause for administrative searches exists if reasonable legislative or administrative standards for conducting area inspection are satisfied.
 - b. Such searches will not necessarily depend on specific knowledge of the conditions of the particular dwelling; rather, may be based upon passage of time, nature of building, condition of entire area, etc. *Camara v. Municipal Court*, 387 U.S. 523.
5. Major function of warrant is to provide property owner with sufficient information to reassure him of the entry's legality.
6. If authorities are seeking evidence to be used in criminal prosecution, the usual standard of probable cause will apply.
7. All entries in this case were without proper consent and were not authorized by valid search warrant--each is therefore illegal **unless** it falls within one of the carefully defined classes of cases (**exigent circumstances**).
8. Burning building is exigency to render warrantless entry reasonable.
 - a. Once inside, firefighters may seize evidence of arson that is in plain view.
 - b. Supreme Court specifically rejects position that once fire ends, the justification for being on property ends.
9. Officials need no warrant to remain for reasonable time to investigate cause of blaze after extinguished.

LEGAL CONSIDERATIONS

10. Court finds morning reentry's by Chief See, after firefighters departed at 0400, acceptable as an actual continuation of the first entry.
 - a. Court permits the evidence collected on January 22 as admissible evidence.
 - b. All entries after January 22 were done without consent or valid warrant and no exigent circumstance existed to justify reentry.

APPENDIX B
MICHIGAN V. CLIFFORD

Michigan v. Clifford

A. Timeline.

1. Fire truck arrives at Clifford house on October 18, 1980, at 0540.
2. Fire extinguished and all fire and police depart 0704.
3. Lieutenant Beyer told to investigate Clifford fire on October 18 at 0800.
4. Lieutenant Beyer arrives at Clifford house on October 18 at 1300.
 - a. Beyer sees work crew on scene boarding up house.
 - b. Crew pumping six inches of water out of basement.
 - c. Neighbor tells Beyer he called Clifford and has been instructed to call Clifford's insurance agent to hire boarding crew to secure house.
5. Lieutenant Beyer begins search of house at 1330, after water is pumped out.

B. Evidence.

1. In driveway, Lieutenant Beyer sees fuel can which firefighters found in basement. He seizes the evidence.
2. Lieutenant Beyer begins search without a warrant or obtaining consent.
3. Beyer's search quickly confirms that fire originated beneath basement stairway.
4. Beyer detects strong odor of fuel throughout basement.
5. Beyer finds two more Coleman fuel cans beneath stairway.
6. Beyer further finds crock pot with attached wires leading to electrical timer plugged into outlet. Timer set to turn on at 0345 and to turn off at 0900. Timer had stopped somewhere between 0400 and 0430.
7. Beyer and partner then search remainder of house going through drawers and closets. They find nails but no pictures on the walls.

- C. Clifford's position.
1. Exclude evidence in basement and upstairs searches because the searches were to gather evidence of arson and were conducted without warrant, consent, or exigent circumstance.
 2. Search violated the Fourth and Fourteenth Amendments.
- D. State's position.
1. Exempt from warrant requirement all administrative investigations into origin and cause of fire.
 2. Modify *Tyler* to allow warrantless searches in this case.
- E. Issue the Court decided.
- Can an arson investigator, in the absence of exigent circumstances or consent, enter a private residence without a warrant to investigate the cause of a recent fire?
- F. Plurality opinion (Powell, Brennan, White, and Marshall).
1. Court declines to exempt administrative investigation into cause and origin of a fire from warrant requirement.
 2. Constitutionality of warrantless and nonconsensual entries onto fire-damaged premises turns on several factors:
 - a. Are there legitimate privacy interests in fire-damaged property that are protected by the Fourth Amendment?
 - b. Do exigent circumstances justify governmental intrusion regardless of any reasonable expectation of privacy?
 - c. Is the object of the search to determine the cause of the fire or to gather evidence of criminal activity?
 3. Legitimate privacy interests.
 - a. Objective test: whether the expectation of privacy is one that society is prepared to recognize as "reasonable." (*Katz v. United States*.)
 - If yes then warrant requirement applies.
 - If no, then there is no warrant requirement.

- b. Court found Clifford's had personal belongings which remained after the fire and that they had taken action to secure their home against intrusion.
 - c. The Clifford's retained a reasonable privacy interest in their fire-damaged residence, and postfire investigations were subject to warrant requirement.
4. Exigency.
- a. Court followed *Tyler* and held that a burning building creates an exigency that justifies a warrantless entry to fight the blaze.
 - b. Once in the building the fire officials need no warrant to remain for a "reasonable time to investigate the cause of a blaze after it has been extinguished" (*Tyler*).
 - c. Determining cause and origin of fire serves a compelling public interest; warrant requirement does not apply in such cases.
 - d. Additional investigation begun after fire was extinguished and firefighters and police have left the scene generally must be made pursuant to a warrant or the identification of some new exigency.
5. Object of the search (if warrant is necessary).
- a. If primary objective is to determine origin and cause, an administrative warrant is sufficient. Must show:
 - Fire of undetermined origin has occurred on premises.
 - Scope of proposed search is reasonable and will not intrude unnecessarily on fire victim's privacy.
 - Search will be executed at reasonable and convenient time.
 - Evidence found in plain view may be seized in administrative search.
 - Administrative search into cause of a recent fire does not give fire officials license to roam freely through fire victim's private residence.

- b. If primary objective is to gather evidence of criminal activity, criminal search warrant may be obtained on showing of probable cause to believe relevant evidence will be found in place to be searched.
 - 6. Court found warrantless and nonconsensual search of basement and house would be valid only if exigent circumstances justified object and scope of each.
 - a. Beyer's search was for evidence of criminal activity as to basement and house.
 - b. Excludes all evidence except the gas can found on the driveway in plain view.
 - 7. Plurality distinguishes *Clifford* from *Tyler*.
 - a. Challenged search was not continuation of earlier search.
 - b. The Clifford's had taken steps to secure their privacy interests that remained in their residence.
 - c. The Cliffords' privacy interests in their residence were significantly greater than those of Tyler in the fire-damaged furniture store.
 - 8. Plurality holds: A subsequent postfire search must be conducted pursuant to a warrant, consent, or the identification of some new exigency.
- G. Steven's concurrence.
 - 1. Unanimity exists, within the Court, regarding the scope of Fourth Amendment protection afforded to owner of fire-damaged building:
 - a. No one questions right of firefighters to make forceful, unannounced, nonconsensual, warrantless entry into a burning building.
 - b. Firefighters have the right to remain on premises, not only until the fire is extinguished and no danger of rekindling exists, but also to investigate the cause of the fire.
 - c. After investigators determine the cause of fire and have located the place it originated, search of other portions of premises may be conducted only pursuant to a warrant.

2. Argues the presumption that once firefighters depart, fire has been extinguished and any danger of rekindling is slight.
 3. Stevens argues fire investigators should give the homeowner reasonable advance notice of their reentry unless they have probable cause to believe the crime of arson has occurred.
- H. Dissent (Rehnquist, Chief Justice, Blackmun, and O'Connor).
1. Finds the plurality's distinction from *Tyler* to be inconsequential.
 2. Allows search of Clifford basement, but does not allow evidence from search of remainder of house.

UNIT 7: REPORTING OF FINDINGS

OBJECTIVE

The students will be able to recognize, recall, and report the pertinent information from their observations as they relay their findings to the Incident Commander or supervisor.

POINTS FOR THE INSTRUCTOR

In this unit the instructor should emphasize the importance of having first responders report their observations accurately to the Incident Commander or supervisor. The most important aspect of the fire investigation is the information based on observations by the first responder: what was seen, found, and, in some cases, what was collected for evidence.

To prepare adequately for instructing this unit, the instructor should

1. Review the Instructor Guide text (and any additional information that may be used) and the Student Manual (SM). The SM will contain more material than is in the Instructor's Guide; this is because there is not enough time allotted to cover everything.
2. Review the audiovisual instructional aids. Make any additional points you wish to include in your presentation.

METHODOLOGY

This unit uses lecture, discussion, and an individual activity.

(Total Time: 20 min.)

Lecture/Discussion

I. OBJECTIVE	3
II. INTRODUCTION	3
III. SCENE COMMANDER REPORTING TO INCIDENT COMMANDER OR SUPERVISOR	4
IV. ORAL AND WRITTEN NOTES OF FINDINGS.....	5
V. PERSONAL NOTES AND DRAWINGS	6
VI. SUMMARY	7
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AUDIOVISUAL

Slides 7-1 to 7-20

<p>Unit 7 Reporting of Findings</p> <p><small>National Fire Academy - ACFE 1</small></p>	<p>Slide 7-1 Reporting of Findings</p>
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Lecture/
Discussion

<p>Objectives</p> <ul style="list-style-type: none">■ Be able to recognize, recall, and report the pertinent information <p><small>National Fire Academy - ACFE 2</small></p>	<p>Slide 7-2 Objective</p>
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I. OBJECTIVE

The students will be able to recognize, recall, and report the pertinent information from their observations as they relay their findings to the Incident Commander or supervisor.

<p>Introduction</p> <ul style="list-style-type: none">■ It is your responsibility to report your observations to the IC or supervisor  <p><small>National Fire Academy - ACFE 3</small></p>	<p>Slide 7-3 Introduction</p>
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II. INTRODUCTION

As the first responder, it is your responsibility to report your observations to the Incident Commander or supervisor. The most important part of any investigation is information based on the observations of first responders: what was observed, heard, found, and, in some cases, the evidence collected.

III. SCENE COMMANDER REPORTING TO INCIDENT COMMANDER OR SUPERVISOR

<p>Ability to Recall the Facts</p> <ul style="list-style-type: none">■ Recall incidents■ Recall situation■ Remember details <p><small>National Fire Academy - ICFE</small></p>	<p>Slide 7-4 Ability to recall the facts</p>
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- A. Ability to recall the facts.
 - 1. Recall incidents.
 - 2. Recall situation.
 - 3. Remember details.

<p>Necessary Information</p> <ul style="list-style-type: none">■ Description of occupancy■ Description of fire■ Fire suppression efforts■ Fire protection systems■ Forcible entry■ Any unusual observations <p><small>National Fire Academy - ICFE</small></p>	<p>Slide 7-5 Information to be included</p>
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- B. Information that should be included.
 - 1. Description of the occupancy.
 - 2. Description of the fire.
 - 3. Fire suppression efforts.
 - 4. Impeded fire protection system.
 - 5. Forcible entry.
 - 6. Any unusual things observed.
 - 7. Anything found that may be suspicious.
- C. Secure the area and remove findings.
 - 1. Report findings.
 - 2. Turn over findings, and, if removed, detail where found.

3. Description of where found in conjunction to the fire or property.

IV. ORAL AND WRITTEN NOTES OF FINDINGS

- A. Repeat the same information to the investigators per department policy.

1. Cover the same information.

<p>Notes of Findings</p> <ul style="list-style-type: none">• Provide to investigator• Make written notes and fire report• Notes/report should be written in narrative form• Stick to the facts, do not pad <p><small>National Fire Academy 4021</small></p>	<p>Slide 7-6 Make written notes if no investigator is present</p>
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2. Make written notes if no investigator is present.
 - a. Fill out fire report.
 - b. The fire report will give you some information as to:
 - Owner.
 - Occupant.
 - Date.
 - Weather.
 - Time.
 - Origin of fire.
 - Who found the fire.
 - Who reported the fire.
 - Fire extension.

- B. Notes of observations.

It is essential that you as the first responder make some written notes of findings. It may be a while before the case goes to court. The ability of total recall is limited after a period of time.

1. Written notes are a written narrative by the first responder.
2. The narrative should be detailed with respect to the first responder's observations.
3. These notes should not be "padded" to increase the length of the report.
 - a. Give facts pertinent to case.
 - b. Do not ramble; get to the point.
 - c. Prepare the narrative as if you were reporting to the Incident Commander or supervisor.

<p>Tips</p> <ul style="list-style-type: none">■ Write the way you talk■ Include only material pertinent to the investigation■ Do not include personal opinions, conclusions or suspicions <p><small>National Fire Academy - ICFE</small></p>	<p>Slide 7-7 Personal notes and drawings</p>
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V. PERSONAL NOTES AND DRAWINGS

- A. Write the way you talk.
 1. Report should reflect the way you talk.
 2. Should contain only material pertinent to the investigation.
 3. Should not include personal opinions, conclusions, and suspicions.

<p>Drawings</p> <ul style="list-style-type: none">■ Helpful to recall facts and incident■ Shows where evidence was found or removed■ Not a detailed sketch <p><small>National Fire Academy - ACFE</small></p>	<p>Slide 7-8 Personal drawings of the fire building or area</p>
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B. Personal drawings of the fire building or area.

1. Personal drawings of the fire building or area (room) where evidence was removed should be made.
2. Not a detailed sketch.
3. The drawings should be simple and easy to explain to the investigator.
4. The drawings should have some identifying figures as to where possible evidence was removed.

Examples: Back bedroom in closet on the north side of house. In the rear of building on the south side ten feet from building.

<p>Summary</p> <ul style="list-style-type: none">■ Know what information is important to IC and investigator■ Provide complete, written notes to fire investigator and keep copy <p><small>National Fire Academy - ACFE</small></p>	<p>Slide 7-9 Summary</p>
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VI. SUMMARY

- A. First responders need to know what information (observations) is important to report to the Incident Commander.
- B. Complete, written notes should be given to the fire investigator and a copy should be kept by the first responder.
- C. Personal drawings of the fire area or building are useful to document any evidence found and later moved.

Individual
Activity 7.1

Slide 7-10

Activity 7.1
Visual Walkthrough

- You will be shown a series of pictures and you will record your individual observations
- You have 2 minutes to write down your observations
- Group will have 5 minutes to discuss

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Activity 7.1

Visual Walkthrough of Fire Scenes

Purpose

To examine a series of slides of fires and to make some basic observations, using the material presented in the course.

Directions to Students

1. Turn to Activity 7.1 in the Student Manual and read the directions.
2. Using your powers of observation, and working individually write down what you observe on each slide.
3. Each slide will be shown for 15 seconds.
4. You will have 2 minutes to write your observations.
5. After each slide is shown, there will be a 5-minute discussion.

SM p. 7-17

Slides 7-111
to 7-20

IG p. 7-11

Suggested responses are given on the following Student Activity Worksheet.

Summary

First responders should be able to recognize in a few seconds conditions that may be normal or abnormal at the fire scene. With the rapid changes caused by burning, these circumstances may change from one minute to the next.

STUDENT ACTIVITY WORKSHEET

Activity 7.1

Visual Walkthrough of Fire Scenes

Purpose

To examine a series of slides of a fire and to make some basic observations, using the material presented in the course.

Directions

1. Watch each slide for 15 seconds.
2. You will have 2 minutes to write down what you have observed, using the material that has been presented to you in the course.
3. There will be a group discussion after each slide is shown.

Suggested responses:



Slide 11

Location of flame and smoke. Color of flame and smoke.



Slide 12

Burn pattern in hallway-fire coming from rear of hallway..



Slide 13

Ceiling damage – damage on counter..

STUDENT ACTIVITY WORKSHEET



Slide 14

Burn through of floor due to HVAC vent.



Slide 15

Inverted "V" pattern..



Slide 16

"V" pattern from chair.



Slide 17

Damage to table and floor under table.



Slide 18

Pointer patterns.



Slide 19

Burn through floor from top down.

STUDENT ACTIVITY WORKSHEET



Slide 20

Fuel gas fire due to leaking connection.

BIBLIOGRAPHY

Fire Cause Determination for Company Officers, Instructor Guide and Student Manual. Emmitsburg, MD: National Fire Academy.

Fire Service Communications, Instructor Guide and Student Manual. Emmitsburg, MD: National Fire Academy, 1983.

Initial Fire Investigation, Instructor Guide and Student Manual. Emmitsburg, MD: National Fire Academy.

NFPA 902M, *Fire Reporting Field Incident Manual, Basic Incident Reporting.* Quincy, MA: National Fire Protection Association, 1990.

NFPA 906M, *Guide for Fire Incident Field Notes.* Quincy, MA: National Fire Protection Association, 1988.

