

Strategy and Tactics for Initial Company Operations

STICO-Student Manual

3rd Edition, 2nd Printing-July 2016



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July 2016
3rd Edition, 2nd Printing

***Strategy and Tactics for Initial Company
Operations***



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ACKNOWLEDGMENTS

The development of any National Fire Academy (NFA) course is a complex process aimed at providing students with the best possible learning opportunity we can deliver.

There are many players in course development, each of whom plays an equally important part in its success. We want to acknowledge their participation and contribution to this effort and extend our heartfelt thanks for making this quality product.

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COURSE GOAL

The goal of the course is to develop the management skills needed by Company Officers (COs) to accomplish assigned tactics for structure fires.

AUDIENCE, SCOPE AND COURSE PURPOSE

The primary target audience for the “Strategy and Tactics for Initial Company Operations” (STICO) course is:

- Newly promoted COs.
- Excellent review for experienced COs.
- Firefighters who may have acting CO responsibilities.
- Firefighters who want to become COs.

The course is designed for newly promoted COs to learn the use and understanding of strategies and tactics and their importance in ensuring firefighter safety on the fireground.

GRADING METHODOLOGY

Course Grade

The required performance to successfully complete the course is attained by completing the examination with at least a “C” by answering correctly a minimum of 21 out of 30 questions.

The following course grading plan should be used to determine the assigned course grade for each student in the class.

Letter Grade	Point Range
A	90-100
B	80-89
C	70-79
F	69 or lower

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STRATEGY AND TACTICS FOR INITIAL COMPANY OPERATIONS

SCHEDULE

TIME	DAY 1	DAY 2
8:00 - 9:45	Introduction, Welcome and Administrative	Unit 2: Fire Confinement, Exposure Protection, and Fire Extinguishment (cont'd) Unit 3: Rescue, Ventilation, Support and Overhaul
9:45 - 10:00	<i>Break</i>	<i>Break</i>
10:00 - 10:45	Unit 1: Incident Command System and the Command Sequence	Activity 31: Rescue Tactics Unit 3: Rescue, Ventilation, Support and Overhaul (cont'd)
10:45 - 11:00	<i>Break</i>	<i>Break</i>
11:00 - 12:00	Unit 1: Incident Command System and the Command Sequence (cont'd)	Activity 3.2: Ventilation Unit 3: Rescue, Ventilation, Support and Overhaul (cont'd) Unit 4: Water Supply, Fixed Fire Protection Systems, and Salvage
12:00 - 1:00	<i>Lunch</i>	<i>Lunch</i>
1:00 - 2:15	Unit 1: Incident Command System and the Command Sequence (cont'd) Unit 2: Fire Confinement, Exposure Protection, and Fire Extinguishment	Activity 4.1: Water Supply Operations Unit 4: Water Supply, Fixed Fire Protection Systems, and Salvage (cont'd)
2:15 - 2:30	<i>Break</i>	<i>Break</i>
2:30 - 5:00	Activity 2.1: Fire Confinement Unit 2: Fire Confinement, Exposure Protection, and Fire Extinguishment (cont'd) Activity 2.2: Fire Confinement and Exposure Protection	Activity 4.2: Salvage Unit 4: Water Supply, Fixed Fire Protection Systems, and Salvage (cont'd) Final Exam

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FIREFIGHTER CODE OF ETHICS

Background

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

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

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

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



FIREFIGHTER CODE OF ETHICS

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

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

Developed by the National Society of Executive Fire Officers

A Student Guide to End-of-course Evaluations

Say What You Mean ...

Ten Things You Can Do to Improve the National Fire Academy

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

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



Actual quotes from student evaluations:	Examples of specific, actionable comments that would help us improve the course:
1 "Update the materials."	<ul style="list-style-type: none"> The (ABC) fire video is out-of-date because of the dangerous tactics it demonstrates. The available (XYZ) video shows current practices. The student manual references building codes that are 12 years old.
2 "We want an advanced class in (fill in the blank)."	<ul style="list-style-type: none"> We would like a class that enables us to calculate energy transfer rates resulting from exposure fires. We would like a class that provides one-on-one workplace harassment counseling practice exercises.
3 "More activities."	<ul style="list-style-type: none"> An activity where students can physically measure the area of sprinkler coverage would improve understanding of the concept. Not all students were able to fill all ICS positions in the exercises. Add more exercises so all students can participate.
4 "A longer course."	<ul style="list-style-type: none"> The class should be increased by one hour per day to enable all students to participate in exercises. The class should be increased by two days so that all group presentations can be peer evaluated and have written abstracts.
5 "Readable plans."	<ul style="list-style-type: none"> The plans should be enlarged to 11 by 17 and provided with an accurate scale. My plan set was blurry, which caused the dotted lines to be interpreted as solid lines.
6 "Better student guide organization," "manual did not coincide with slides."	<ul style="list-style-type: none"> The slide sequence in Unit 4 did not align with the content in the student manual from slides 4-16 through 4-21. The instructor added slides in Unit 4 that were not in my student manual.
7 "Dry in spots."	<ul style="list-style-type: none"> The instructor/activity should have used student group activities rather than lecture to explain Maslow's Hierarchy. Create a pre-course reading on symbiotic personal relationships rather than trying to lecture on them in class.
8 "More visual aids."	<ul style="list-style-type: none"> The text description of V-patterns did not provide three-dimensional views. More photographs or drawings would help me imagine the pattern. There was a video clip on NBC News (date) that summarized the topic very well.
9 "Re-evaluate pre-course assignments."	<ul style="list-style-type: none"> The pre-course assignments were not discussed or referenced in class. Either connect them to the course content or delete them. The pre-course assignments on ICS could be reduced to a one-page job aid rather than a 25-page reading.
10 "A better understanding of NIMS."	<ul style="list-style-type: none"> The instructor did not explain the connection between NIMS and ICS. The student manual needs an illustrated guide to NIMS.

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UNIT 1: INCIDENT COMMAND SYSTEM AND THE COMMAND SEQUENCE

TERMINAL OBJECTIVE

The students will be able to:



- 1.1 *Identify an organized approach to safely managing incident scenes.*

ENABLING OBJECTIVES

The students will be able to:

- 1.1 *Discuss the Incident Command System (ICS).*
 - 1.2 *Analyze the Command Sequence Action Cycle.*
 - 1.3 *Identify the types of building construction.*
 - 1.4 *Identify how fire behavior factors affect objectives and strategies.*
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**UNIT 1:
INCIDENT COMMAND
SYSTEM AND THE
COMMAND SEQUENCE**

Slide 1-1

ENABLING OBJECTIVES

- Discuss the Incident Command System (ICS).
- Analyze the Command Sequence Action Cycle.
- Identify the types of building construction.
- Identify how fire behavior factors affect objectives and strategies.

Slide 1-2

I. MAJOR FUNCTIONS OF THE INCIDENT COMMAND SYSTEM

**MAJOR FUNCTIONS OF THE
INCIDENT COMMAND SYSTEM**

- Command is responsible for overall incident management:
 - Size up.
 - Identify problems.
 - Establish objectives.
 - Determine strategies.
 - Select tactics.
 - Set the Incident Action Plan (IAP).

Slide 1-3

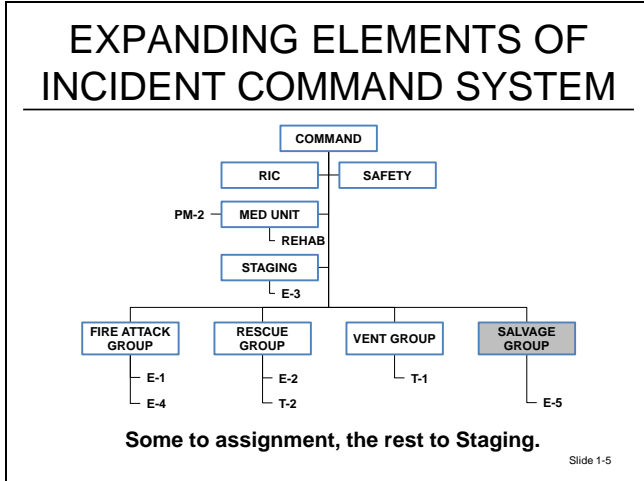
- A. Command is responsible for overall incident management.
- B. Responsibilities of command.
 - 1. Size up.
 - 2. Identify problems.
 - 3. Establish objectives.
 - 4. Determine strategies.
 - 5. Select tactics.
 - 6. Set the Incident Action Plan (IAP).

**MAJOR FUNCTIONS OF THE INCIDENT
COMMAND SYSTEM (cont'd)**

- Develop ICS organization.
- Manage resources.
- Coordinate resource activities.
- Provide for safety.
- Release information.
- Coordinate with outside agencies.

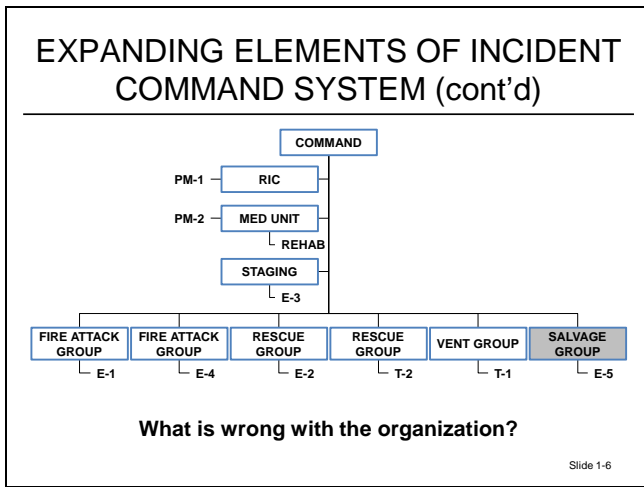
Slide 1-4

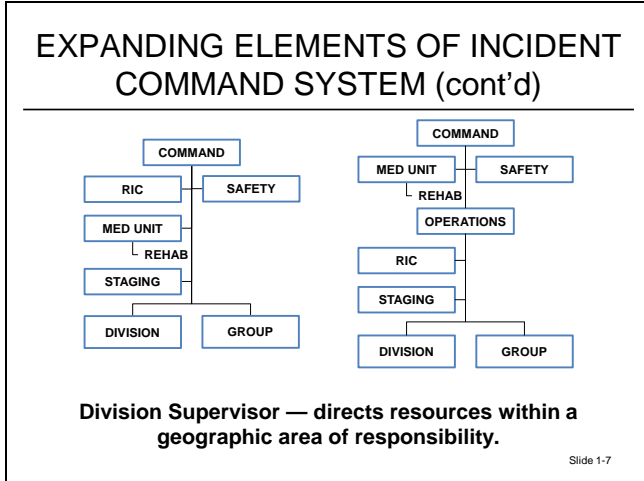
- 7. Develop appropriate Incident Command System (ICS) organization.
- 8. Manage resources.
- 9. Coordinate resource activities.
- 10. Provide for safety.
- 11. Release information.
- 12. Coordinate with outside agencies.



C. Expanding elements of ICS.

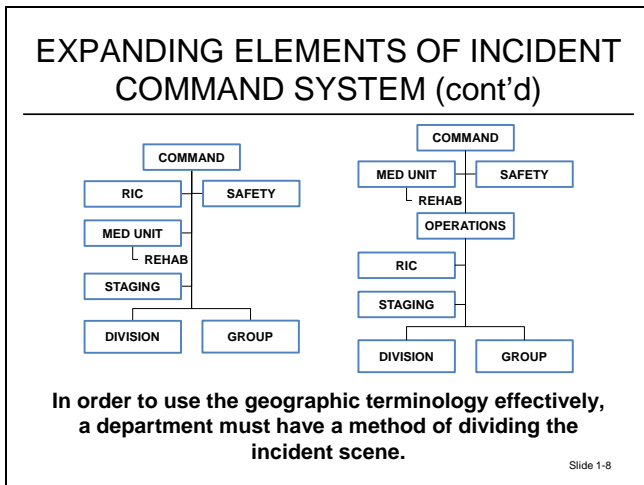
1. How will they be distributed?
2. All to Staging; all to fire; some to each.
3. Let's end with a total of seven units at the scene and look at the ICS chart on the slide.





4. Division Supervisor.

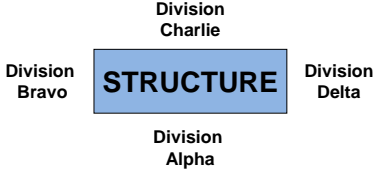
- a. Directs resources within a geographic area of responsibility.



- b. In order to use the geographic terminology effectively, a department must have a method of dividing the incident scene.

DIVIDING THE INCIDENT

- An example:
 - ABCD system.



Division Charlie

Division Bravo **STRUCTURE** Division Delta

Division Alpha

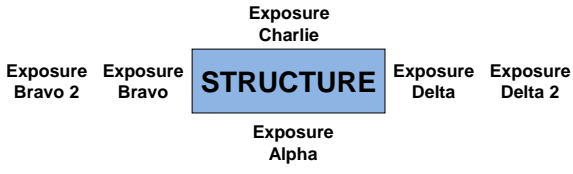
Slide 1-9

c. Dividing the incident.

- Exposures around the outside of the structure.
- Exposure buildings or areas.
- Floors of a building.

DIVIDING THE INCIDENT (cont'd)

- An example:
 - Exposure system.



Exposure Charlie

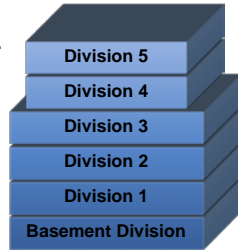
Exposure Bravo 2 Exposure Bravo **STRUCTURE** Exposure Delta Exposure Delta 2

Exposure Alpha

Slide 1-10

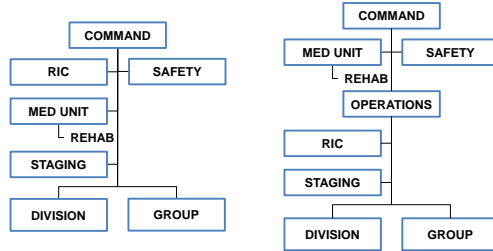
DIVIDING THE INCIDENT (cont'd)

- An example of floors:
 - Each floor is a Division.



Slide 1-11

EXPANDING ELEMENTS OF INCIDENT COMMAND SYSTEM (cont'd)



Group Supervisor — directs resources within a functional area of responsibility (e.g., Vent, Salvage, Rescue and Water Supply Groups).

Slide 1-12

5. Group Supervisor.

- a. Directs resources within a functional area of responsibility (e.g., Vent Group, Salvage Group, Rescue Group, and Water Supply Group).

EXPANDING ELEMENTS OF INCIDENT COMMAND SYSTEM (cont'd)

- Groups work across Division lines.
 - Group Supervisors must coordinate with the Division Supervisor before doing the tasks in that Division.

Slide 1-13

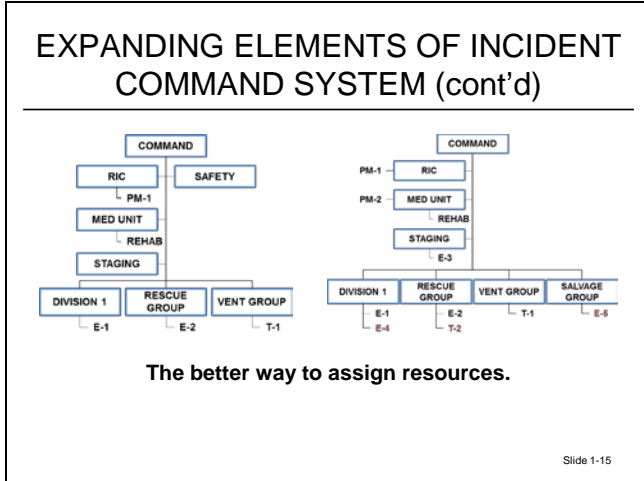
- b. Groups work across Division lines.
- c. Divisions and Groups operate on the same level.
- d. Divisions do not work for Groups, and Groups do not work for Divisions.

OPERATE ON THE SAME LEVEL

- Division Supervisors are responsible for considering all problems and solutions for that geographic area.
- Groups relieve Divisions of specific functional responsibilities.

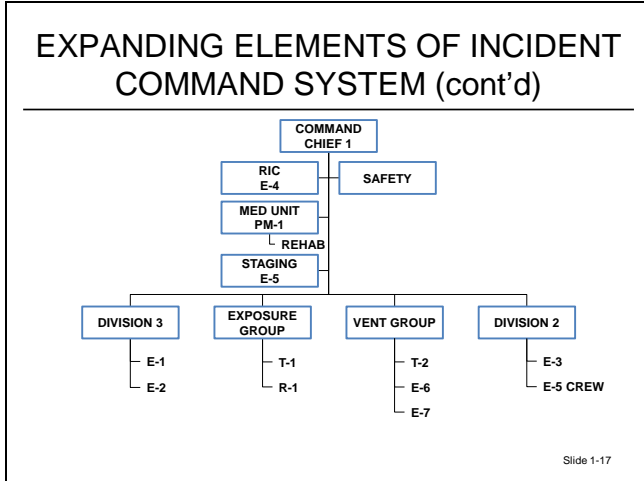
Slide 1-14

- 6. When a Division is created, the Division Supervisor is responsible for considering all problems and solutions for that geographic area.
 - a. Groups can relieve Divisions of functional responsibilities.
 - b. Group Supervisors are responsible for coordinating with Division Supervisors **before** taking any action that can affect the personnel within that Division.



7. A more effective method of implementing ICS with the first alarm would be:
 - a. At initial arrival and assignment of the first-alarm units, begin at the Division and Group level.
 - b. Plug in additional resources as they arrive.





8. In this example scenario, a fire has broken out at a garden apartment complex.
 - a. Seven engines, two trucks, and a Rescue Unit have arrived; other units are responding (approximately 38 personnel or about 10 crews).
 - b. Engines — four people; trucks — four people; rescue — two people.
 - c. The attic and third floor are heavily involved (about 50 percent).
 - Engine 1 or E-1 arrives on the scene.
 - Safety Officer arrives and assumes safety duties.
 - E-2 arrives on the scene.
 - Truck 1 or T-1 arrives on the scene.
 - Paramedic 1 or PM-1 arrives and is assigned to Rehab.
 - Chief 1 arrives on the scene.
 - E-3 arrives on the scene.
 - E-4 arrives on the scene.
 - T-2 arrives on the scene.
 - E-5 arrives on the scene.
 - E-6 arrives on the scene.

- Rescue 1 or R-1 arrives on the scene.
- E-7 arrives on the scene.

II. ESTABLISHING INCIDENT OBJECTIVES

ESTABLISHING INCIDENT OBJECTIVES

- What is an objective?

Slide 1-18

ESTABLISHING INCIDENT OBJECTIVES (cont'd)

- Objectives must be SMART:
 - **S**pecific.
 - **M**easurable.
 - **A**ttainable.
 - **R**elevant.
 - **T**ime sensitive.

Slide 1-19

A. Objectives must be **S**pecific, **M**easurable, **A**ttainable, **R**elevant and **T**ime sensitive (SMART):

1. **S**pecific.
2. **M**easurable.
3. **A**ttainable.
4. **R**elevant.
5. **T**ime sensitive.

IDENTIFYING INCIDENT STRATEGY

- What is strategy?

Slide 1-20

IDENTIFYING INCIDENT STRATEGY (cont'd)

- Initially for small incidents:
 - This is the sole responsibility of the Incident Commander (IC)/Company Officer (CO).

Slide 1-21

6. For small incidents, incident objectives and strategies are the sole responsibility of the Incident Commander (IC)/Company Officer (CO) and may take only a few minutes to complete.

IDENTIFYING INCIDENT STRATEGY (cont'd)

- For large incidents, members of the General Staff will contribute incident strategies.
 - Rescue.
 - Exposures.
 - Confine the fire.
 - Extinguish.
 - Overhaul.
 - Ventilate.
 - Salvage (RECEO-VS).

Slide 1-22

7. For larger incidents, members of the General Staff (and others) will contribute to this process.
- a. **Rescue.**
 - b. **Exposures.**
 - c. **Confine the fire.**
 - d. **Extinguish.**
 - e. **Overhaul.**
 - f. **Ventilate.**
 - g. **Salvage (RECEO-VS).**

**TACTICAL DIRECTIONS AND
RESOURCE ASSIGNMENTS**

What are tactics?

Slide 1-23

TACTICAL DIRECTIONS

- Tactical directions include determining the tactics necessary for the selected strategy and assigning appropriate resources.
- Developed around specific operational periods.

Slide 1-24

8. Tactical directions include:
 - a. Determining the tactics and operations necessary for the selected strategy.
 - b. Determining and assigning appropriate resources.
9. The tactical directions are developed around specific operational periods and must have measurable results.

TACTICAL DIRECTIONS
(cont'd)

- Large incidents may last for some time.
- Tactical directions should be realistic.
- Resource assignments will be made for each of the specific tasks.

Slide 1-25

10. For large incidents that may last for some time, there is a limit to what may be achieved (in terms of accomplishing an incident objective in a single operational period).
11. Therefore, tactical directions should be stated in terms of accomplishments that can be achieved realistically within the time frame of an operational period.

THE COMMAND SEQUENCE

- Incident priorities.
- The mission statement of the fire department.
- Life safety.
- Incident stabilization.
- Property conservation.

Slide 1-26

B. The command sequence.

The incident priorities define the mission. All strategies and tactics must be conceived within the boundaries of the mission. The incident priorities are:

1. Life safety.
2. Incident stabilization.
3. Property conservation.

III. COMMAND SEQUENCE ACTION CYCLE

**COMMAND SEQUENCE
ACTION CYCLE**

- Critical factors of incident operations are often overlooked (or not given enough emphasis). This can result in:
 - Poor use of resources.
 - Inappropriate strategies and tactics.
 - Safety problems.
 - High incident costs.
 - Lower effectiveness.

Slide 1-27

A. Overview.

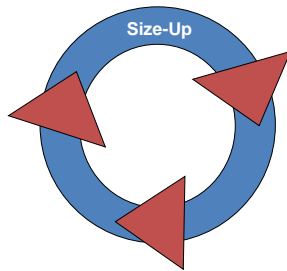
1. Critical factors of incident operations are often overlooked (or not given enough emphasis). This can result in:
 - a. Poor use of resources.
 - b. Inappropriate strategies and tactics.
 - c. Safety problems.
 - d. High incident costs.
 - e. Lower effectiveness.
2. A simple (but thorough) process for planning can be used for small, short-term events and for long, more complex incidents and events.

COMMAND SEQUENCE ACTION CYCLE (cont'd)

- Consists of six sequential steps:
 - Understanding the situation.
 - Establishing incident objectives.
 - Developing incident strategy.
 - Directing tactical and resource assignments.
 - Implementing the plan.
 - Evaluating the plan.

Slide 1-28

THE COMMAND SEQUENCE (cont'd)



Slide 1-29

3. This process is referred to as the Command Sequence Action Cycle and consists of six sequential parts:
 - a. Understanding the situation. (Size up the primary factors.)
 - b. Establishing incident objectives.
 - c. Developing incident strategy (activities).
 - d. Directing tactical direction and resource assignments.
 - e. Implementing the plan.
 - f. Evaluating the plan.

UNDERSTANDING THE SITUATION

Involves knowing:

- What has occurred.
- If the incident will expand (or get smaller).
- Present (and future) resource and organizational needs.

Slide 1-30

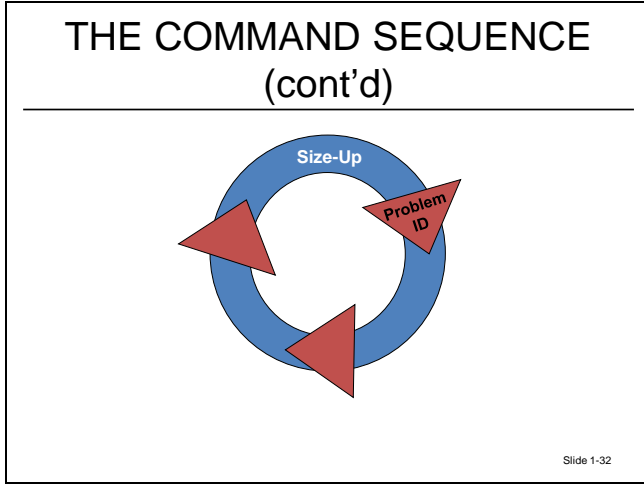
4. You must know:
 - a. What has occurred.
 - b. If the incident will get bigger (or smaller).
 - c. Present (and future) resource and organizational needs.

THE COMMAND SEQUENCE (cont'd)

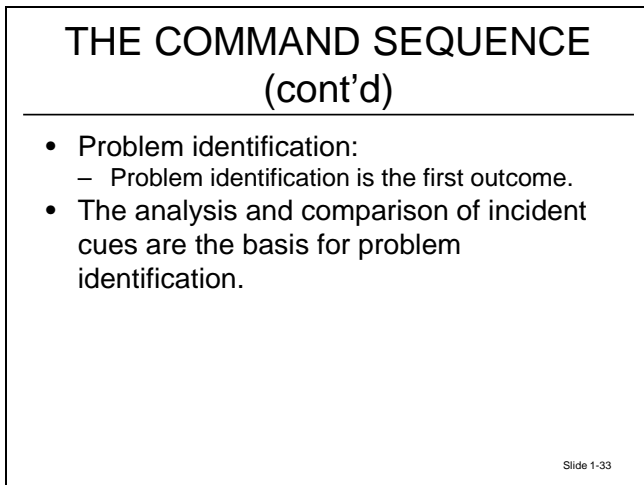
- Size-up.
 - First step in the process of determining the incident situation.
 - Assessment of the situation.
 - Gathering and analyzing cues.
 - The first action.

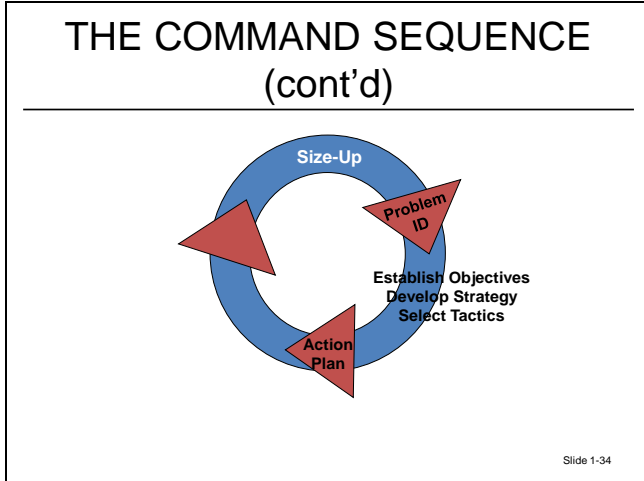
Slide 1-31

5. Size-up is the gathering and recognition of information cues.
 - a. The assessment of the situation.
 - b. The first action.

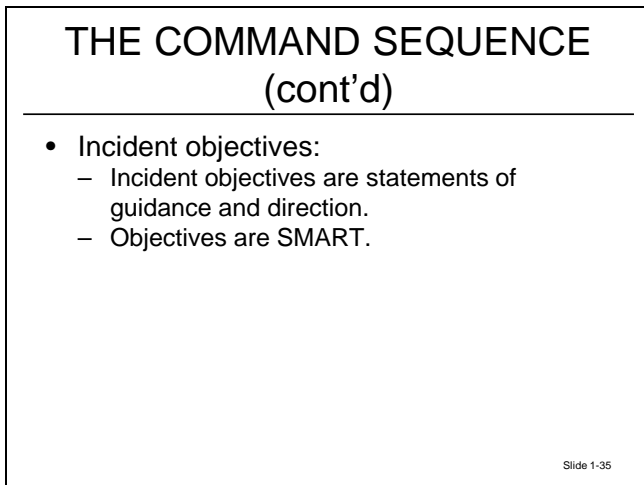


6. Size-up is the analysis and comparison of incident cues and the basis for problem identification.
 - a. These problems must be identified to set incident priorities.
 - b. Problem identification is the first outcome.





7. The analysis and comparison of incident primary factors and cues are the basis for problem identification.
 - a. Report of occupants trapped.
 - b. Fire extending to exposures.
 - c. Presence of flammable vapors.



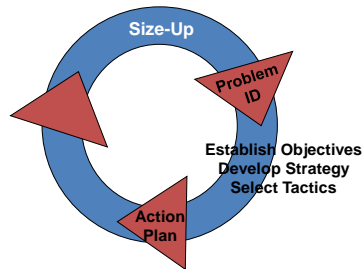
8. Establishing incident objectives.
 - a. Incident objectives are statements of guidance and direction.
 - b. Objectives are SMART.

THE COMMAND SEQUENCE (cont'd)

- Determining strategies and selecting tactics.
 - Strategy is the “what” of the solution.
 - Tactics are the “how” of the solution.
 - Designating incident objectives, strategy and tactics is the second action.

Slide 1-36

THE COMMAND SEQUENCE (cont'd)



Slide 1-37

9. Determining strategies and selecting tactics.
 - a. Strategy is the “what” of the solution: What must be done to solve the problem?
 - b. Tactics are the “how” of the solution: They are the specific actions that must be performed.
 - c. Designating strategies and tactics is the second action step.

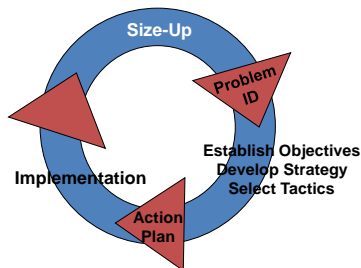
THE COMMAND SEQUENCE (cont'd)

- IAP:
 - Comprised of the strategy and tactics, including “who, when and where.”
 - The IAP is the second outcome.
 - Objectives explain what can be accomplished when all allocated resources have been deployed efficiently.

Slide 1-38

10. The IAP delineates “who” takes the action and “when” and “where” the action takes place.
 - a. The IAP includes the determined strategy and selected tactics.
 - b. The IAP is the second outcome.

THE COMMAND SEQUENCE (cont'd)



Slide 1-39

THE COMMAND SEQUENCE
(cont'd)

- Implementing the IAP:
 - Directives issued to resources delineating their part of the plan and the “when” and “where.”
 - Implementation is the third action.

Slide 1-40

11. Implementing the IAP.
 - a. Resources need to know their part of the plan.
 - b. Directives are issued to the resources delineating their part of the plan, the “when,” and the “where.”
 - c. Implementing the IAP is the third action step.

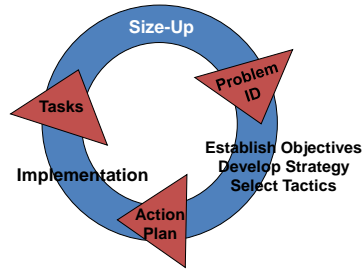
THE COMMAND SEQUENCE
(cont'd)

- Communicating assignments clearly.
- Ensure that assignments are understood.
- Obtain timely feedback.

Slide 1-41

- d. Communicating assignments clearly.
- e. Ensure that assignments are understood.
- f. Obtain timely feedback.

THE COMMAND SEQUENCE (cont'd)



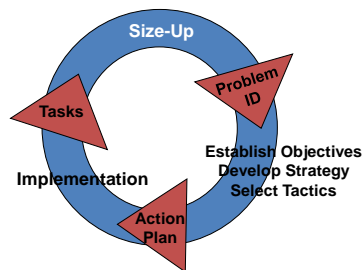
Slide 1-42

THE COMMAND SEQUENCE (cont'd)

- Performing tactical operations (tasks):
 - The tasks that companies and crews perform to accomplish the tactics.
 - Tactics are done at the Division or Group level by those supervisors.

Slide 1-43

THE COMMAND SEQUENCE (cont'd)



Slide 1-44

12. Performing tactical operations.
 - a. Companies perform specifically learned manual tasks that, when completed, achieve or help achieve a tactic.

- b. Performing tasks is the third outcome.
- c. Performance of tactical operations cycles back into the first action step: size up.

EVALUATING THE PLAN

- Is the strategy attaining the overall objectives?
- Are the appropriate tactics facilitating the strategy?

Slide 1-45

- 13. Evaluating the plan.
 - a. Is the strategy attaining the overall objectives?
 - b. Are appropriate tactics facilitating the strategy?

**EVALUATING THE PLAN
(cont'd)**

- Does the plan need to be modified or adjusted?
- Continue the size-up, and evaluate the effectiveness of the IAP. Evaluate every 10 minutes.

Slide 1-46

- c. Does the plan need to be modified or adjusted?
- d. Continue the size-up, and evaluate the effectiveness of the IAP. Evaluate every 10 minutes.

GUIDE TO ACTION PLANNING

- Makes you think before you act.
- Helps keep the IC in a proactive mode.
- Ensures that critical cues are not overlooked.
- Can be used at any type of incident.
- Provides a logical thought process.

Slide 1-47

14. A guide to action planning.
 - a. Makes you think before you act.
 - b. Helps keep IC in a proactive mode.
 - c. Helps to ensure that critical cues are not overlooked.
 - d. Can be used at any type of incident.
 - e. Provides a logical thought process to follow.

ESTABLISHING AN ACTION PLAN

Walk-around: hypothetical house fire.



Slide 1-48

- B. Establishing an action plan.

EXAMPLE OF OBJECTIVES

- Occupied house fire:
 - Two-story occupied dwelling, 20 feet by 40 feet, ordinary construction, fire located in living room area, first floor, Side Delta, report of occupants trapped in second floor bedroom, Side Bravo. No external exposures.

Slide 1-49

EXAMPLE OF OBJECTIVES (cont'd)

- Incident objectives:
 - Objective 1: Provide for the safe removal of occupants within 10 minutes.
 - Objective 2: Contain and control fire to room/building of origin within 15 minutes.

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EXAMPLE OF STRATEGIES

- Example of strategies for Objective 1:
 - Strategy 1: Rescue.
 - Strategy 2: Confine/Extinguish.
 - Strategy 3: Ventilate.

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EXAMPLE OF TACTICS

- For Objective 1, the strategy and tactics may be:
 - Rescue/Confine/Extinguish:
 - Tactic 1: Deploy a Search and Rescue Group to upper floors.
 - Tactic 2: Deploy a hoseline to first floor for stairwell/occupant protection.

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EXAMPLE OF TACTICS (cont'd)

- Ventilate:
 - Tactic 1: Ventilate stairwell (if possible) and Side Bravo to support occupant removal.

Slide 1-53

EXAMPLE OF STRATEGIES (cont'd)

- Example of strategies for Objective 2:
 - Strategy 1: Confine/Extinguish.
 - Strategy 2: Ventilate.
 - Strategy 3: Salvage.

Slide 1-54

EXAMPLE OF TACTICS (cont'd)

- For Objective 2, the strategy and tactics may be:
 - Confine/Extinguish:
 - Tactic 1: Deploy a hoseline to first floor, Side Delta for confinement/extinguishment.
 - Tactic 2: Deploy a hoseline to second floor, Side Delta for interior exposure protection.

Slide 1-55

EXAMPLE OF TACTICS (cont'd)

- Ventilate:
 - Tactic 1: vertical ventilation of roof apertures and horizontal ventilation on the first and second floors.

Slide 1-56

EXAMPLE OF TACTICS (cont'd)

- Salvage:
 - Tactic 1: positive ventilation with proper use of fans.
 - Tactic 2: use of salvage covers and control of water runoff.

Slide 1-57

IV. BUILDING CONSTRUCTION

BUILDING CONSTRUCTION CLASSIFICATIONS

- Understanding the strengths, concerns and specific characteristics of construction types is critical.
- As structural elements become weakened, gravity will take over and pull the building down.

Slide 1-58

There are five different building construction classifications. Each has inherent strengths and weaknesses (i.e., pros and cons). These characteristics affect the objectives, strategies and tactics used during an incident.

BUILDING CONSTRUCTION CLASSIFICATIONS (cont'd)

- Type I: fire-resistive.
- Type II: noncombustible.
- Type III: ordinary construction.
- Type IV: heavy timber.
- Type V: wood frame.

Slide 1-59

A. As a refresher, the building construction classifications are:

1. Type I: fire-resistive.
2. Type II: noncombustible.
3. Type III: ordinary.
4. Type IV: heavy timber.
5. Type V: wood frame.

TYPE I: FIRE-RESISTIVE CONSTRUCTION

What is the effect of fire-resistive construction on objectives?

Slide 1-60

B. Type I: fire-resistive construction.

TYPE I: FIRE-RESISTIVE CONSTRUCTION (cont'd)



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Slide 1-61

1. Office buildings of this type of construction often contain large open areas with heavy fire loading.
2. Ventilation is a significant problem.
3. Operations are extremely labor intensive, demanding extensive resources.

TYPE I: FIRE-RESISTIVE CONSTRUCTION (cont'd)



TYPE I: FIRE-RESISTIVE CONSTRUCTION (cont'd)



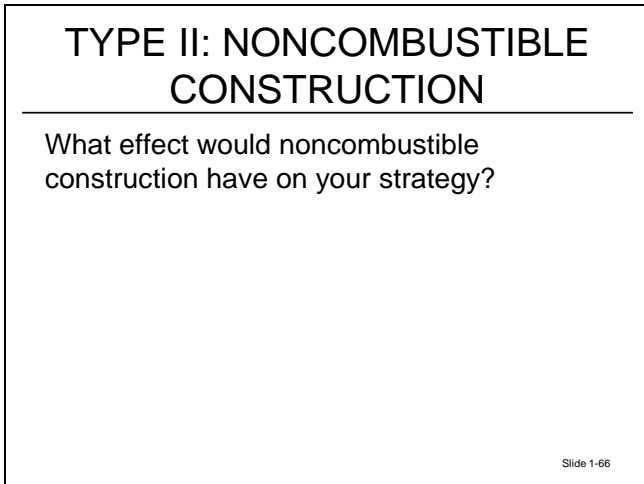
SPRAY-ON FIREPROOFING



- 4. Structural steel is not exposed. It is often protected by encasing, sprayed-on protection or membrane ceilings.



- 5. All vertical openings, such as stairwells and shafts, are protected using approved doors.



- C. Type II: noncombustible construction.

TYPE II: NONCOMBUSTIBLE
CONSTRUCTION (cont'd)



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Slide 1-67

TYPE II: NONCOMBUSTIBLE
CONSTRUCTION (cont'd)



Photo/NFA
Slide 1-68

TYPE II: NONCOMBUSTIBLE
CONSTRUCTION (cont'd)



Photo/NFA
Slide 1-69

1. Structural steel is usually exposed.
2. The structural steel members will retain heat, causing them to become good heat conductors.

TYPE III: ORDINARY CONSTRUCTION

What is the effect of ordinary construction on objectives?

Slide 1-70

D. Type III: ordinary construction.

TYPE III: ORDINARY CONSTRUCTION (cont'd)



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Slide 1-71

TYPE III: ORDINARY CONSTRUCTION (cont'd)



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TYPE III: ORDINARY
CONSTRUCTION (cont'd)



TYPE III: ORDINARY CONSTRUCTION —
NEW STRIP MALL



1. Ordinary construction buildings may have common walls and common floor sockets, allowing for rapid fire spread.
2. Parapet walls, cornices, overhangs, loads on walls, signs and marquees, or other heavy items must be considered for the safety of those working underneath.

TYPE IV: HEAVY TIMBER CONSTRUCTION

- What is the effect of heavy timber construction on objectives/strategies?

Slide 1-75

- E. Type IV: heavy timber construction.
1. Usually masonry (noncombustible) exterior walls and substantial timber construction.
 2. Wood beams, as used in open ceiling structures.

TYPE IV: HEAVY TIMBER CONSTRUCTION (cont'd)

- Portions of walls are noncombustible or limited combustible materials (usually masonry load-bearing walls).
- Interior members are solid or laminated wood.



PhotoNFA

Slide 1-76

TYPE IV: HEAVY TIMBER CONSTRUCTION (cont'd)

- A modern style of Type IV constructions is masonry wall structures (churches, gymnasiums).



Photo/NFA

Slide 1-77

- a. Large mass, 4 inches by 6 inches.
- b. Slow burning and stay strong for a long time.
3. Potential for unprotected open areas, such as freight elevators or utility shafts.
4. Potential for close exposures.

TYPE V: WOOD-FRAME CONSTRUCTION

What is the effect of wood-frame construction on objectives?

Slide 1-78

TYPE V: WOOD-FRAME CONSTRUCTION (cont'd)



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Slide 1-79

TYPE V: WOOD FRAME, PLATFORM FRAME



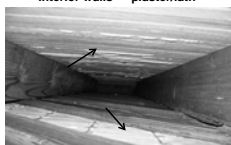
Photo/NFA
Slide 1-80

F. Type V: wood-frame construction.

1. Wall studs are placed on the floor deck with a sill at the bottom of the wall and a plate at the top.

TYPE V: WOOD FRAME, BALLOON FRAME

- Balloon frame construction allows fire to travel uninterrupted.



Interior walls — plaster/lath

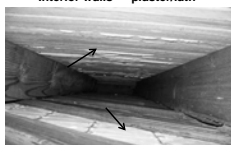
Photo/NFA



Exterior siding removed

Photo/NFA

Slide 1-81



Exterior walls — siding

2. This provides a natural fire buffer for vertical extension within the walls.
3. Studs are run from the foundation to the roof.
4. Floor joists are nailed to the wall studs, allowing fire extension in all directions.
5. Balloon frame structure must be scrutinized aggressively.

BUILDINGS UNDER CONSTRUCTION

What is the effect of buildings under construction on objectives?

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EXAMPLE OF BUILDING UNDER CONSTRUCTION



Photo/NFA
Slide 1-83

G. Buildings under construction.

BUILDING UNDER DEMOLITION

What is the effect of buildings under demolition on objectives?

Slide 1-84

EXAMPLE OF BUILDING UNDER DEMOLITION



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Slide 1-85

H. Buildings under demolition.

OCCUPANCY

What effect would "occupancy" have on your objectives/strategies?

- Type of occupancy.
- Contents of structure (fire load).
- Exposures.



Photo/NFA




Photo/NFA
Slide 1-86

- I. Occupancy and contents.
 - 1. Ventilation.
 - a. Some materials give off gases that are toxic or injurious to the eyes or skin. Ventilation is achieved more slowly.
 - b. Where the presence of explosive mixtures or substances is suspected, exterior ventilation measures should be taken to prevent an explosion or to minimize the results.
 - 2. Placement of hoselines — difficulty in ventilating can reduce the effectiveness of hoselines.
 - 3. Selecting an extinguishing agent — in some cases, water may spread the fire or may cause an explosion or release of gases that can intensify and abet extension of the fire.
 - 4. Overhauling — the quantity of material involved, the manner in which it is stored, its nature, and the degree to which it has been subjected to the fire affect overhauling.

HEIGHT

What effect would “height of building” have on your objectives/strategies?

- Fire building.
- Exposures.



Photo/NFA
Slide 1-87


- J. Height.
 - 1. Ventilation.
 - a. Height can affect activities at fires in high-rise buildings.
 - b. At lower-level fires, roof or window ventilation may be possible, thus facilitating the advance of lines from either side of the fire as well as the search for and removal of occupants.

2. Placement of hoselines.
 - a. Exterior lines also may be used.
 - b. In this case, control is likely to be established more quickly than at a similar but higher fire that can be attacked only from the interior.

AREA

What effect would “area of building” have on your objectives/strategies?

- Fire building.
- Exposures.



Photo/NFA

Slide 1-88

- K. Area.
1. If the fire can be confined to a small room, the fact that the total floor area is 200 feet by 200 feet hardly matters.
 2. However, if such an area is not effectively subdivided and there is no small room, the extent of the fire sooner or later can cover the total floor area.
 3. Proximity of exposures.
 - a. Proximity alone does not make an exposure vulnerable.
 - b. To evaluate the effects of proximity in selecting objectives and activities, proximity must be considered in conjunction with other contributing factors — such as construction, location of fire, occupancy, and wind direction and velocity.

STRUCTURAL COLLAPSE

What effect would “structural collapse” have on your objectives/strategies?

- Fire building.
- Exposures.
- Collapse zone.
- Apparatus placement.



Slide 1-89

- L. Structural collapse — in assessing the effects of other factors on structural collapse, officers should carefully consider the type of construction involved in the fire.

WEATHER

What effect would “weather” have on your objectives/strategies?

- Low temperatures.
- High temperatures.
- Rain.
- Wind.



Slide 1-90


- M. Weather.
1. Low temperatures retard the initial development of fire, but once a fire has started, they impair efficiency.
 2. High temperatures generally are classified as temperatures in the 80s and 90s.
 - a. High humidity and inversion conditions are characterized by dense smoke and poor visibility.
 - b. High humidity and high moisture content make it more difficult for a vigorous fire to become established but do not slow its spread once it is well-started.

3. Rain greatly reduces the probability of fire spreading from building to building.
4. Wind.
 - a. Velocity is an important factor. Winds under 15 mph usually can be controlled by defensive measures.
 - b. With winds from 15 to 30 mph, the rate of fire propagation increases dramatically.
 - Wind at 30 mph threatens exposures downwind.
 - Wind at 30 mph is conducive to conflagrations.
5. Visibility — impaired visibility makes it more difficult to recognize and evaluate pertinent factors properly, thereby hampering decision-making and increasing the possibility of error.

RESOURCE REQUIREMENTS

What effect would “resource requirements” have on your objectives/strategies?

- Water.
- Apparatus.
- Equipment.
- Personnel.
- Special extinguishing agents.



Photo/NFA

Slide 1-91

- N. Resource requirements — the water, apparatus, equipment, personnel, and special extinguishing agents that are required and available for an effective fire operation.

AUXILIARY APPLIANCES

What effect would “auxiliary appliances” have on your objectives/strategies?

- Sprinkler systems.
- Pressurization of stairways or other building areas.



Photo/NFA



Photo/NFA

Slide 1-92

- O. Auxiliary appliances.
1. Sprinkler systems.
 2. Pressurization of stairways or other building areas.

TOPOGRAPHY

What effect would “topography” have on your objectives/strategies?

- Steeply graded streets/roads.
- Leveling portable ladders on grades.
- Congested streets/roads.
- Snow-/Ice-covered streets/roads.


Slide 1-93

- P. Topography.
1. Operating at a fire on steeply graded streets, it may be advisable to position aerial trucks or tower ladders on the high side of the fire to ensure maximum reach.
 2. Use wedges to level portable ladders to allow for safe climbing on hilly terrain.
 3. Streets that are one-way, congested by vehicular traffic, or snow- or ice-covered tend to delay response of the fire department.

EXPLOSIONS

What effect would “explosions” have on your objectives/strategies?

- Smoke explosions.
- Bomb explosions.



Photo/NFA

Slide 1-94

Q. Explosions.

1. Smoke explosions or backdrafts at fires are caused essentially by the rapid combustion of a mixture of flammable gas, vapor, mist or dust, and air under certain conditions.
2. Bomb explosions.
 - a. Warnings of the impending explosion may or may not be given.
 - b. Chief officers responding to the designated target must assume that any warning is authentic and conduct operations accordingly.

V. ANALYTICAL SIZE-UP FOR INCIDENT MANAGEMENT

**USE THE
SCIENTIFIC METHOD**

- Observe the facts (size-up).
- Test the accuracy of the facts through observation.
- If the facts are accurate, logical hypotheses can be deduced.
- If the hypothesis is proved true, outcomes may be predicted in similar situations.
- These hypotheses are called principles.

Slide 1-95

- A. Use the scientific method.
 1. Observe the facts (size-up).
 2. Test the accuracy of the facts through observation.
 3. If the facts are accurate, a logical hypothesis can be deduced.
 4. If the hypothesis is proved true, outcomes may be predicted in similar situations.
 5. These hypotheses are called principles.

Column 1 Primary Factors Size-Up Chart		Column 2 Incident Objectives Specific/Measurable/Attainable/ Relevant/Time Sensitive (SMART)		Column 3 Activities (Strategies)		Column 4 Evaluate Effect of Activities (Strategies) Every 15 Minutes	
		Examples of Incident Objectives				EFFECTIVE	INEFFECTIVE
Patient Factors (P)				(R) Rescue			
Check appropriate boxes	P			• Interior/Exterior			
Life Hazard	Occupants		• Removal of all occupants within 10 minutes	(RT) Egress/Rescue			
Location/Fire	Fire Origin		• Confine and control fire to building of origin in 30 minutes	• Enclosure examination			
	After Arrival		• Control, contain, limit fire exposure within one hour	(CA) Confine/Extinguish			
	Burn Time		• Remove all smoke within 20 minutes	• Negative placement			
Construction	Fire Building			(O) Overhaul			
	Exposures			• Expose hidden fire			
Occupancy (Contents)	Fire Building			(OV) Ventilate			
	Exposures			• Removal of all occupants			
	Exposures (Front/Rear)			• Fire spread			
Height	Fire Bldg (Front/Rear)			(SC) Salvage			
	Exposures (Front/Rear)			• Water run-off			
	Exposures (Front/Rear)			• Apply salvage covers			
Area	Fire Bldg/Configuration						
	Proximity of Exposures/Config						
Structural Collapse	Fire Building			(L) List Incident Strategies	Assigned To		
	Exposures						
Weather	Apparatus Placement						Identify alternative strategies for firefighter safety when occupant safety has been determined not to be a primary factor.
	Visibility						
	Wind — Direction/Velocity						
Resources	Apparatus/Personnel/Equipment						
	Water Supply/Suppression Agent						
Auxiliary	Fire Building Supplied						
Agencies	Exposures Supplied						
	Street Conditions						
Exposure Backdraft	Flashover Conditions						
	Exposures						
Time	Duration of Incident						
	Time of Day						
	Time of Alarm						

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B. Primary Factors Size-Up Chart.

Column 1 Primary Factors Size-Up Chart	
Patient Factors (P)	
Check appropriate boxes	P
Life Hazard	Occupants
Location/Fire	Fire Origin
	After Arrival
	Burn Time
Construction	Fire Building
	Exposures
Occupancy (Contents)	Fire Building
	Exposures
Height	Fire Bldg (Front/Rear)
	Exposures (Front/Rear)
Area	Fire Bldg/Configuration
	Proximity of Exposures/Config
Structural Collapse	Fire Building
	Exposures
Weather	Apparatus Placement
	Visibility
	Temperature/Humidity
	Wind — Direction/Velocity
Resources	Apparatus/Personnel/Equipment
	Water Supply/Suppression Agent
Auxiliary	Fire Building Supplied
Agencies	Exposures Supplied
	Street Conditions
Exposure Backdraft	Flashover Conditions
	Exposures
Time	Duration of Incident
	Time of Day
	Time of Alarm

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- Column 1:
 - The conditions and elements that should be recognized and evaluated on arrival and during operations.

- 2. Column 2: incident objectives.
 - a. Safe removal of all occupants: when life hazard for occupants is the limiting or strategic factor.

**PRIMARY FACTORS SIZE-UP
CHART (cont'd)**

– Contain and control fire to room/building of origin:
-- No life hazard for occupants, and fire is considered to be controllable by a direct or indirect attack.

Column 2
Incident Objectives
Specific, Measurable, Attainable,
Relevant, Time Sensitive (SMART)

Examples of Incident Objectives

- Remove all occupants within 15 minutes
- Contain and control fire to building of origin in 30 minutes
- Contain, control, limit fire in exposure within one hour
- Remove all smoke within 20 minutes

List Incident Objectives

1	Provide for the safety of all responders for the duration of the incident.
2	
3	
4	
5	
6	
7	
8	
9	

Slide 1-99

- b. Contain and control fire to room/building of origin: no life hazard for occupants, and fire is considered to be controllable by a direct or indirect attack.

**PRIMARY FACTORS SIZE-UP
CHART (cont'd)**

– Contain, control and limit fire in exposures:
-- No life hazard for occupants, and the situation is temporarily uncontrollable.

Column 2
Incident Objectives
Specific, Measurable, Attainable,
Relevant, Time Sensitive (SMART)

Examples of Incident Objectives

- Remove all occupants within 15 minutes
- Contain and control fire to building of origin in 30 minutes
- Contain, control, limit fire in exposure within one hour
- Remove all smoke within 20 minutes

List Incident Objectives

1	Provide for the safety of all responders for the duration of the incident.
2	
3	
4	
5	
6	
7	
8	
9	

Slide 1-100

- c. Contain, control and limit fire in exposures: no life hazard for occupants, and the situation is temporarily uncontrollable.

**PRIMARY FACTORS SIZE-UP
CHART (cont'd)**

- Column 3:
 - **R**escue.
 - **E**xposures.
 - **C**onfine the fire/**E**xtinguish.
 - **O**verhaul.
 - **V**entilate.
 - **S**alvage.

Column 3 Activities (Strategies)	
(R) Rescue	• Interior/Exterior
(E) Exposures	• Exposure examination
(C/E) Confine/Extinguish	• Hose-line placement
(O) Overhaul	• Expose hidden fire
(V) Ventilate	• Removal of all occupants • Fire control
(S) Salvage	• Water run-off • Apply salvage covers
List Incident Strategies	Assigned To
1	
2	
3	
4	
5	
6	
7	

Slide 1-101

3. Column 3: activities (strategies).
 - a. **R**escue.
 - b. **E**xposures.
 - c. **C**onfine the fire/**E**xtinguish.
 - d. **O**verhaul.
 - e. **V**entilate.
 - f. **S**alvage.
 - g. **S**ize-up.
 - h. **L**ocation of fire.
 - i. **I**dentify and control flow path.
 - j. **C**ool space from the safest location.
 - k. **E**xtinguish the fire.
 - l. **R**escue.
 - m. **S**alvage (SLICE-RS).

PRIMARY FACTORS SIZE-UP CHART (cont'd)

- Column 4:
 - Re-evaluation of the progress of incident strategies in use.
 - Implement alternative strategies to affect and/or resolve primary factors.

Column 4	
Evaluate Effect of Activities (Strategies) Every 15 Minutes	
EFFECTIVE	INEFFECTIVE
Identify alternative strategies for firefighter safety when occupant safety has been determined not to be a primary factor.	
•	_____
•	_____
•	_____
•	_____
•	_____

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- 4. Column 4: evaluate effect of activities (strategies).
 - a. Re-evaluation of the progress of incident strategies in use.
 - b. Implement alternative strategies to affect and/or resolve primary factors.
- C. Using the Primary Factors Size-Up Chart.
 - 1. Step 1: Assess the pertinent factors, and establish major incident objectives.
List the major objectives in Column 2.
 - 2. Step 2: Identify incident strategies (circle).
List incident strategies in Column 3 (left).
 - 3. Step 3: Assign incident strategies.
Indicate unit or units assigned to the strategy in Column 3 (right).
 - 4. Step 4: Evaluate incident strategies.
 - a. At 10-minute intervals, re-evaluate (in Column 4) the primary factors and the effects of the strategies on these factors.
 - b. Always identify alternative strategies for firefighter safety when occupant safety has been determined not to be a primary factor.



LIMITS

- Risk a lot to save a lot.
- Risk a little to save a little.
- Risk nothing to save nothing.

Slide 1-103

- D. Limits: For practical purposes, there are three limits.
1. Risk a lot to save a lot.
 2. Risk a little to save a little.
 3. Risk nothing to save nothing.

VI. SUMMARY

 **SUMMARY** 

- Major functions of the ICS.
- Establishing incident objectives.
- Command sequence action cycle.
- Building construction.
- Analytical size-up for incident management.

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APPENDIX

PRIMARY FACTORS SIZE-UP CHART

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Primary Factors Size-Up Chart

Column 1 Primary Factors Size-Up Chart		Column 2 Incident Objectives Specific/Measurable/Attainable/ Relevant/Time Sensitive (SMART)	Column 3 Activities (Strategies)	Column 4 Evaluate Effect of Activities (Strategies) Every 10 Minutes EFFECTIVE _____ INEFFECTIVE _____
Pertinent Factors (P)	P	Examples of Incident Objectives	(R) Rescue	
Check appropriate boxes				
Life Hazard	Occupants	<ul style="list-style-type: none"> Removal of all occupants within 10 minutes Contain and control fire to building of origin in 30 minutes Contain, control, limit fire in exposure within one hour Remove all smoke within 20 minutes 	(E) Exposures <ul style="list-style-type: none"> Interior/Exterior 	
	Firefighters			(C/E) Confine/Extinguish <ul style="list-style-type: none"> Exposure examination
Location/Fire	Fire Bldg/Exposures on Arrival	<ul style="list-style-type: none"> Contain, control, limit fire in exposure within one hour Remove all smoke within 20 minutes 		
	After Arrival — Burn Time			
Construction	Fire Building	List Incident Objectives	(O) Overhaul <ul style="list-style-type: none"> Expose hidden fire 	
	Exposures			
Occupancy (Contents)	Fire Building	List Incident Objectives	(V) Ventilate <ul style="list-style-type: none"> Removal of all occupants Fire control 	
	Exposures			
Height	Fire Bldg (Front/Rear)	<ol style="list-style-type: none"> Provide for the safety of all responders for the duration of the incident. 	(S) Salvage <ul style="list-style-type: none"> Water run-off Apply salvage covers 	
	Exposures (Front/Rear)			
Area	Fire Bldg/Configuration	<ol style="list-style-type: none"> 		
	Proximity of Exposures/Config.			
Structural Collapse	Fire Building	<ol style="list-style-type: none"> 	List Incident Strategies	Identify alternative strategies for firefighter safety when occupant safety has been determined not to be a primary factor. <ul style="list-style-type: none"> _____ _____ _____ _____ _____ _____
	Exposures		Assigned To	
Weather	Apparatus Placement	<ol style="list-style-type: none"> 	1	
	Visibility		2	
Resources	Temperature/Humidity	<ol style="list-style-type: none"> 	3	
	Wind — Direction/Velocity		4	
Auxiliary Appliances	Apparatus/Personnel/Equip/RIC	<ol style="list-style-type: none"> 	5	
	Water Supply/Suppression Agent		6	
Topography	Fire Building Supplied	<ol style="list-style-type: none"> 	7	
	Exposures Supplied		8	
Explosion Backdraft	Street Conditions	<ol style="list-style-type: none"> 	9	
	Flashover Conditions			
Time	Duration of Incident	<ol style="list-style-type: none"> 		
	Time of Day			
	Time of Alarm			

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UNIT 2: FIRE CONFINEMENT, EXPOSURE PROTECTION, AND FIRE EXTINGUISHMENT

TERMINAL OBJECTIVES

The students will be able to:



- 2.1 *Recognize critical size-up factors.*
- 2.2 *Recognize that locating the fire's origin and identifying flow control issues are critical during the initial stages of an incident.*

ENABLING OBJECTIVES

The students will be able to:

- 2.1 *Explain the difference between **Rescue, Exposures, Confine the fire, Extinguish, Overhaul, Ventilate, Salvage (RECEO-VS)** and **Size-up, Locate the fire, Identify and control flow path, Cool space from safest location, Extinguish fire, Rescue, Salvage (SLICE-RS)**.*
 - 2.2 *Given a scenario, develop a confinement action plan using the command sequence cycle.*
 - 2.3 *Given a scenario, develop an exposure protection action plan using the command sequence cycle.*
 - 2.4 *Given a scenario, develop a fire extinguishment action plan using the command sequence cycle.*
 - 2.5 *Identify and explain the actions required to support fire confinement, exposure protection, and fire extinguishment activities.*
-

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**UNIT 2:
FIRE CONFINEMENT,
EXPOSURE PROTECTION,
AND FIRE EXTINGUISHMENT**

Slide 2-1

ENABLING OBJECTIVES

- Explain the difference between **R**escue, **E**xposures, **C**onfine the fire, **E**xtinguish, **O**verhaul, **V**entilate, **S**alvage (RECEO-VS) and **S**ize-up, **L**ocate the fire, **I**dentify and control flow path, **C**ool space from safest location, **E**xtinguish fire, **R**escue, **S**alvage (SLICE-RS).
- Given a scenario, develop a confinement action plan using the command sequence cycle.

Slide 2-2

**ENABLING OBJECTIVES
(cont'd)**

- Given a scenario, develop an exposure protection action plan using the command sequence cycle.
- Given a scenario, develop a fire extinguishment action plan using the command sequence cycle.
- Identify and explain the actions required to support fire confinement, exposure protection, and fire extinguishment activities.

Slide 2-3

I. A FRESH APPROACH — RECEO-VS VERSUS SLICE-RS

A FRESH APPROACH

Traditional structural fire strategic goals.

Sequential Actions	Actions of Opportunity
R escue.	V entilate.
E xposures.	S alvage.
C onfine the fire.	
E xtinguish.	
O verhaul.	

Slide 2-4

A FRESH APPROACH (cont'd)

Revised structural fire strategic goals.

Sequential Actions	Actions of Opportunity
R escue	R escue.
S ize-up.	S alvage.
L ocate the fire.	
I dentify and control flow path.	
C ool space from safest location.	
E xtinguish fire.	

Slide 2-5

- A. There may be times that size-up comes before rescue for the safety of the firefighters.
- B. Locating and extinguishing the fire may facilitate a quicker and safer rescue.

A FRESH APPROACH (cont'd)

- Several tactical acronyms have come to challenge RECEO-VS.
- It is not the acronym that makes the attack sequence successful.
- Instead, it is how the attack sequence tactics are applied to the conditions determined during the size-up/360-degree walk-around.

Slide 2-6

C. A new approach.

1. Several tactical acronyms have come to challenge **R**escue, **E**xposures, **C**onfine the fire, **E**xtinguish, **O**verhaul, **V**entilate, **S**alvage (RECEO-VS).
2. It is not the acronym that makes the attack sequence successful.
3. Instead, it is how the attack sequence tactics are applied to the conditions determined during the size-up/360-degree walk-around.

A FRESH APPROACH (cont'd)

- This essential process provides the means to locate the fire, isolate the flow path, and begin the cooling process **without delay!**

Slide 2-7

4. This essential process provides the means to locate the fire, isolate the flow path, and begin the cooling process **without delay!**

WHAT ABOUT VENTILATION?

Ventilation has been removed from a must-do tactical component and placed as a special consideration. More details to follow.

Slide 2-8

- D. Ventilation has been removed from a must-do tactical component and placed as a special consideration. More details to follow.

A FRESH APPROACH (cont'd)

- Reinforce that whenever crews enter immediately dangerous to life and health (IDLH) conditions during a structural fire, the proper firefighter rescue capability should be established prior to their entry.

Slide 2-9

- E. A Rapid Intervention Crew (RIC) should be in place prior to any interior firefighting in immediately dangerous to life and health (IDLH) conditions.

INITIAL OPERATIONS — TWO-IN/TWO-OUT

- Occupational Safety and Health Administration (OSHA) 1910.134.
- Two-in/Two-out rule.
- Federal law in most states.
- A two-person team must remain in contact with members in the IDLH atmosphere.



Slide 2-10

- F. Interior firefighting operations.
 - 1. Minimum of four personnel needed. (There are exceptions such as South Carolina, which has a state rule of two in and one out.)
 - 2. Can be assembled in a number of ways.
 - a. Two two-person companies.
 - b. One four-person company.
 - c. One three-person company plus a duty chief.

G. Options for standby team.

- 1. First member.

Don appropriate personal protective equipment (PPE) and self-contained breathing apparatus (SCBA), and be ready to go.

- a. Dedicated to rescue.
- b. Attired with full PPE, including SCBA.

- 2. Second member.

**INITIAL OPERATIONS —
TWO-IN/TWO-OUT (cont'd)**

- Assigned members can be used for other duties.
 - They must be able to leave those duties to perform rescue.
- Requirement can be suspended if life-threatening conditions exist.


Slide 2-11

- a. The second person outside may be assigned other duties as long as this person is able to perform assistance or rescue activities (e.g., Incident Commander (IC) or Safety Officer) without delay and without jeopardizing the safety or health of any firefighter working at the incident.

- b. This person will need to don SCBA and have the mask available for immediate use.

**RAPID INTERVENTION
CREWS**

- It is paramount that whenever personnel are operating in positions or performing functions that subject them to immediate danger, at least one properly attired Rapid Intervention Crew (RIC) is available and ready to provide assistance.



Slide 2-12

- H. Ensure that RICs have the needed tools for rapid deployment.

**RAPID INTERVENTION
CREWS (cont'd)**

- Rapid intervention procedures should not be confused with initial interior structural firefighting operations (two-in/two-out), addressed in National Fire Protection Association (NFPA) 1500, *Standard on Fire Department Occupational Safety and Health Program*.

Slide 2-13

- 1. Do not confuse rapid intervention procedures with interior structural firefighting operations (two-in/two-out).

**RAPID INTERVENTION CREW PRIMARY
FOCUS UPON ACTIVATION**

- Search, reconnaissance or recon, and locate.
- Remove trapped firefighters to a safe location if possible.



Slide 2-14

2. Primary focus upon activation.
 - a. Search, reconnaissance or recon, and locate.
 - b. Remove trapped firefighters to a safe location if possible.

**RAPID INTERVENTION CREW PRIMARY
FOCUS UPON ACTIVATION (cont'd)**

- Provide air supply to trapped firefighters.
- Request resources from Incident Commander (IC) to protect and rescue.



Slide 2-15

- c. Provide air supply to trapped firefighters.
- d. Request resources from IC to protect and rescue.

RAPID INTERVENTION CREWS (cont'd)

- Some common responses by some officers and firefighters alike when assigned to the position of rapid intervention:
 - “You have got to be kidding me, RIC!?”
 - “What? You want us to just stand here?”
 - “Chief, if you get us out of RIC, we’ll put this fire out!”

Slide 2-16

3. Common responses to RIC assignment.
 - a. “You have got to be kidding me, RIC!?”
 - b. “What? You want us to just stand here?”
 - c. “Chief, if you get us out of RIC, we’ll put this fire out!”

RAPID INTERVENTION CREW PROACTIVE MEASURES

- In order to promote proactive measures for improving firefighter safety within the IDLH atmosphere, RICs should be directly involved or coordinate with the IC to ensure that the following duties are achieved.
 - Placement of ground ladders to support egress.

Slide 2-17

- I. Look for that assigned RIC to coordinate and, by observation of the scene, evaluate and possibly initiate the following proactive tasks to support and potentially eliminate the “mayday.”

**RAPID INTERVENTION CREW
PROACTIVE MEASURES (cont'd)**

- Placement of lighting to illuminate points of egress.
- Force open exterior doors in operational areas to improve egress opportunities.

Slide 2-18

1. Placement of ground ladders to support egress.
2. Placement of lighting to illuminate points of egress.
3. Force open exterior doors in operational areas to improve egress opportunities.

**RAPID INTERVENTION CREW
PROACTIVE MEASURES (cont'd)**

- Remove window obstructions in operational areas, such as bars, security screens, casement window frames.
- Confirm control of utilities.

Slide 2-19

4. Remove window obstructions in operational areas, such as bars, security screens, and casement window frames.
5. Confirm control of utilities.

RAPID INTERVENTION CREW PROACTIVE MEASURES (cont'd)

- What is the common thread for the tasks listed previously?
- With all that, the primary mission of the RIC is to:
 - Maintain readiness to react to a “mayday” by orders of the IC.

Slide 2-20

6. Maintain readiness to react to a “mayday” by orders of the IC.

“MAYDAY” MENTALITY



Slide 2-21

II. SIZE-UP AND RISK ASSESSMENT

SIZE-UP AND RISK ASSESSMENT



Slide 2-22

**SEQUENTIAL STRATEGIC
ACTIONS: SIZE-UP**

Size-up.

- A cornerstone of tactical operations.
- Make 360-degree laps.
- Communicate the conditions, building construction, etc.

Slide 2-23

A. Size-up.

1. A cornerstone of tactical operations.
2. Make 360-degree laps.
3. Communicate the conditions, building construction, etc.

**SEQUENTIAL STRATEGIC
ACTIONS: SIZE-UP (cont'd)**

- Declare operational modes by advising actions.
- Request additional resources, if needed.
- Establish command.

Slide 2-24

4. Declare operational modes by advising actions.
5. Request additional resources, if needed.
6. Establish command.

SIZE-UP DEFINED

Size-up is an ongoing process of evaluating the situation to determine:

- What happened.
- What is happening.
- What is likely to happen.

Slide 2-25

B. Size-up is an ongoing process of evaluating the situation to determine:

1. What happened.
2. What is happening.
3. What is likely to happen.

WHAT IS SIZE-UP: WHAT IS DISCOVERED?

- An inadequate size-up can lead to choosing the wrong strategy, overlooking trapped occupants, and putting firefighters at excessive risk.

Slide 2-26

C. An inadequate size-up can lead to choosing the wrong strategy, overlooking trapped occupants, and putting firefighters at excessive risk.

WHAT IS SIZE-UP: WHAT IS DISCOVERED? (cont'd)

- Example — fire travel:
 - The first responding officer makes a reasonable assumption of what the fire will consume and where it can be stopped.
 - Predict the path and speed of the fire.



Slide 2-27

Example — fire travel.

1. The first responding officer makes a reasonable assumption of what the fire will consume and where it can be stopped.
2. Predict the path and speed of the fire.

THREE PHASES OF SIZE-UP

- Preincident information — what you know from your preplanning efforts.
- Initial size-up — what you see and hear during the initial stages of the event.
- Ongoing size-up — the gathering of information throughout the event.

Slide 2-28

D. Three phases of size-up.

1. Preincident information — what you know from your preplanning efforts.
2. Initial size-up — what you see and hear during the initial stages of the event.
3. Ongoing size-up — the gathering of information throughout the event.

SIZE-UP

- Size-up is the process of gathering and analyzing information that is critical to the outcome of the event. This information includes conditions and elements that should be recognized and evaluated on arrival and during operations.

Slide 2-29

- E. Size-up is the process of gathering and analyzing information that is critical to the outcome of the event. This information includes conditions and elements that should be recognized and evaluated on arrival and during operations.

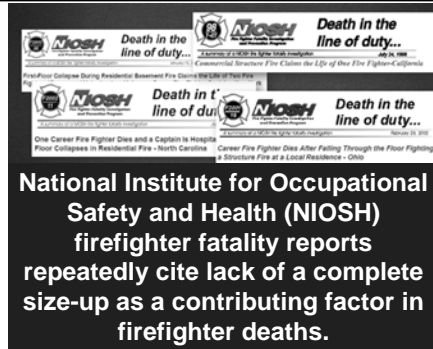
SIZE-UP (cont'd)

- How valuable is doing this 360-degree size-up to us?
 - Size up, locate the fire's origin, identify flow control issues.
- What we see during the 360-degree size-up can be a huge determining factor in whether our trip to the interior will be a one-way or round trip.

Slide 2-30

1. Performing a 360-degree size-up allows the IC to prepare a more efficient incident attack plan. The fire's origin could be different than the location where the fire is actually showing.
2. Without a complete perspective of the incident scene, critical clues could be missed, leading to unnecessary structure damage and the potential for loss of life.

SIZE-UP (cont'd)



Slide 2-31

3. The National Institute for Occupational Safety and Health (NIOSH) conducts independent investigations of firefighter line-of-duty deaths (LODDs).
 - a. On average, 100 firefighters perish in the line of duty annually.
 - b. Incomplete or insufficient size-up factors are cited as contributing factors in firefighter deaths.

360-DEGREE SIZE-UP

- Opportunity to determine not just where the fire is showing from but also where the fire's origin is.
- With only a limited perspective (windshield size-up), a visible first- or second-floor fire may just be a mirage of the fire's origin.

Slide 2-32

- F. 360-degree size-up.
 1. Provides a greater opportunity to determine not just where the fire is showing from but also where the fire's origin is.
 2. With only a limited perspective (windshield size-up), a visible first- or second-floor fire may just be a mirage of the fire's origin.

360-DEGREE SIZE-UP (cont'd)

- Often when below-grade fires are not identified early and the attack is made from above, fatal results occur.

Slide 2-33

3. You don't want to make entry only to not be able to find the fire and realize it's below you. This reality occurs far too often when below-grade fires are not identified early and the attack is made from above them, with fatal results.

PRIMARY CRITICAL SIZE-UP FACTORS/INDICATORS

True or False?

Each scene has indicators that provide varying degrees of information. The ability to manage an incident scene will be enhanced when firefighters and officers use every piece of information at their disposal.

Slide 2-34

PRIMARY CRITICAL SIZE-UP FACTORS TO CONSIDER

- Locate the fire/Identify flow control.
- Occupancy and contents.
- Location, access and topography.
- Building construction features.
- Collapse potential.
- Weather.
- Resources for the potential problems and duration of operations.

Slide 2-35

- G. Primary critical size-up factors to consider.
1. Locate the fire/Identify flow control.
 2. Occupancy and contents.
 3. Location, access and topography.
 4. Building construction features.
 5. Collapse potential.
 6. Weather.
 7. Resources for the potential problems and duration of operations.

<p style="text-align: center;">SEQUENTIAL STRATEGIC ACTIONS: LOCATE</p> <hr/> <p>Locate the fire:</p> <ul style="list-style-type: none">• This is key — know where the fire is.• Where are the superheated spaces that pose a risk to firefighters and the occupants of the building? <p style="text-align: right; font-size: small;">Slide 2-36</p>
--

- H. Sequential strategic actions:
1. This is key — know where the fire is.
 2. Where are the superheated spaces that pose a risk to firefighters and the occupants of the building?

SEQUENTIAL STRATEGIC ACTIONS: LOCATE (cont'd)

- Strongly consider the importance of taking a thermal imaging camera (TIC) on the initial 360-degree lap.
 - For IC to quickly identify which parts of the building are hotter than the others, assuming that the fire has not self-vented.

Slide 2-37

3. Strongly consider the importance of taking a thermal imaging camera (TIC) on the initial 360-degree lap.

WALK-UP, SIZE-UP

Firefighters may overcome obstacles such as rapidly changing conditions, unknown building construction features, blinding smoke, and poor nighttime visibility with the proper use of thermal imagers.

Slide 2-38

- I. Firefighters may overcome obstacles such as rapidly changing conditions, unknown building construction features, blinding smoke, and poor nighttime visibility with the proper use of thermal imagers.

LOCATING THE FIRE

- If the size of the building permits, a lap should be taken.
 - If not, solicit reports from other units.
 - There may be cases where lines should not be stretched until the location of the fire has been ensured.

Slide 2-39

J. Locating the fire.

1. If the size of the building permits, a lap should be taken.
 - a. If not, solicit reports from other units.
 - b. There may be cases where lines should not be stretched until the location of the fire has been ensured.

LOCATING THE FIRE (cont'd)

- Premature stretching can take place in the wrong street, go into the wrong building, come up short, or come up the wrong stairs or stairway.
- If the location of the fire is not obvious, use trucks or rescue companies to locate the fire prior to committing hoselines.

Slide 2-40

- c. Premature stretching can take place in the wrong street, go into the wrong building, come up short, or come up the wrong stairs or stairway.
- d. If the location of the fire is not obvious, use trucks or rescue companies to locate the fire prior to committing hoselines.

LOCATING THE FIRE (cont'd)

- Exterior observations (reading the building).
 - Location of fire or smoke.
 - Building area and height.
 - Entrance(s) and exit(s).
 - Exposures.
 - Information from evacuees.

Slide 2-41

2. Exterior observations (reading the building).
 - a. Location of fire or smoke.
 - b. Building area and height.
 - c. Entrance(s) and exit(s).
 - d. Exposures.
 - e. Information from evacuees.

LOCATING THE FIRE (cont'd)

- Interior observations.
 - Visible fire, smoke and odors.
 - Sensed heat or sound of fire (crackling).
 - Occupants who may provide information.
 - Stairways leading to fire area.
 - Structural stability.
 - Secondary means of egress.

Slide 2-42

3. Interior observations.
 - a. Visible fire, smoke and odors.
 - b. Sensed heat or sound of fire (crackling).

- c. Occupants who may provide information.
- d. Stairways leading to fire area.
- e. Structural stability.
- f. Secondary means of egress.

CONFIRMING FIRE LOCATION

- Does smoke always send you to the seat of the fire?
- Crews should always confirm lowest level of fire involvement.

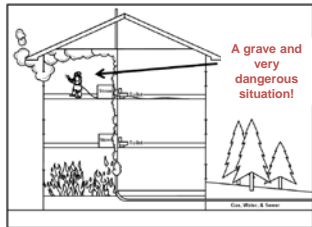
Slide 2-43

K. Confirming fire location.

- 1. Does smoke always send you to the seat of the fire?
- 2. Crews should always confirm lowest level of fire involvement.

**CONFIRMING FIRE LOCATION
(cont'd)**

- Check the lower floors/apartments for layout and absence of heat/fire/smoke.



Slide 2-44

- 3. Check the lower floors/apartments for layout and absence of heat/fire/smoke.

CONFIRMING FIRE LOCATION (cont'd)

- Once the fire is located, crews can properly determine strategy, and everyone can realize safer and more productive fireground operations.

Slide 2-45

4. Once the fire is located, crews can properly determine strategy, and everyone can realize safer and more productive fireground operations.

SEQUENTIAL STRATEGIC ACTIONS: FLOW PATH

Identify and control the flow path.

- Once hotter locations are identified, determine the presence of a flow path.
- If one exists, attempt to control the flow path by controlling the door.
- If a flow path does not yet exist and the fire has become vent-limited, do not create one until you are ready to do so.

Slide 2-46

SEQUENTIAL STRATEGIC ACTIONS: FLOW PATH (cont'd)

- In the training environment, giving officers open doors on arrival will help build the skill of recognizing them and initiating control early in the operation.

Slide 2-47

- L. Identify and control flow path.
 - 1. Once hotter locations are identified, determine the presence of a flow path.
 - 2. If one exists, attempt to control the flow path by controlling the door.
 - 3. If a flow path does not yet exist and the fire has become vent-limited, do not create one until you are ready to do so.

FLOW PATH



- Area between inlet and outlet that allows for the movement of heat and smoke from higher pressure areas toward lower pressure areas. Examples include door and window openings.
- What hazards are associated with operations conducted in the flow path (between the fire and where the fire wants to go)?

Slide 2-48

- 4. The flow path is the area between inlet and outlet that allows for the movement of heat and smoke from higher pressure areas toward lower pressure areas. Examples include door and window openings.
- 5. Operations conducted in the flow path, between the fire and where the fire wants to go, will place members at significant risk due to increased flow of fire, heat and smoke toward their position.

FLOW PATH (cont'd)

- Enlarging inlet to or exhaust paths from the seat of the fire will result in growth and spread of the fire.
- Limiting or controlling the inlet and/or the outlet (interrupting the flow path) can limit fire growth.





Slide 2-49

- 6. Enlarging inlet to or exhaust paths from the seat of the fire will result in growth and spread of the fire.
- 7. Limiting or controlling the inlet and/or the outlet (interrupting the flow path) can limit fire growth.

FLOW PATH (cont'd)

- Upon arrival, you may find doors and windows left open by escaping homeowners.
- Simply holding the door closed after forcing entry can limit air to the fire and slow rapid fire progress.



Slide 2-50

- 8. Upon arrival, you may find doors and windows left open by escaping homeowners.
- 9. Simply holding the door closed after forcing entry can limit air to the fire and slow rapid fire progress.

FIRE FLOW FORMULA

- Calculates theoretical fire flow.
 - Large amounts of heat absorbed.
 - Reduce temperature below ignition temperature.
 - Fire is blacked out, ready for overhaul.

Slide 2-51

- M. Fire flow formula.
 - 1. Knowledge of fire flow is required for effective decisions on number of handlines and personnel to extinguish a fire.

2. This formula is intended to calculate the theoretical fire flow for interior fire attack.
 - a. Large quantities of heat are absorbed as water is vaporized.
 - b. Reduce the temperature of the burning materials below ignition temperature.
 - c. The fire is blacked out and ready for overhaul.

FIRE FLOW FORMULA (cont'd)

- With high percentages of involvement, interior operations are not possible.
 - Answer of 100 percent involvement is theoretical.
 - Starting point for realistic flow rate.
 - Starting point for defensive operations.
 - Tactical operations must be evaluated.

Slide 2-52

- N. With high percentages of involvement, interior operations are not possible.
 1. Answer of 100 percent involvement is theoretical.
 2. The basic formula for 100 percent involvement is used as a basis for calculating a realistic flow rate for interior attack.
 3. Flow rates for high percentages of involvement provide a starting point for defensive operations.
 4. The effect of tactical operations must be evaluated and the rate of application must be adjusted as necessary.
- O. Origin of the formula.
 1. Empirical formula developed by a National Fire Academy (NFA) development team.
 2. Study of fire flows at fire situations.

BASIC FIRE FLOW FORMULA

$$\frac{L \times W}{3} = \text{gallons per minute (gpm)}$$



Photo/National Fire Academy (NFA)

Slide 2-53

P. Basic fire flow formula: $(L \times W)/3 = \text{gallons per minute (gpm)}$.

FIRE FLOW FORMULA (cont'd)

- Flow for one floor fully involved.
- Estimate length/width to nearest 10 feet.
- Multiply length by width, then divide by 3.
- Theoretical fire flow for 100 percent involvement.

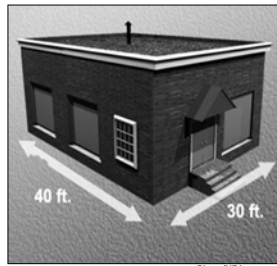
Slide 2-54

1. Needed fire flow (NFF) for one floor fully involved.
2. Estimate length/width of building to nearest 10 feet.
3. Multiply length by width, then divide by 3.
4. This is the theoretical fire flow for 100 percent involvement of one floor.

USING THE BASIC FORMULA

$$\text{gpm} = \frac{L \times W}{3}$$
$$\text{gpm} = \frac{40' \times 30'}{3} =$$
$$\frac{1,200'}{3} = 400 \text{ or}$$

fire flow = 400 gpm



Slide 2-55

USING THE BASIC FORMULA (cont'd)

- Quick calculations at the scene.
- Calculates water required for:
 - Confinement.
 - Extinguishment.
 - Backup lines.



Slide 2-56

5. Used for quick calculations at emergency scenes.

Preincident calculation for common structure sizes assists in developing skills in incident estimation of required fire flow.

6. This formula calculates the water required for confinement, extinguishment and backup lines based on an evaluation of actual fire flows.

FIRE FLOW FORMULA (cont'd)

- Fully involved: 1,000 gpm.
- 50 percent involved: 500 gpm.
- 25 percent involved: 250 gpm.



Photo/NFA

Slide 2-57

Q. Multiple stories.

1. If additional floors, or perhaps a basement, are occupied areas, the fire flow for additional floors must be included.
2. Fire flow: fire floor multiplied by number of floors.
3. Example:
 - a. Two-story dwelling — basement and attic not finished and not occupied. Fire on first floor.
 - b. 500 gpm first floor x 2 floors = 1,000 gpm total flow for 100 percent involvement.

EXPOSURE PROTECTION

- Buildings or other objects.
- Up to four floors above the fire.
- 0 to 50 feet — usually an exposure.
- 50 to 100 feet — could be an exposure.
- 100 feet or more — usually not an exposure.




Photo/NFA

Slide 2-58

- R. Exposure protection.
 - 1. Buildings or other objects that may be threatened by a fire in the target building are considered exposures.
 - a. Up to four floors above in a “fire-resistive” building.
 - b. Less than 50-foot separation — usually considered an exposure.
 - c. 50- to 100-foot separation — could be an exposure.
 - d. Over 100-foot separation — usually not an exposure.
 - e. You must make a final determination based on observed conditions.
 - 2. Buildings or fire areas within a building that have a separation distance of zero but have a rated firewall with all openings protected with a rated closure are considered exposures.

FIRE FLOW FORMULA (cont'd)

- Exposure protection.
 - $\text{gpm} = \frac{L \times W}{3} \times 25$ percent for each exposure.
 - Fire building = $\frac{30' \times 100'}{3} = 1,000$ gpm.



Photo/NFA Slide 2-59

- 3. The formula calculates gpm required to keep a fire from extending to an exposure.
- 4. The exposure rate is 25 percent of the “basic fire flow” of the involved structure, regardless of the height of the fire building or exposure for each side of a fire building with exposures. A fire building with more than one exposure on a side will still be calculated at 25 percent per side with exposures.

FIRE FLOW FORMULA (cont'd)

Exposures.

- Side Alpha = 75 feet.
- Side Bravo = 20 feet.
- Side Charlie = 60 feet.
- Side Delta = 15 feet.



Slide 2-60

5. Example calculation for a building with a required fire flow of 1,000 gpm and two exterior exposures.

FIRE FLOW FORMULA (cont'd)

- $1,000 \times 25$ percent (Side Bravo) = 250 gpm.
- $1,000 \times 25$ percent (Side Delta) = 250 gpm.
- Total exposure protection = 500 gpm.



Slide 2-61

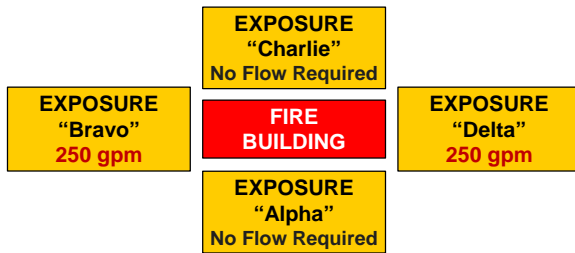
FIRE FLOW REQUIREMENTS

EXPOSURE "Bravo"	FIRE BUILDING 1,000 gpm	EXPOSURE "Delta"
----------------------------	-----------------------------------	----------------------------

- Base flow = 1,000 gpm.
- Exposure Bravo = 250 gpm (25 percent).
- Exposure Delta = 250 gpm (25 percent).

Slide 2-62

FIRE FLOW REQUIREMENTS (cont'd)



Slide 2-63

PERCENTAGE OF INVOLVEMENT

$$\text{gpm} = \frac{L \times W}{3} + \text{exposure} \times \text{percent of involvement.}$$

Fire building = 1,000 gpm. Exposures Bravo and Delta = 500 gpm (25 percent).

Slide 2-64

PERCENTAGE OF INVOLVEMENT (cont'd)

- 100 percent involvement = 1,500 gpm required.
- 75 percent involvement = 1,125 gpm (1,500 x 0.75).
- 50 percent involvement = 750 gpm (1,500 x 0.50).
- 25 percent involvement = 375 gpm (1,500 x 0.25).

Slide 2-65

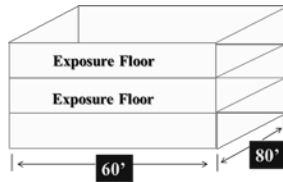
CALCULATION: INTERIOR EXPOSURE

- Add 25 percent of the (L x W)/3 total for each floor above the fire floor.
- Consider a maximum of five floors.
- Use the calculation on the following slides to determine the needed fire flow (NFF) to combat interior exposure situations.

Slide 2-66

CALCULATION: INTERIOR EXPOSURE (cont'd)

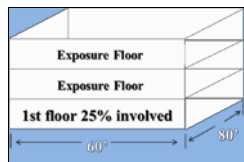
$$\begin{aligned} \text{gpm} &= [(L \times W)/3] + \text{interior exposure charge} \\ &= [(60 \times 80)/3] + [0.50 \times (60 \times 80)/3] \\ &= 1,600 + (0.50 \times 1,600) \\ &= 1,600 + 800 \\ &= 2,400 \end{aligned}$$



Slide 2-67

CALCULATION: INTERIOR EXPOSURE (cont'd)

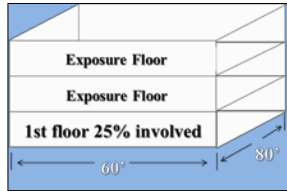
- NFF = 1,600 gpm x 25 percent involvement of first floor.
- NFF = 1,600 x 0.25 = 400 gpm.
- NFF = 1,600 x 0.50 = 800 gpm exposure protection.



Slide 2-68

CALCULATION: INTERIOR EXPOSURE (cont'd)

- Note: 1,200 gpm should provide sufficient water to knock down the fire and provide lines on the second and third floor for extension control.



Slide 2-69

QUICK ACCESS PREFIRE PLAN

Quick Access Prefire Plan				
Completed Example				
Building Address: 101 Maple Lane				
Building Description: 2 1/2 story wood-frame residential building with basement				
Roof Construction: Asph/Flt shingles 2 1/2" thick sheathing, compression strapping				
Floor Construction: 1 1/2" thick concrete 1 1/2" thick insulating horizontal layer				
Occupancy Type: Residential	Initial Resources Required: 2 Engines, 1 Ladder Truck, 1 Ambulance, 1 Medic, 1 Battalion (PUC)			
Hazards to Personnel: None known for this building				
Location of Water Supply: Public water main Fire hydrant	Available Flow: 420 gpm @ 100 psi			
Estimated Fire Flow*				
Level of Involvement	25%	50%	75%	100%
Estimated Fire Flow	225	350	475	550
* Fire flow values are based on the fire flow table in the NFPA 1143 Handbook.				
Fire Behavior Prediction: Fire spread and vertical fire spread				
Predicted Strategies: Evacuate occupants, ventilate				
Problems Anticipated: None known for this building				
<input type="checkbox"/> Handicap	<input type="checkbox"/> Stairways	<input type="checkbox"/> Fire Detection		

Slide 2-70

S. The Quick Access Prefire (QAP) form.

- The QAP Plan is a method of capturing the risk assessment information on hazards in the community and the needed resources to address a problem if it should occur. It contains initial resources required, estimated fire flow based on levels of involvement, fire behavior predictions, potential strategies to use, and anticipated problems in an at-a-glance format for quick analysis on the way to an incident.
- Reviewing the QAP Plan en route to the incident prepares the Company Officer (CO) to make quick decisions upon arrival on the scene. Having a good estimation of the resources that may be needed allows the CO to request additional resources early and better manage occupant and firefighter safety.

PURPOSE OF A QUICK ACCESS PREFIRE PLAN

- For first-in officers.
- Memory-jogger for better decisions.
- Incident scene safety data.
- Floor/plot plan for access.
- Can be absorbed in 30 to 60 seconds.

Slide 2-71

T. Purpose of the QAP Plan.

1. Provides first-in officers with sufficient data to make better decisions (memory-jogger).
2. Provides incident scene safety data.
3. Provides floor/plot plan for access data.
4. Can be read and absorbed in approximately 30 to 60 seconds. It is a single-page summary of the detailed prefire plan.

PURPOSE OF A QUICK ACCESS PREFIRE PLAN (cont'd)

- Important scene data in an easily readable format.
- Does not replace a more detailed prefire plan for complex facilities.
 - Training reference for target hazards.

Slide 2-72

5. While the QAP Plan is critical to on-scene management, it is not meant to take the place of the more detailed prefire plan for a complex structure.
 - a. Keep the complex plan for use in extended attack operations.

- b. Add the QAP Plan as the cover sheet for the complex plan to help the first-in officer make sound early decisions.
- c. A point of reference for the CO to evaluate company strengths and weaknesses and tailor training to target hazardous operational areas where additional training is needed.

III. FIRE CONFINEMENT

Size-up report of fireground conditions.

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ACTIVITY 2.1

Fire Confinement

Purpose

Learn where to use the command sequence cycle to develop an action plan for fire confinement for selected occupancies.

Directions

1. The class will be divided into table groups.
2. A floor plan is in your Student Manual (SM). The floor plan shows the amount of involvement in the building.
3. You will be shown several slides of the building's dimensions, resources available, and smoke and/or fire.
4. Look at your floor plan.
5. Your group will develop a fire confinement action plan using the command sequence cycle. Complete the Student Activity Worksheet (SAW).
6. Your group will be required to report your action plan back to the class using the command sequence cycle.

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ACTIVITY 2.1 (cont'd)

246 10th Street

Building description: 21 by 50 feet, three-story building, ordinary construction.

Occupancy type: office building, connected to a three-story warehouse and a two-story warehouse, both of ordinary construction.

Fire location: 246 10th St. Fire is on the second floor at the front of the office building. All occupants have been removed. Involvement is approximately 35 percent.

Time: 1000 hours.

Water available: hydrant area — hydrants at every corner. System flow = 8,000 gpm.

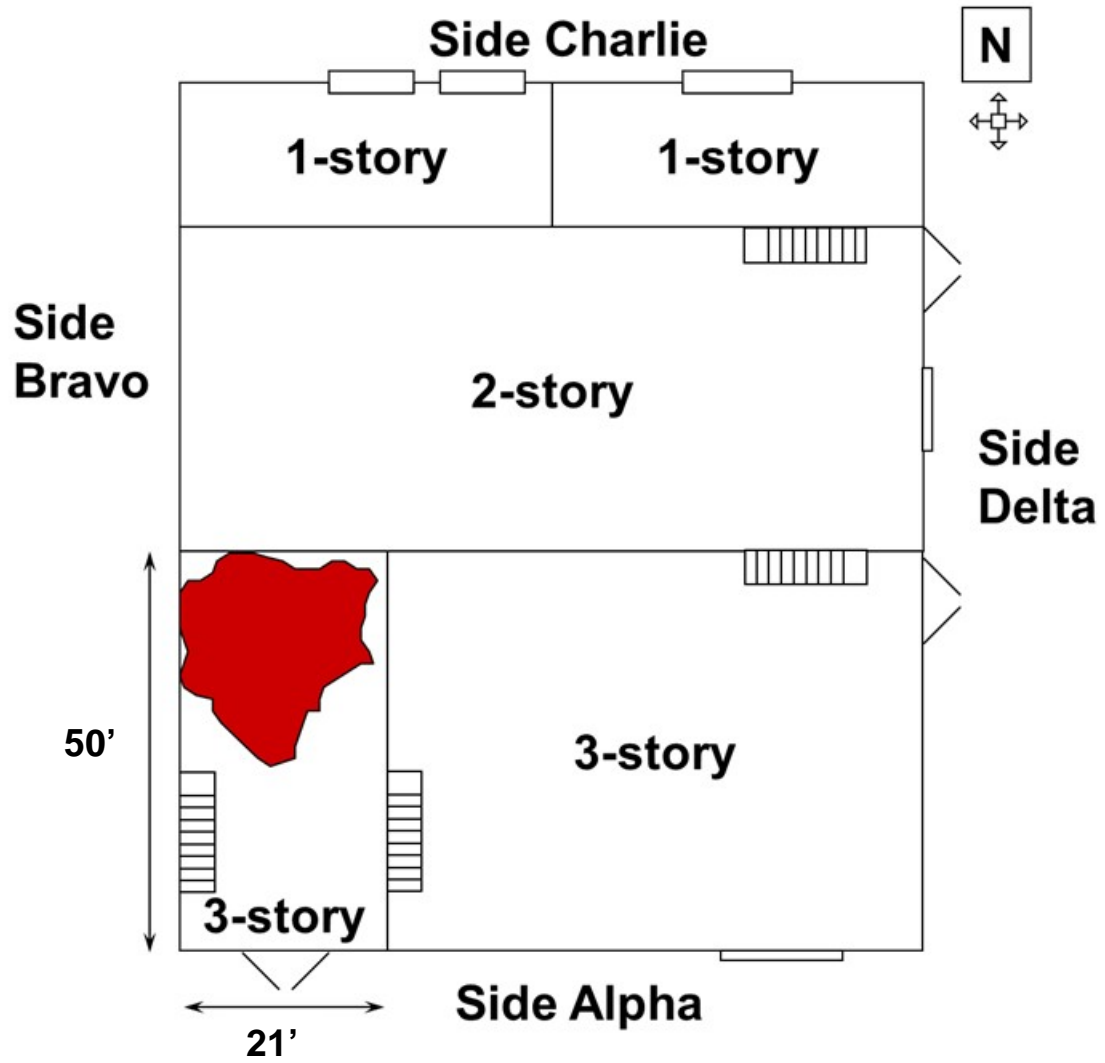
Resources available:

- Engine-1 or E-1.
- E-2.
- E-3.
- Truck-1 or T-1.
- Safety Officer 1.
- Battalion Chief (BC)-1: 30-minute response.

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ACTIVITY 2.1 (cont'd)

Floor Plan



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ACTIVITY 2.1 (cont'd)

Command Sequence Cycle

Size-up:

Objective(s):

Strategy(ies):

Tactics:

- Confinement/Extinguishment.

- Ventilation.

Implement:

Evaluate:

IV. EXPOSURE PROTECTION

**EXPOSURE PROTECTION
DEFINITION**

Tactical operations performed to protect exposed property and areas near the fire from becoming involved.

Slide 2-82

- A. Definition: tactical operations performed to protect exposed property and areas near the fire from becoming involved.

**PRINCIPLES OF EXPOSURE
PROTECTION**

- Protect external exposures.
- Protect internal exposures.
- Protect areas downwind from the fire.

Slide 2-83

- B. Principles of exposure protection.
1. Protect areas and property near the fire building from becoming involved (external exposures).
 2. Protect areas in the fire building from becoming involved (internal exposures).
 3. Protect the areas that are downwind from the fire from the dangers of flying brands.

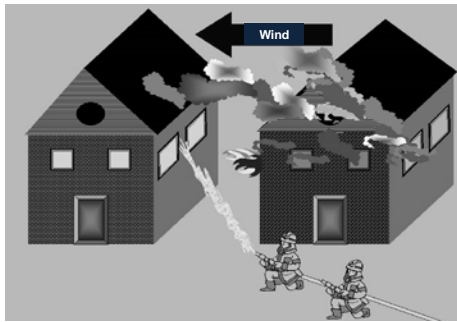
PROTECT VULNERABLE AND VALUABLE EXPOSURES

- Select and prioritize exposures to be protected first.
- Preplanning is essential to determine most vulnerable and valuable exposures.

Slide 2-84

- C. Protect vulnerable and valuable exposures.
1. The CO often must select and prioritize which exposures should be protected first.
 2. Preplanning is essential in helping the CO determine the most vulnerable and valuable exposures.

PERSONAL ASSESSMENTS



Slide 2-85

3. Personal assessments of what is valuable may vary among individuals at the scene.
4. Protect interior exposures.

PROTECT EXPOSURES

- Interior.
- Exterior.

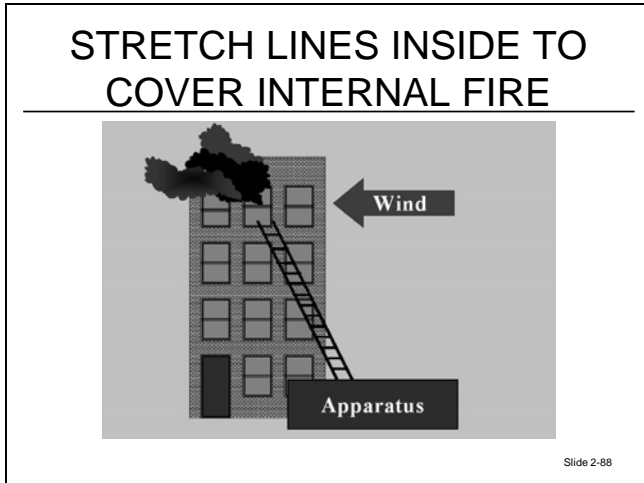
Slide 2-86

- D. Protect areas above and below fire area.
1. Protect exterior exposures.
 - a. Property connected to the fire building.
 - b. Property close to the fire building.
 2. Up to 50 feet is an exposure.
 3. From 50 to 100 feet may be an exposure.
 4. More than 100 feet is not an exposure.
 5. The CO must make a decision based on conditions.

TACTICS FOR PROTECTING EXPOSURES

- Provide adequate flow, and put fire out.
- Wash face of exposed building.
- Stretch lines to inside exposure.

Slide 2-87



E. Tactics for protecting exposures.

1. Coordinated attack on fire with adequate flow is the best way to protect exposures.
2. Wash the face of exposed buildings with water to prevent ignition of exposed surface areas by reducing the amount of heat absorbed.



F. Initiate brand control to search for and monitor the flow of hot brands. Fires involving wildlands generally produce small particles of burning material called brands.

1. Building fires also may produce many flying brands.
 - a. Tobacco barns.
 - b. Hay barns.

- c. Large wooden structures that are well-involved.
 - d. One of the most probable brand producers always has been a wood-shingle roof.
2. Brands are carried by convection and wind currents.

BRAND CONTROL (cont'd)

- Monitor weather conditions.
- Assign teams to check roofs.

Slide 2-90

3. Weather conditions must be monitored.
4. Teams may be assigned to check and monitor roofs near the fire.

SUPPORT FOR EXPOSURE OPERATIONS

- Gaining entry to exposures.
- Use ladders to access buildings.

Slide 2-91

- G. Support for exposure operations.
- 1. Fire crews may have to gain entry to exposure buildings or areas.
 - 2. Fire crews must consider accessibility to both interior and exterior exposures.

3. Fire crews may have to use ladders to gain entry or access to exposure buildings.

**TACTICAL SIZE-UP
CONSIDERATIONS**

- Is operating position outside collapse zone?
- What flow is available for exposure protection?
- What tactics are appropriate?
- What number and size of hoselines or appliances are required?

Slide 2-92

H. Tactical size-up considerations.

1. Is operating position outside the collapse zone?
 - a. All operations must be set up outside the collapse zone.
 - b. A collapse zone is a distance at least equal to 1 1/2 times the height of the building measured on the ground horizontally out from the base of the wall.
2. What fire flow is available for exposure protection?
 - a. If water supply is not adequate, streams can be directed on the fire and on the exposure alternately.
 - b. Avoid directing too much attention at the fire and too little at the exposure.
3. What tactics are most appropriate to accomplish exposure protection?
4. What number and size of hoselines or appliances are required for exposure protection?

TACTICAL SIZE-UP CONSIDERATIONS (cont'd)

- Where should lines or appliances be placed?
- Is any support required?
- What coordination is needed?
- What safety concerns exist?
- How effective is the exposure protection effort?

Slide 2-93

5. Where should lines or appliances be placed?
6. Is any support required?
7. What coordination with other tactics is needed?
8. What safety concerns exist?
9. How effective is the exposure protection effort?

COORDINATION

- Ventilation.
- Adequate water for exposures and fire building.
- Prevent opposing hoselines.

Slide 2-94

I. Coordination.

1. Ventilation must be performed to provide a more tenable interior environment and draw the fire away from exposures.
2. Coordinate use of water supply so that adequate water is available for both exposure protection and fire confinement and extinguishment.

3. Operation of all fire streams for exposure protection must be coordinated to prevent opposing streams and pushing objects on crews.

V. COMMAND SEQUENCE 1

Command Sequence 1

Slide 2-95

- A. Fire confinement and exposure protection action plan — Command Sequence 1: 100 Block B St.

**COMMAND SEQUENCE 1:
ACTION PLAN**

Fire confinement and exposure protection.

- Command Sequence 1.
- 100 Block B St.

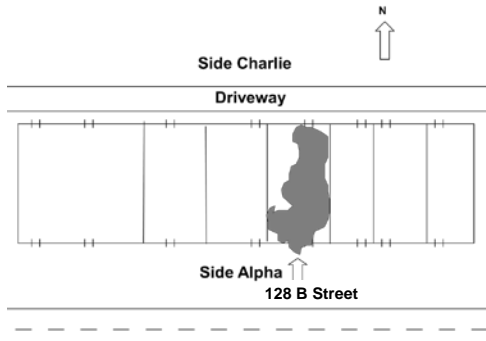
Slide 2-96

HEAVY FIRE, SIDE ALPHA



Slide 2-100

COMMAND SEQUENCE 1: 128 B STREET



Slide 2-101

SIZE-UP REPORT EXAMPLE

- On location at 128 B St., one-story strip store, 20-by-45 foot, ordinary construction, occupied as a furniture store.
- Heavy fire and smoke, Side Alpha.
- All occupants have been removed.
- Exposure Sides Bravo and Delta are similar store types, light to medium smoke showing.

Slide 2-102

Action Plan

Slide 2-103

- B. Fire confinement and exposure protection action plan.
1. Incident objectives.

**FIRE CONFINEMENT AND
EXPOSURE PROTECTION**

- What can be accomplished?
- What needs to be done?
- How are you going to do it?

Slide 2-104

2. Incident strategy.
3. Incident tactics.

IMPLEMENT THE ACTION PLAN

Fire confinement and exposure protection action plan — communicate all assignments clearly to all resources operating on the incident.

Slide 2-105

- C. Implement the fire confinement and exposure protection action plan — communicate all assignments clearly to all resource units operating on the incident.

EVALUATE THE ACTION PLAN

- Evaluate progress every 10 minutes.
- Obtain feedback reports from resources operating on the incident.
- Develop Conditions, Actions and Needs (CAN) report.

Slide 2-106

HEAVY FIRE SIDE ALPHA (cont'd)



Photo/NFA

Slide 2-107

- D. Evaluate the exposure protection action plan.
 - 1. Evaluate progress of the plan every 10 minutes.
 - 2. Obtain periodic feedback reports from all resource units operating on the incident.
 - 3. Develop Conditions, Actions and Needs (CAN) report.

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ACTIVITY 2.2

Fire Confinement and Exposure Protection

Purpose

Learn where to use the command sequence cycle to develop an action plan for exposure protection for selected occupancies.

Directions

1. The class will be divided into table groups.
2. A plot plan is in your SM. The plot plan shows the amount of involvement in the building.
3. You will be shown several slides of the building's various sides and at least one slide showing smoke and/or fire.
4. Look at your plot plan.
5. Your group will develop an exposure protection action plan using the command sequence cycle. Use the Primary Factors Size-Up Chart, and complete the SAW.
6. Your group will be required to report your action plan back to the class using the command sequence cycle.

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ACTIVITY 2.2 (cont'd)

122 M Street

Building description: 50 feet by 90 feet, three-story building, wood-frame construction.

Occupancy type: garden apartment complex, one section, four apartments per floor — total of 12 apartments.

Fire location: 122 M St. Fire started on the second floor, spread to the balcony, and extended to the third-floor balcony.

Time: 1100 hours.

Water available: hydrant area — hydrants at every corner. System flow = 2,500 gpm.

Resources available:

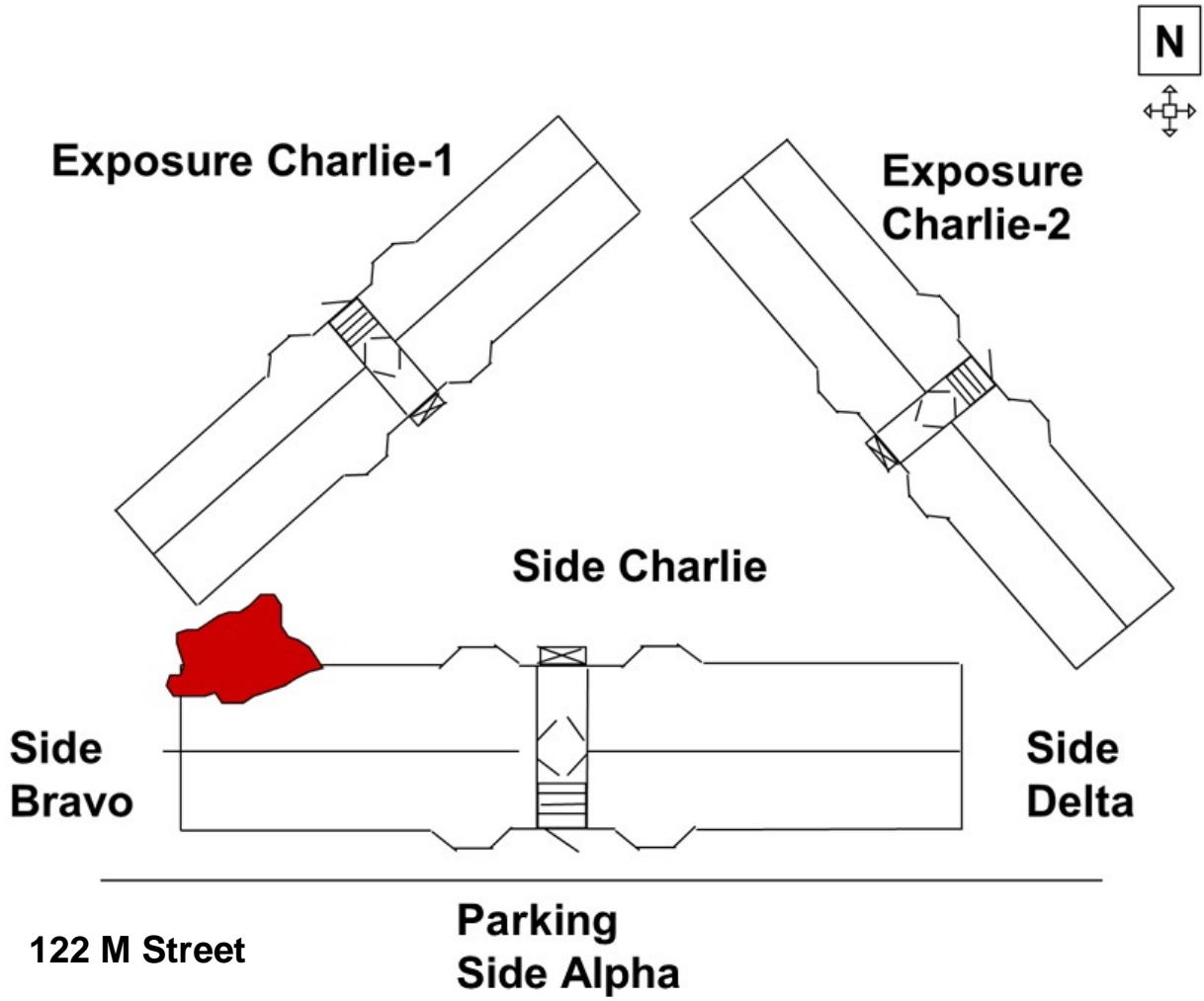
First Alarm:

- E-1.
- E-2.
- E-3.
- T-1.
- Safety Officer 1.
- BC-1: 30-minute response.

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ACTIVITY 2.2 (cont'd)

Plot Plan



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ACTIVITY 2.1 (cont'd)

Command Sequence Cycle

Size-up:

Objective(s):

Strategy(ies):

Tactics:

- Exposure protection.

- Confinement/Extinguishment.

- Ventilation.

Implement:

Evaluate:

VI. FIRE EXTINGUISHMENT

FIRE EXTINGUISHMENT

Purpose: to bring burning materials below their ignition temperature to stop flame production.

Slide 2-116

- A. Fire extinguishment tactics: The purpose of tactical assignment for fire extinguishment is to bring the burning materials below their ignition temperature to stop flame production.
1. A tactical assignment for fire extinguishment should describe the geographic location of the assignment.
 2. Example: Extinguish the fire on Division 1.

SIZE-UP FOR EXTINGUISHMENT

- Location and extent of fire.
- Risk/Benefit analysis.
- Access and egress.
- Classification of building construction and occupancy.
 - Preplanning.

Slide 2-117

- B. Size-up for extinguishment.
1. Location and extent of the fire.
 - a. Where is the fire now?
 - b. Where is the fire going?

- c. Who or what is in its way?
2. Risk/Benefit analysis for personnel.
3. Access and egress.
4. Classification of building construction and occupancy.
 - a. May provide clues of floor plan and potential problems.
 - b. Any structural deficiencies.
 - c. Preplanning.

HOSELINE SELECTION

Long enough to reach seat of fire plus 50 feet.

Slide 2-118

C. Select a line that is long enough to reach seat of fire with at least 50 feet to spare.

POSITIONING OF HOSELINE

- Areas of access and egress.
- Attack from unburnt side, or use transitional attack.
- Select position for backup line, and communicate information to crew.

Slide 2-119

- D. Positioning of hoseline for extinguishment.
1. Areas of access and egress.
 - a. Doors.
 - b. Windows.
 - c. Porch roofs and balconies.
 2. Attack from unburnt side of structure if possible, or use transitional attack.
 - a. Fire is in front, attack from rear.
 - b. Fire is in rear, attack from front.
 - c. Fire is above ground level, attack from below and upward.
 - d. Fire is below-grade, coordination with ventilation is essential.
 3. Select position for backup line, and communicate information to crew.
 - a. Backup line could be part of the original tactical assignment.
 - b. Eliminate opposing hoselines.
 - c. Backup line should be of equal size or larger than attack line.
 - d. Place backup line in position ASAP to protect initial fire attack team.
 - e. If possible, the backup line should come from a separate water supply.

**COORDINATE WITH OTHER
TACTICAL ASSIGNMENTS**

- Ventilation.
- Entry.
- Ladders.
- Lighting.

Slide 2-120

- E. Coordinate fire extinguishment with other tactical assignments.
 - 1. Ventilation.
 - a. If possible, ventilate just prior to water application.
 - b. Premature ventilation will cause fire to grow.
 - c. Delayed ventilation will not provide a place for hoseline team to push products of combustion or allow heat to escape.
 - 2. Entry.
 - a. Will doors and windows need to be forced open?
 - b. Who will be responsible for entry?
 - c. If you are assigned to confinement and no one has been assigned entry or laddering, you must do these as well.
 - 3. Ladders.
 - a. Will ladders be required for advancement of lines?
 - b. Where are ladders being placed for a secondary means of egress?
 - 4. Lighting: Who will provide auxiliary lighting?

SAFETY

- Has Safety Officer been designated?
 - If the IC does not establish and staff the Safety Officer position, the IC will also serve as the Safety Officer for the incident.

Slide 2-121

- F. Safety: Has a Safety Officer been designated, or is IC the Safety Officer?
 - 1. If the IC does not establish and staff the Safety Officer position, the IC will also serve as the Safety Officer for the incident.

SAFETY (cont'd)

- Everyone at the incident must operate safely and keep the Safety Officer informed of all safety concerns.
- The IC is responsible for the incident.
- Safety Officer is part of the Command Staff.

Slide 2-122

2. Everyone at the incident must operate safely and keep the Safety Officer informed of all safety concerns.
3. The IC is responsible for the incident.
4. Safety Officer is part of the Command Staff.

VII. COMMAND SEQUENCE 2

Command Sequence 2

Slide 2-123

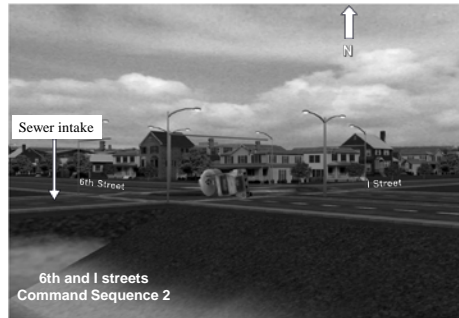
- A. Fire confinement, exposure protection, and fire extinguishment action plan — Command Sequence 2: 6th and I streets.

COMMAND SEQUENCE 2: ACTION PLAN

- Fire confinement, exposure protection, and fire extinguishment action plan.
- 6th and I streets.

Slide 2-124

WALK-AROUND, 6TH AND I STREETS



Slide 2-125

COMMAND SEQUENCE 2: FIRST-ALARM RESOURCES

- E-1.
- E-2.
- E-3.
- T-1.
- Safety Officer.
- BC-1: 30-minute response.

Slide 2-126

SIZE-UP REPORT EXAMPLE
(cont'd)

- Fire has spread to several occupied structures along 6th Street.
- All occupants in exposures have been removed.
- Exposures on Side Alpha are two-and three-story dwellings, exposures on Side Delta are the same.

Slide 2-130

Action Plan

Slide 2-131

B. Fire confinement, exposure protection, and fire extinguishment action plan — incident objectives.

- What can be accomplished?
- What needs to be done?
- How are you going to do it?

Slide 2-132

IMPLEMENT THE ACTION PLAN

Fire extinguishment — communicate all assignments clearly to all resources operating on the incident.

Slide 2-133

- C. Implement the fire extinguishment action plan — communicate all assignments clearly to all resource units operating on the incident.

EVALUATE THE ACTION PLAN

- Evaluate progress every 10 minutes.
- Obtain feedback reports from resources operating on the incident.
- Develop CAN report.

Slide 2-134

- D. Evaluate the fire extinguishment action plan.
1. Evaluate progress of the plan every 10 minutes.
 2. Obtain periodic feedback reports from all resource units operating on the incident.
 3. Develop CAN report.

SIDES ALPHA AND DELTA



Photo/NFA
Slide 2-135

TRANSFER OF COMMAND REPORT PROCEDURE



Deliver to the next commanding officer arriving at an incident:

- Location and extent of fire.
- Control efforts.
- Deployment of resources.
- Need for additional resources.

Slide 2-136

- E. Transfer of command report procedure — deliver to the next commanding officer arriving at an incident:
1. Location and extent of fire.
 2. Control efforts.
 3. Deployment of resources.
 4. Need for additional resources.

VIII. SUMMARY



SUMMARY

- A fresh approach — RECEO-VS versus SLICE-RS.
- Size-up and risk assessment.
- Fire confinement.
- Exposure protection.
- Command Sequence 1.
- Fire extinguishment.
- Command Sequence 2.

Slide 2-137

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UNIT 3: RESCUE, VENTILATION, SUPPORT AND OVERHAUL

TERMINAL OBJECTIVE

The students will be able to:



- 3.1 *Identify and explain the actions required to address rescue, ventilation, support and overhaul.*

ENABLING OBJECTIVES

The students will be able to:

- 3.1 *Given a scenario, select appropriate ventilation tactics based on identified ventilation principles and tactical considerations.*
 - 3.2 *Given a scenario, develop a ventilation action plan using the command sequence cycle.*
 - 3.3 *Given a scenario, select appropriate rescue tactics based on identified rescue principles and tactical considerations.*
 - 3.4 *Given a scenario, develop a rescue action plan using the command sequence cycle.*
 - 3.5 *Identify the incident support activities that are necessary to promote safe fireground operations before, during and after a fire.*
 - 3.6 *Explain the necessary safe practices that need to be implemented during overhaul operations.*
-

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**UNIT 3:
RESCUE, VENTILATION,
SUPPORT AND OVERHAUL**

Slide 3-1

ENABLING OBJECTIVES

- Given a scenario, select appropriate ventilation tactics based on identified ventilation principles and tactical considerations.
- Given a scenario, develop a ventilation action plan using the command sequence cycle.

Slide 3-2

**ENABLING OBJECTIVES
(cont'd)**

- Given a scenario, select appropriate rescue tactics based on identified rescue principles and tactical considerations.
- Given a scenario, develop a rescue action plan using the command sequence cycle.

Slide 3-3

ENABLING OBJECTIVES (cont'd)

- Identify the incident support activities that are necessary to promote safe fireground operations before, during and after a fire.
- Explain the necessary safe practices that need to be implemented during overhaul operations.

Slide 3-4

I. RESCUE

RESCUE

Rescue is a systematic process used to locate, protect and remove occupants and fire victims safely from a structure and convey them to a place of safety.



Slide 3-5

A. Definition/Principles.

Rescue is a systematic process used to locate, protect and remove occupants and fire victims safely from a structure and convey them to a place of safety.

RESCUE TACTICS

- Conduct primary search.
- Conduct secondary search.
- Provide for rescued occupants.

Slide 3-6

- B. Select appropriate rescue tactic(s).
1. Conduct primary search.
 2. Conduct secondary search.
 3. Provide for rescued occupants.

**CONDUCT
PRIMARY SEARCH**

- Rapid search of all areas involved in or exposed to fire, if they can be entered, to verify removal and/or safety of occupants.
- Key elements.
 - Quick search for live victims.
 - Consider risk/benefit.
 - Routine function performed at structure fires.

Slide 3-7

- C. Conduct primary search.
1. Definition: rapid search of all areas involved in or exposed to fire, if they can be entered, to verify removal and/or safety of occupants.
 2. Key elements.
 - a. Quick search for live victims.
 - b. Consider risk/benefit.
 - c. Routine function performed at every structure fire.

**CONDUCT
PRIMARY SEARCH (cont'd)**

- Dual effort.
 - Interior team searches immediate fire area and normal exit paths.
 - Exterior team enters upper floors directly from exterior, bypassing severe conditions in the fire area.

Slide 3-8

- d. Dual effort.
 - Interior team searches immediate fire area and normal exit paths.
 - Exterior team enters upper floors directly from exterior, bypassing severe conditions in the fire area.

**CONDUCT
PRIMARY SEARCH (cont'd)**

- Where to start.
 - If possible, work outward from fire area.
 - If not possible, work inward from normal entry point.
- Probable victim locations.
 - Routes used to enter and exit.
 - Behind doors and under windows.
 - Bedrooms.

Slide 3-9

- e. Where to start.
 - If possible, work outward from fire area.
 - If not possible, work inward from normal entry point.
- f. Probable location of victims.
 - Routes normally used to enter and exit.

- Behind doors and under windows.
- Bedrooms.

**CONDUCT
PRIMARY SEARCH (cont'd)**

- Removal of victims.
 - Choose method that will move people out of danger in the quickest and safest way.
 - Use stairs, if possible.
- Transmit "all-clear" upon completion of primary search.

Slide 3-10

3. Removal of victims.
 - a. Choose method that will move people out of danger in quickest and safest way.
 - b. Use stairs, if possible.
4. The "all-clear" should be transmitted upon completion of primary search.

**CONDUCT
SECONDARY SEARCH**

- Extremely thorough search of interior fire area, after initial fire control, ventilation and interior lighting are completed, to ensure that there is no possibility of victims remaining undiscovered.

Slide 3-11

- D. Conduct secondary search.
 1. Definition: extremely thorough search of interior fire area, after initial fire control, ventilation and interior lighting are completed, to ensure that there is no possibility of victims remaining undiscovered.

**CONDUCT
SECONDARY SEARCH (cont'd)**

- Key elements.
 - Establish ventilation and maintain during secondary search.
 - Different teams perform primary and secondary searches.
 - Search all spaces that could possibly hold a human being.
 - May involve body recovery.

Slide 3-12

2. Key elements.

- a. Ventilation needs to be established and maintained during secondary search.
- b. Different people should do primary and secondary searches, if possible.
- c. All spaces that could possibly hold a human being, including those spaces not damaged by fire, must be examined.
- d. May involve body recovery.

**PROVIDE FOR RESCUED
OCCUPANTS**

- Victim removal paths.
 - Best option — interior stairs.
 - Escort victims down exterior fire escape.
 - Least desirable option — ground or aerial ladders.
 - Place victims in care of qualified personnel.

Slide 3-13

E. Provide for rescued occupants.

1. Identify victim removal paths.

- a. Best — interior stairs.

- b. Escort victims down exterior fire escape.
- c. Least desirable — ground or aerial ladders.
- d. Place victims in care of qualified personnel.

**PROVIDE FOR RESCUED
OCCUPANTS (cont'd)**

- Move victims to triage area.
- Treat victims.
- Transport victims.
- Provide for uninjured, displaced people.
 - Shelter.
 - Security (police).

Slide 3-14

- 2. Move victims to triage area.
- 3. Treat victims.
- 4. Transport victims to medical facility.
- 5. Rescued victims need to be secured so that they do not go back into the building.
 - a. Shelter.
 - b. Security (police).

**TACTICAL SIZE-UP
FOR RESCUE**

Size-up factors:

- Stage of fire development.
- Number, location and condition of victims; effect of fire on victims.
- Capability of on-scene companies.
- Preservation of evidence.

Slide 3-15

F. Tactical size-up for rescue.

1. Size-up factors.

a. Stage of fire development.

- Investigation — simple interior primary search.
- Minor fire — primary search with attack lines.
- Working offensive fire — primary search, attack lines and support.
- Transitional fire (switching between offensive and defensive modes) — primary search in accessible areas.
- Preservation of evidence.

b. Number, location and condition of victims and effect of fire on victims affect order of rescue.

- Generally the order is the fire floor, the floor above, the top floor, and then the rest of the building.
- Large number of potential victims requires large number of firefighters. Call for help early on.

c. Capability of on-scene companies to enter building, protect or remove occupants, and control fire.

d. Preservation of evidence.

SIZE-UP QUESTIONS

- Rescue.
- Exits.
- Fire extension.
- Ventilation.
- Fire attack.
- Hazards.

Slide 3-16

2. Size-up questions.
 - a. How many people are trapped? Where are they trapped?
 - b. How can you best reach and remove or protect people?
 - c. Are exits cut off?
 - d. Where is the fire, and in what direction is the fire traveling?
 - e. Can ventilation assist trapped people?
 - f. Can hoselines be advanced to protect victims or exit paths?
 - g. Are there hazards to firefighters?

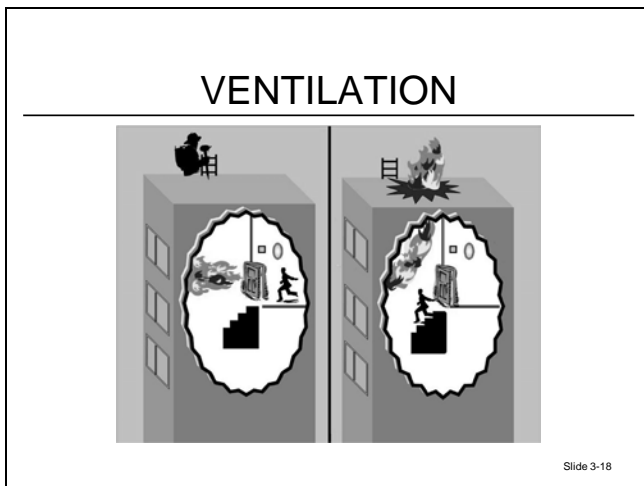
**SUPPORT FOR
RESCUE OPERATIONS**

- Timing.
- Protective lines.
- Entry.
- Ventilation.
- Ladders.
- Confinement/Extinguishment.

Slide 3-17

- G. Support for rescue operations.
 1. Timing.
 - a. Almost all support functions open the structure in some way and can magnify the problem.
 - b. Support should be just ahead of rescue to enable personnel to function where needed.
 2. Protective lines.
 - a. Required when conducting a search.
 - b. May be provided by the search team or the attack team.

- c. Protect firefighters and citizens by:
 - Separating fire from the people closest to it.
 - Controlling interior stairways and corridors so that firefighters can advance and occupants can be evacuated.
 - d. Protect firefighters who are searching above and around the fire area.
 - e. Serve as guide lines to escape path.
3. Entry.
- a. Rapid entry is required when fire threatens to cut off escape routes or traps victims.
 - b. Most likely place to find victims is in the path to doors that occupants normally use.



4. Ventilation.
- a. Allows entry.
 - b. Increases safety of interior operations.
 - c. Improves visibility.
 - d. Ventilation must be coordinated with search, and protective lines must be in place.
 - e. Opening the roof assists rescue and attack.

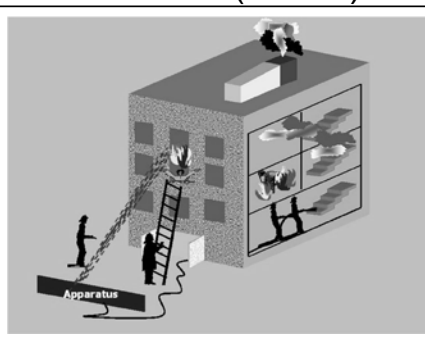
- f. Rapid ventilation by exterior ladders can support interior search.
- 5. Ladders.
Portable and aerial ladders should be raised if and where needed.
 - a. Place personnel on upper floors.
 - b. Remove occupants.
 - c. Lower the injured.
 - d. Provide secondary means of egress.
- 6. Confinement/Extinguishment.
 - a. The best way to protect occupants is to put the fire out.
 - b. Outside streams should not be used in occupied buildings.

**RESCUE
COORDINATION ISSUES**

- Teamwork, organization and good communication.
- Rapid ventilation.
- Keep fire away from people, and protect escape routes with hoselines.
- Use ladders to ventilate and advance protective hoselines.

Slide 3-19

**RESCUE COORDINATION
ISSUES (cont'd)**



Slide 3-20

H. Rescue coordination issues.

1. Teamwork, organization and good communication are vital to effective operations.
2. Rapid ventilation to prevent further buildup of products of combustion, being careful not to draw them toward occupants.
3. First hoseline to keep fire away from people and other lines to protect escape routes.
4. Ladders may be necessary to ventilate and advance protective hoselines.

II. COMMAND SEQUENCE 3

Command Sequence 3

Slide 3-21

COMMAND SEQUENCE 3:
ACTION PLAN

- Command Sequence 3.
- 450 C St.

Slide 3-22

- A. Size-up report of fireground conditions — Command Sequence 3: 450 C St.

THREE-STORY APARTMENT BUILDING

450 C St.
Command
Sequence 3



Slide 3-23

SIDES ALPHA AND BRAVO

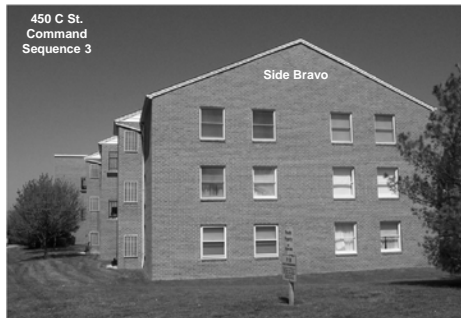
450 C St.
Command
Sequence 3



Slide 3-24

SIDE BRAVO

450 C St.
Command
Sequence 3



Slide 3-25

SIDES BRAVO AND CHARLIE



Slide 3-26

SIDES CHARLIE AND DELTA



Slide 3-27

SIDES ALPHA AND DELTA



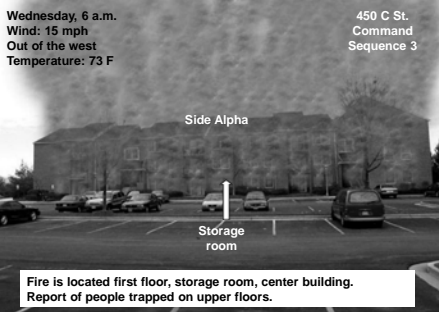
Slide 3-28

COMMAND SEQUENCE 3: FIRST-ALARM RESOURCES

- Engine 1 or E-1.
- E-2.
- E-3.
- Truck 1 or T-1.
- Safety Officer 1.
- Battalion Chief (BC)-1: 30-minute response.

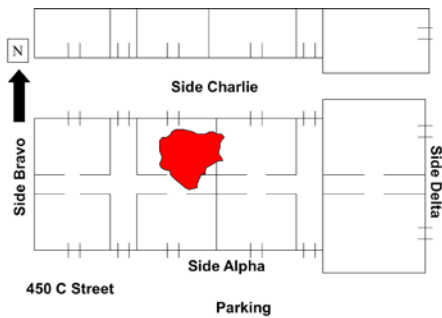
Slide 3-29

FIRE SLIDE



Slide 3-30

PLOT PLAN



Slide 3-31

SIZE-UP

What is the situation (size-up)?

Slide 3-32

SIZE-UP REPORT EXAMPLE

- On location at 450 C St., three-story brick apartment building, 50 feet by 125 feet, wood-frame construction, occupied.
- Medium to heavy smoke showing on all floors.
- Many occupants reported still in the building.

Slide 3-33

SIZE-UP REPORT EXAMPLE (cont'd)

- Exposure Side Bravo is a similar attached apartment building.
- No other immediate exposures.
- E-1 is establishing C Street Command.

Slide 3-34

**RESCUE
ACTION PLAN**

- What can be accomplished?
- What needs to be done?
- How are you going to do it?

Slide 3-35

- B. Rescue action plan.
1. Incident objectives.
 2. Incident strategy(ies).
 3. Incident tactics.

**IMPLEMENT THE
RESCUE ACTION PLAN**

Communicate all assignments clearly to all resources operating on the incident.

Slide 3-36

- C. Implement the rescue action plan.
- Communicate all assignments clearly to all resources operating on the incident.

**EVALUATE THE
RESCUE ACTION PLAN**

- Evaluate progress every 10 minutes.
- Obtain feedback reports from resources operating on the incident.
- Develop Conditions, Actions and Needs (CAN) report.

Slide 3-37

- D. Evaluate the rescue action plan.
1. Evaluate progress of the plan every 10 minutes.
 2. Obtain feedback reports from resources operating on the incident.
 3. Develop Conditions, Actions and Needs (CAN) report.

ACTIVITY 3.1

Rescue Tactics

Purpose

Learn where to use the command sequence cycle to develop an action plan for rescue operations.

Directions

1. The class will be divided into table groups.
2. A plot plan/floor plan is in your Student Manual (SM). The plot plan/floor plan shows the amount of involvement in the building.
3. You will be shown several slides of the building's dimensions, resources available, and at least one slide showing smoke and/or fire.
4. Look at your plot plan/floor plan.
5. Your group will develop a rescue action plan using the command sequence cycle. Use the Primary Factors Size-Up Chart, and complete the Student Activity Worksheet (SAW).
6. Your group will be required to report your action plan back to the class using the command sequence cycle.

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ACTIVITY 3.1 (cont'd)

122 M Street

Building description: 50 feet by 90 feet, three-story building, wood-frame construction.

Occupancy type: garden apartment complex.

One section, four apartments per floor — total: 12 apartments.

Fire location: 122 M St.

Fire is on the third floor, rear apartment. Involvement is approximately 50 percent. Heavy smoke, third floor.

Report of occupants: two occupants reported trapped in third floor, front bedroom, Side Charlie.

Time: 0100 hours.

Water available: hydrant area — hydrants at every corner. System flow = 2,500 gallons per minute (gpm).

Resources available:

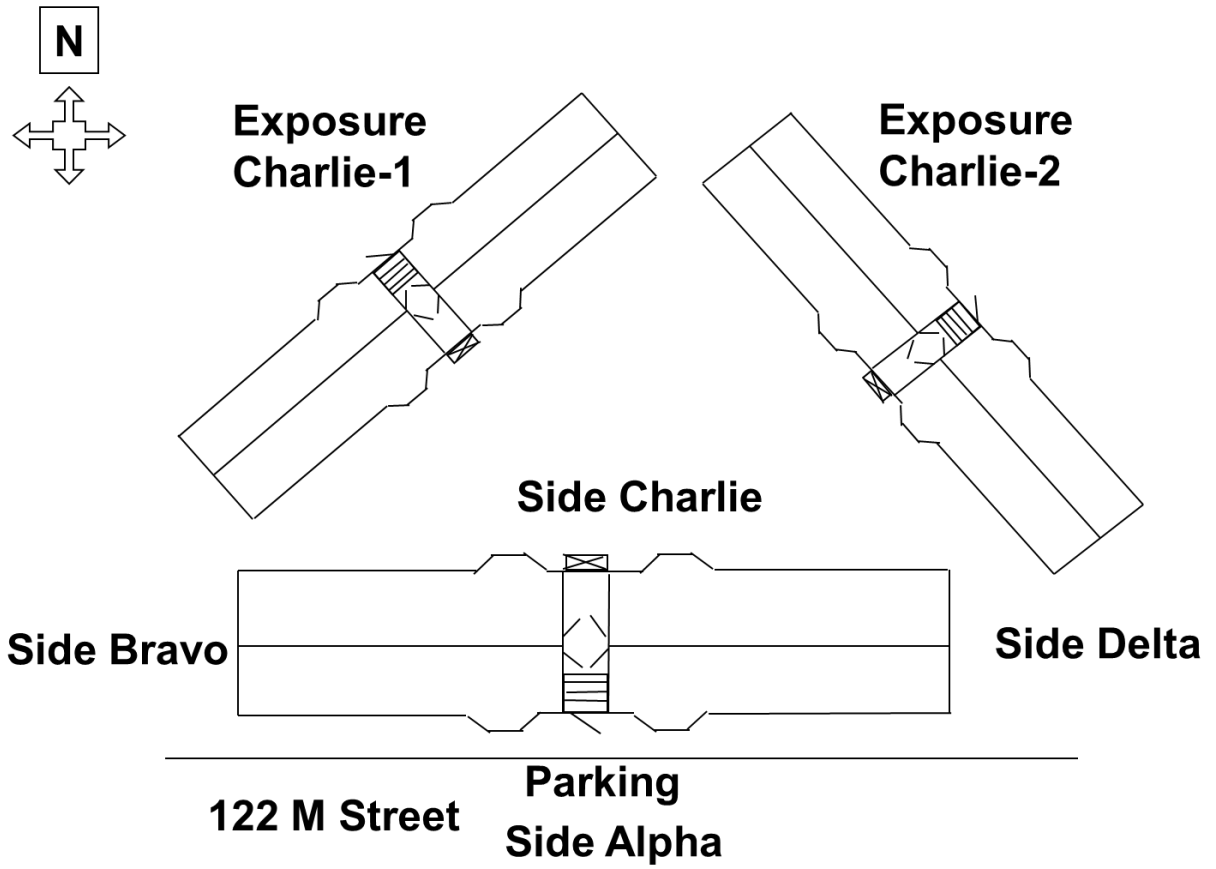
First alarm:

- Engine 1 or E-1.
- E-2.
- E-3.
- Truck-1 or T-1.
- Safety Officer 1.
- Battalion Chief (BC)-1: 30-minute response.

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ACTIVITY 3.1 (cont'd)

Plot Plan

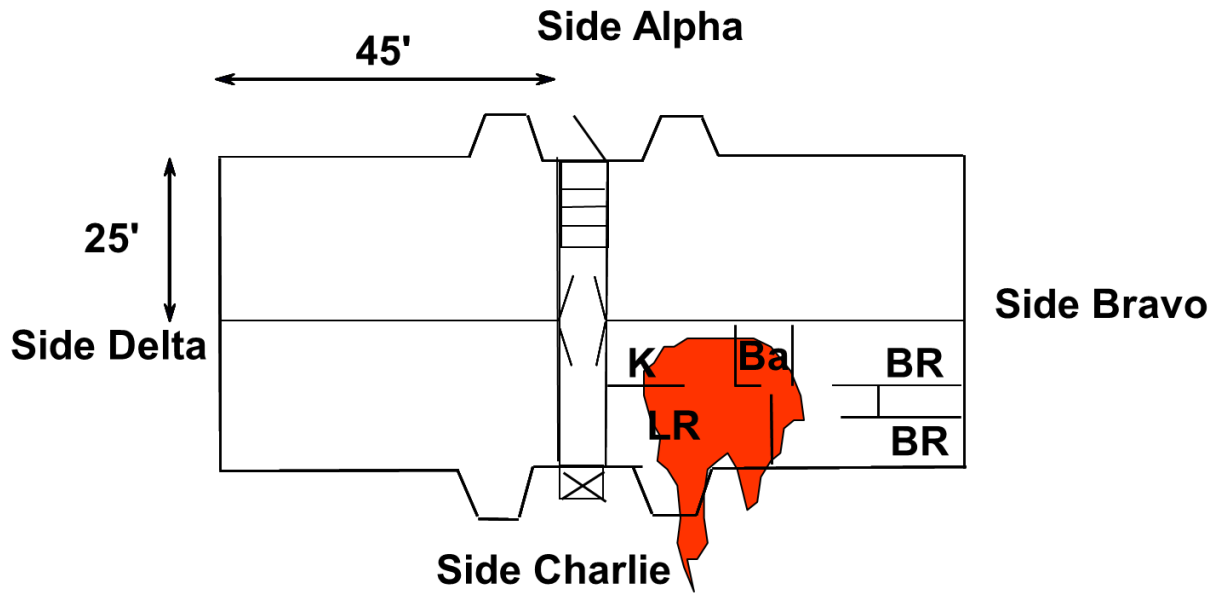


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ACTIVITY 3.1 (cont'd)

Floor Plan

Third Floor
122 M Street



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ACTIVITY 3.1 (cont'd)

Command Sequence Cycle

Size-up:

Objective(s):

Strategy(ies):

Tactics:

- Rescue.

- Exposure protection.

- Confinement/Extinguishment.

- Ventilation.

Implement:

Evaluate:

III. VENTILATION

VENTILATION

A planned, systematic procedure for reducing, redirecting or removing heat, smoke and fire gases from a structure and replacing them with clean, fresh air.

Slide 3-48

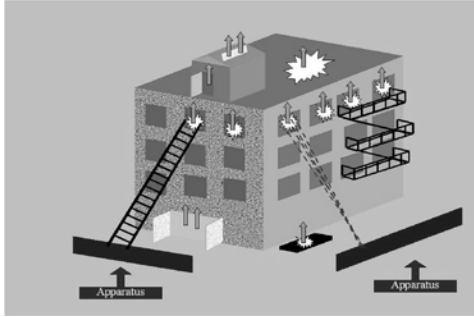
A. Definition: a planned, systematic procedure for reducing, redirecting or removing heat, smoke and fire gases from a structure and replacing them with clean, fresh air.

VENTILATION PRINCIPLES

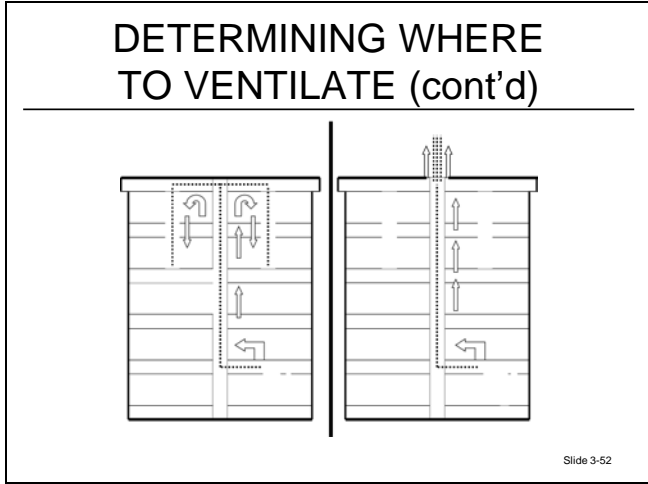
- Ventilation for life safety.
- Ventilation for incident stabilization.
- Ventilation for property conservation.

Slide 3-49

**VENTILATION PRINCIPLES
(cont'd)**



Slide 3-50



- C. Determine where ventilation is needed.
 - 1. Planned, systematic approach to determining location considers:
 - a. Location and condition of possible victims.
 - b. Type and age of building and structural integrity.
 - c. Type and style of roof.
 - d. Location, rate of burning, and possible paths of fire travel.
 - e. Safe routes of travel and escape routes.
 - 2. General location priorities.
 - a. Away from occupants.
 - b. Above stairways.
 - c. Hallways.
 - d. Over the fire.
 - e. Rest of structure.

SELECT APPROPRIATE
TACTIC(S)

- Horizontal ventilation.
- Vertical ventilation.
- A combination.

Slide 3-53

D. Select appropriate tactic(s).

1. Horizontal ventilation.

- a. Open doors and windows to allow cross-ventilation.
- b. Minor- to moderate-scale fires.
- c. Fast and easy because it takes advantage of existing openings.
- d. Can be performed from ground with portable ladders or from interior.

2. Vertical ventilation.

- a. Use natural roof openings, such as vertical shafts, skylights, hatches, ventilators and penthouse openings, if possible.
- b. If openings in building are not available, cut roof open.
- c. Longer ladders and more personnel are needed to get to roof.
- d. Vertical ventilation slows horizontal extension.
- e. More efficient because of the tendency of heat to rise but needs higher heat buildup to work.
- f. Consider safety of operating on roof.
- g. Vertical ventilation is very time-consuming. As a practical matter, the fire may be out before it is completed.

3. Combination of vertical and horizontal ventilation.

Example: using a fan to blow air down basement stairs, forcing smoke out at first floor (vertically), and using horizontal ventilation to get smoke outside from first floor.

VENTILATION METHODS

- Natural ventilation.
- Self-ventilation.
- Forced (mechanical) ventilation.

Slide 3-54

E. Ventilation methods.

1. Natural ventilation.

- a. Provides openings for passage of air between interior and exterior of building using natural convection currents.
- b. Natural ventilation is often inadequate. This is indicated when smoke and heat are not leaving the building as rapidly as needed for effective interior operations.
 - Lack of horizontal paths and openings.
 - Lack of vertical paths.
 - Prevailing winds may hinder efforts.
 - High humidity.
 - Exposures may be endangered.
 - Low-intensity fires.

2. Self-ventilation — allows fire to burn and find its most direct path to outside.

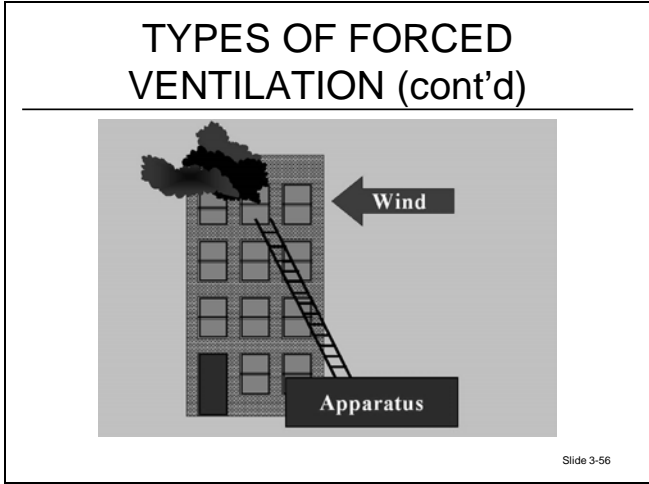
3. Forced (mechanical) ventilation.
 - a. All mechanical methods force fresh air into the structure and remove contaminated air.
 - b. Used if natural ventilation is insufficient.
 - c. More control of air movement.
 - d. Requires more personnel and equipment.

TYPES OF FORCED VENTILATION

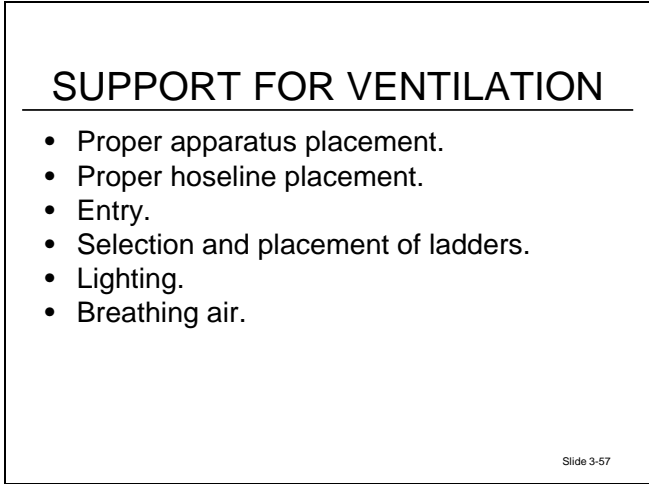
- Fog streams.
- Building's heating, ventilating, and air conditioning (HVAC) system.
- Negative pressure.
- Positive pressure.

Slide 3-55

4. Types of forced ventilation.
 - a. Fog streams.
 - b. Building's heating, ventilating, and air conditioning (HVAC) system — if available and you know how it works.
 - c. Negative pressure.
 - "Sucking" air out.
 - Less efficient.



- d. Positive pressure.
 - “Blowing” fresh air in.
 - Higher efficiency.
 - Appropriate air outlet has to be provided opposite the inlet (approximately three-fourths to 1 3/4 the size of the inlet opening).



- F. Support for ventilation.
 - 1. Proper apparatus placement.
 - 2. Proper hoseline placement.
 - 3. Entry.

4. Selection and placement of ladders.
5. Lighting.
6. Breathing air.

VENTILATION HAZARDS

- Opening below fire or at same level.
- Opening too soon.
- Opening in wrong place.
- Opening into blind attic.
- Insufficient opening.
- Delayed too long.

Slide 3-58

G. Ventilation hazards.

1. Opening below fire or at same level — backdraft.
2. Opening too soon — fire spreads.
3. Opening in the wrong place — fire spreads and may endanger exposures.

**VENTILATION HAZARDS
(cont'd)**

Slide 3-59

4. Opening into blind attic — products of combustion cannot get out.
5. Insufficient opening — products of combustion removed too slowly for effectiveness.

H. Ventilation coordination issues.

1. With rescue.
 - a. Highest priority.
 - b. Improves environment for victim(s) and firefighters.
2. With entry and fire attack.
 - a. Too early will increase fire spread and damage.
 - b. Too late will make extinguishing fire more difficult and increase hazards for firefighters.
3. Make sure that hoselines do not hinder ventilation.
 - a. Hose streams in roof holes.
 - b. Opposing hoselines.
 - c. Lines down outside and inside steps at same time in basement fires.

IV. **COMMAND SEQUENCE 4**

Command Sequence 4

Slide 3-63

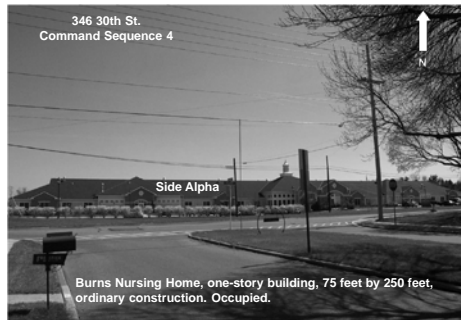
COMMAND SEQUENCE 4: ACTION PLAN

- Rescue and ventilation action plan.
- Command Sequence 4.
- 346 30th St.

Slide 3-64

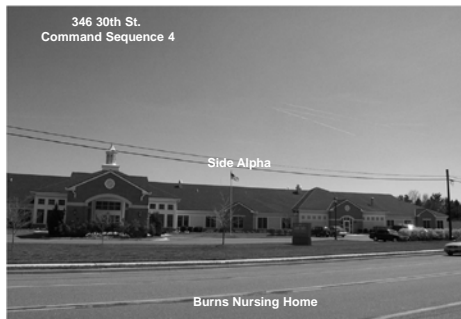
A. Rescue and ventilation action plan — Command Sequence 4: 346 30th St.

SIDE ALPHA



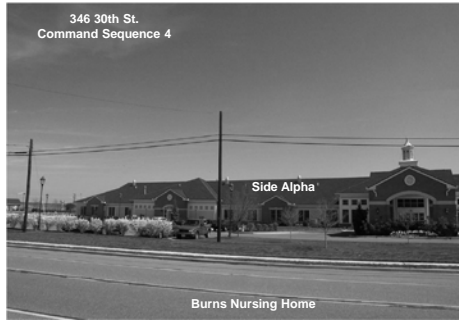
Slide 3-65

SIDE ALPHA (cont'd)



Slide 3-66

SIDE ALPHA (cont'd)



Slide 3-67

SIDE BRAVO



Slide 3-68

SIDES BRAVO AND CHARLIE



Slide 3-69

SIDES ALPHA AND DELTA



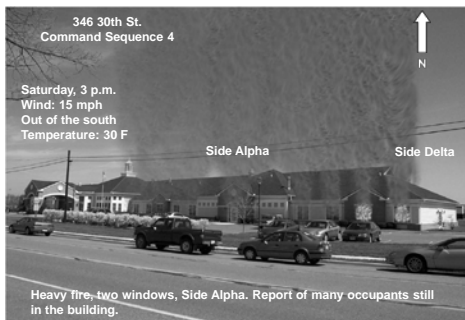
Slide 3-73

COMMAND SEQUENCE 4: FIRST-ALARM RESOURCES

- E-1.
- E-2.
- E-3.
- T-1.
- Safety Officer 1.
- BC-1: 30-minute response.

Slide 3-74

FIRE ON SIDE ALPHA



Slide 3-75

RESCUE AND VENTILATION ACTION PLAN

- What can be accomplished?
- What needs to be done?
- How are you going to do it?

Slide 3-79

- B. Rescue and ventilation action plan.
1. Incident objectives.
 2. Incident strategy(ies).
 3. Incident tactics.

IMPLEMENT THE RESCUE AND VENTILATION ACTION PLAN

Communicate all assignments clearly to all resources operating on the incident.

Slide 3-80

- C. Implement the rescue and ventilation action plan.

Communicate all assignments clearly to all resource units operating on the incident.

EVALUATE THE RESCUE AND VENTILATION ACTION PLAN

- Evaluate progress every 10 minutes.
- Obtain feedback reports from resources operating on the incident.
- Develop CAN report.

Slide 3-81

- D. Evaluate the rescue and ventilation action plan.
1. Evaluate progress of the plan every 10 minutes.
 2. Obtain feedback reports from resources operating on the incident.
 3. Develop CAN report.

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ACTIVITY 3.2

Ventilation

Purpose

Learn where to use the command sequence cycle to develop an action plan for ventilation operations for selected occupancies.

Directions

1. The class will be divided into table groups.
2. A plot plan/floor plan is in your SM. The plot plan/floor plan shows the amount of involvement in the building.
3. You will be shown several slides of the building's various sides and at least one slide showing smoke and/or fire.
4. Look at your plot plan/floor plan.
5. Your group will develop a ventilation action plan using the command sequence cycle. Use the Primary Factors Size-Up Chart, and complete the SAW.
6. Your group will be required to report your action plan back to the class using the command sequence cycle.

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ACTIVITY 3.2 (cont'd)

122 M Street

Building description: 50 feet by 90 feet, three-story building, wood-frame construction.

Occupancy type: garden apartment complex.

One section, four apartments per floor — total: 12 apartments.

Fire location: 122 M St.

Fire is on the third floor, rear apartment and attic area. Involvement is approximately 50 percent. Heavy smoke on the third floor and attic.

Report of occupants: All occupants have been removed.

Time: 0100 hours.

Water available: hydrant area — hydrants at every corner. System flow = 2,500 gpm.

Resources available:

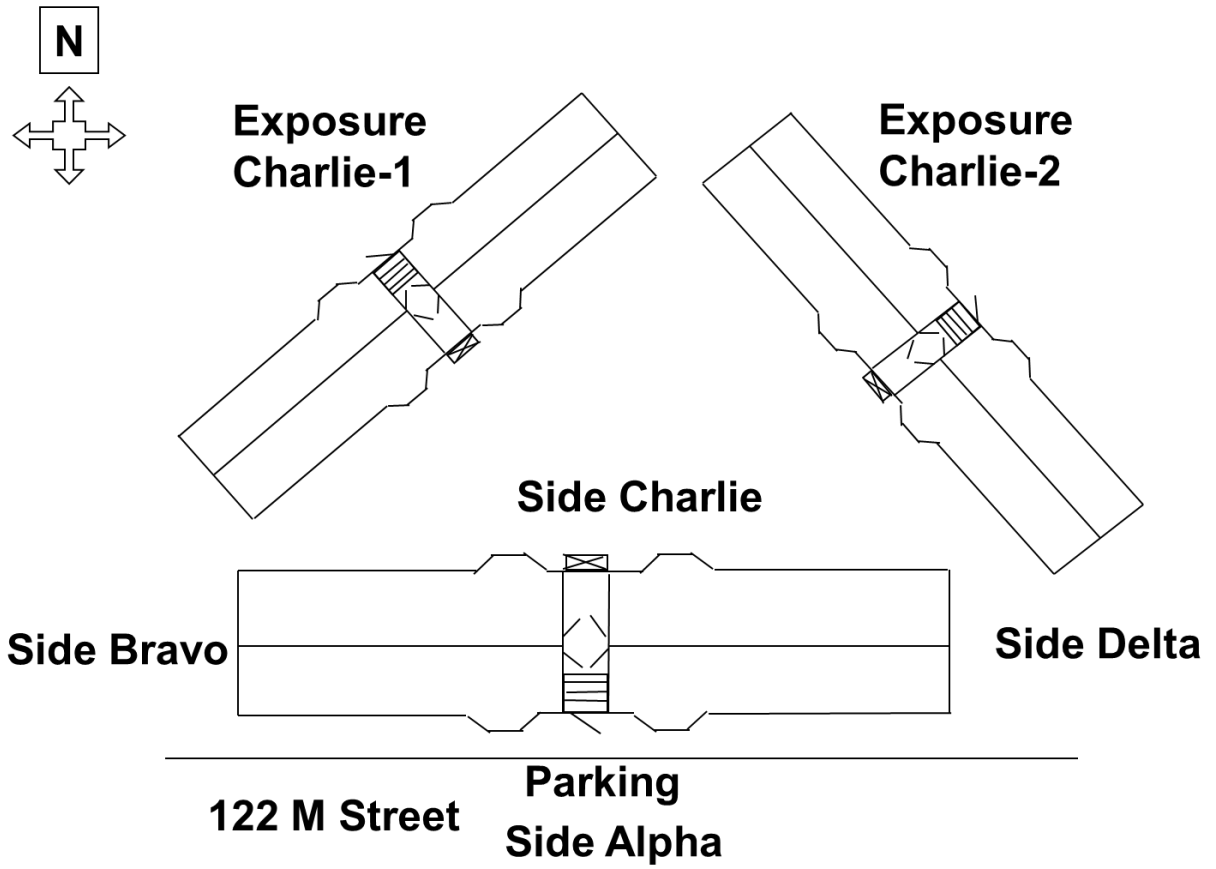
First Alarm:

- E-1.
- E-2.
- E-3.
- T-1.
- Safety Officer 1.
- BC-1: 30-minute response.

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ACTIVITY 3.2 (cont'd)

Plot Plan

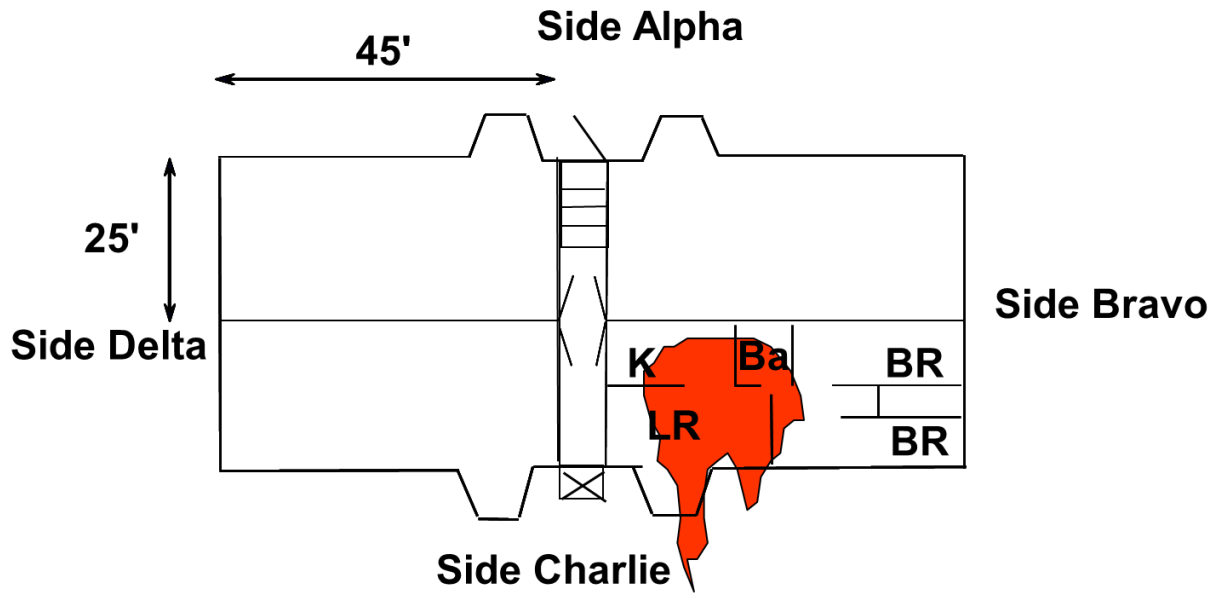


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ACTIVITY 3.2 (cont'd)

Floor Plan

Third Floor
122 M Street



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ACTIVITY 3.2 (cont'd)
Command Sequence Cycle

Size-up:

Objective(s):

Strategy(ies):

Tactics:

- Exposure protection.

- Confinement/Extinguishment.

- Ventilation.

Implement:

Evaluate:

SIDE BRAVO



Slide 3-95

SIDES BRAVO AND CHARLIE



Slide 3-96

SIDES ALPHA AND DELTA



Slide 3-97

SIZE-UP REPORT EXAMPLE

- On location at 230 29th St., four-story dormitory building, 50 feet by 150 feet, ordinary construction, occupied.
- Heavy fire and smoke from two windows, first floor, Side Alpha.
- Medium smoke throughout the rest of the building.

Slide 3-101

SIZE-UP REPORT EXAMPLE (cont'd)

- Many occupants still in the building.
- No other immediate exposures.
- E-1 is establishing 29th Street Command.

Slide 3-102

ACTION PLAN

Slide 3-103

- B. Rescue, ventilation, support and overhaul action plan.
 - 1. Incident objectives.

ACTION PLAN (cont'd)

- What can be accomplished?
- What needs to be done?
- How are you going to do it?

Slide 3-104

2. Incident strategy(ies).

3. Incident tactics.

IMPLEMENT

- Implement the rescue, ventilation, support and overhaul action plan.
- Communicate all assignments clearly to all resources operating on the incident.

Slide 3-105

C. Implement the rescue, ventilation, support and overhaul action plan. Communicate all assignments clearly to all resources operating on the incident.

EVALUATE

- Evaluate the rescue, ventilation, support and overhaul action plan.
 - Evaluate progress every 10 minutes.
 - Obtain feedback reports from resources operating on the incident.
 - Develop CAN report.

Slide 3-106

- D. Evaluate the rescue, ventilation, support and overhaul action plan.
 - 1. Evaluate progress of the plan every 10 minutes.
 - 2. Obtain feedback reports from resources operating on the incident.
 - 3. Develop CAN report.

VI. SUPPORT AND OVERHAUL ACTIVITIES

**SUPPORT AND OVERHAUL
ACTIVITIES**

- Support activities.
 - Support activities are tasks carried out at fire incidents to support ongoing tactical operations.

Slide 3-107

- A. Definition: Support activities are tasks carried out at fire incidents to support ongoing tactical operations.

**PRINCIPLES OF SUPPORT
ACTIVITIES**

- Provide compressed breathing air.
- Provide scene lights and electricity.
- Provide for firefighter rehabilitation and rehydration.
- Provide for medical monitoring and treatment of personnel.
- Provide animal control.

Slide 3-108

B. Principles of support activities.

1. Provide compressed breathing air supply for at least one change of cylinders.
 - a. Locate an appropriate area away from the fire and other possible contaminants.
 - b. This may be combined with rehabilitation area.
2. Provide scene lighting and electricity as needed.
 - a. Light all dark areas, interior and exterior.
 - b. Provide electricity for lights, fans and other equipment.
3. Provide for firefighter rehabilitation and rehydration.
 - a. Set up an area away from the fire.
 - b. Should be in a cool or heated area (as needed) that is dry.
 - c. Fluid replacement should be given to personnel, such as a thirst quencher or water.
4. On major fires, an area should be assigned for monitoring and providing medical treatment of emergency personnel.

The medical area can be combined with rehabilitation.
5. When necessary, provide for animal control.

CONTROL ALL UTILITIES

- Use appropriate personnel.
- Coordinate with other operations and the Incident Commander (IC).
- Control fuels.
- Shut off electricity to involved areas.
- Control water.

Slide 3-109

C. Control all utilities.

1. It is essential to control all utilities for safe firefighting operations. The Company Officer (CO) must have a good utility control plan.
2. Use appropriate personnel, such as utility employees or building maintenance personnel.
3. If fire department personnel must shut off utilities, they should not turn them back on.
4. All utility control efforts must be coordinated with other tactics and the Incident Commander (IC).
5. Control fuels when involved (or potentially involved) in the fire.
 - a. Fuel oil.
 - b. Natural gas.
 - c. Liquefied petroleum gas (LPG).
6. Shut off electricity to the involved areas of the fire.
 - a. Locate primary service.
 - b. Exposed wires may still be live.
 - c. Do not pull meters.
 - d. Develop preplan for underground utilities.

- 7. Control water.
 - a. Water may cause weight problems.
 - b. Water shut-off must be coordinated to eliminate shutdown of sprinkler and standpipe system.

VII. OVERHAUL OPERATIONS

OVERHAUL OPERATIONS

Overhaul is the action taken to expose hidden fire and to ensure complete extinguishment.

Slide 3-110

- A. Definition: Overhaul is the action taken to expose hidden fire and to ensure complete extinguishment.

PRINCIPLES OF OVERHAUL

- Extinguish all smoldering contents.
- Check for and extinguish hidden fires or extension.

Slide 3-111

- B. Principles of overhaul.
 - 1. Extinguish all smoldering contents.
 - 2. Check for and extinguish hidden fires or extension.

OVERHAUL TACTICS

- Extinguish spot fires and smoldering fires.
- Open walls and voids.
- Prevent rekindles.
- Do not work in unsafe areas.

Slide 3-112

C. Select overhaul tactics.

1. Extinguish spot fires and smoldering fires.
2. Open hot walls and any voids where heat may have transferred, and look for any hidden fires.
3. Prevent rekindles by ensuring that the fire is completely out and there are no hidden fires.
4. Do not work in unsafe areas.
 - a. When overhaul begins, the emergency is over and firefighter safety is of utmost concern. Tired firefighters make mistakes.
 - b. Full protective clothing, including self-contained breathing apparatus (SCBA), must be worn.
 - During most overhaul operations, the air has the highest level of contamination. For this reason, SCBA must be used in all overhaul operations.
 - c. Beware of any unstable walls, roofs and floors.
 - d. Unsafe areas must be made safe before personnel can enter.

TACTICAL SIZE-UP FACTORS

What factors must be considered in a tactical size-up for overhaul?

Slide 3-113

OVERHAUL COORDINATION

- Coordinate with salvage operations.
- Firefighters may complete overhaul while completing salvage.
- Coordinate with investigators.

Slide 3-114

- D. Overhaul coordination.
1. Often salvage operations are coordinated with overhaul operations.
 2. While companies are completing overhaul, they can also perform a great deal of salvage work.
 3. Coordinate with origin-and-cause investigators.
 - a. Identify evidence.
 - b. Protect it.

TRANSFER OF COMMAND REPORT PROCEDURE

- Deliver to the next commanding officer arriving at an incident.
 - Location and extent of fire.
 - Control efforts.
 - Deployment of resources.
 - Need for additional resources.

Slide 3-115

- E. Transfer of command report procedure — deliver to the next commanding officer arriving at an incident:
1. Location and extent of fire.
 2. Control efforts.
 3. Deployment of resources.
 4. Need for additional resources.

VIII. SUMMARY



SUMMARY



- Rescue.
- Command Sequence 3.
- Ventilation.
- Command Sequence 4.
- Command Sequence 5.

Slide 3-116



SUMMARY (cont'd)



- Support and overhaul activities.
- Overhaul operations.

Slide 3-117

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UNIT 4: WATER SUPPLY, FIXED FIRE PROTECTION SYSTEMS, AND SALVAGE

TERMINAL OBJECTIVE

The students will be able to:



- 4.1 *Identify and explain the actions required to address water supply, fixed fire protection systems, and salvage.*

ENABLING OBJECTIVES

The students will be able to:

- 4.1 *Identify the principles of water supply and the tactics for establishing water supplies using municipal sources, static sources and portable sources.*
 - 4.2 *Identify the principles and tactics to achieve salvage.*
 - 4.3 *Describe the procedures for deployment of a hoseline from a standpipe system.*
 - 4.4 *Given a scenario, develop a water supply action plan using the command sequence cycle.*
 - 4.5 *Given a scenario, develop a salvage action plan using the command sequence cycle.*
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**UNIT 4:
WATER SUPPLY, FIXED
FIRE PROTECTION
SYSTEMS, AND SALVAGE**

Slide 4-1

ENABLING OBJECTIVES

- Identify the principles of water supply and the tactics for establishing water supplies using municipal sources, static sources and portable sources.
- Identify the principles and tactics to achieve salvage.
- Describe the procedures for deployment of a hoseline from a standpipe system.

Slide 4-2

**ENABLING OBJECTIVES
(cont'd)**

- Given a scenario, develop a water supply action plan using the command sequence cycle.
- Given a scenario, develop a salvage action plan using the command sequence cycle.

Slide 4-3

I. WATER SUPPLY

**DEFINITION OF
WATER SUPPLY**

The tactical operation of providing sufficient water to meet needed fire flows (NFFs) at fire incidents.

Slide 4-4

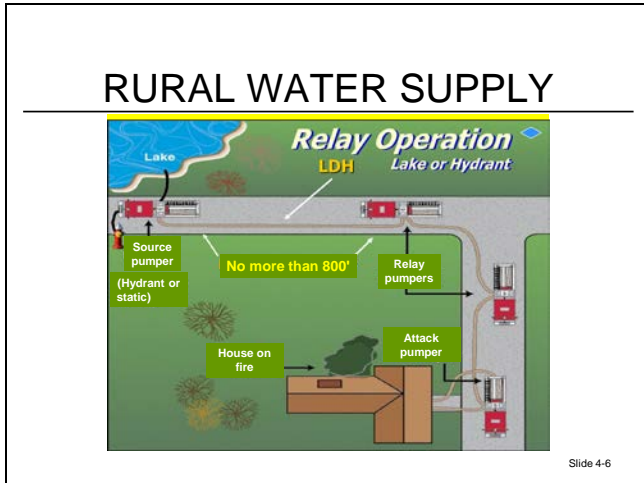
- A. Definition: the tactical operation of providing sufficient water to meet needed fire flows (NFFs) at fire incidents.

**PRINCIPLE OF
WATER SUPPLY**

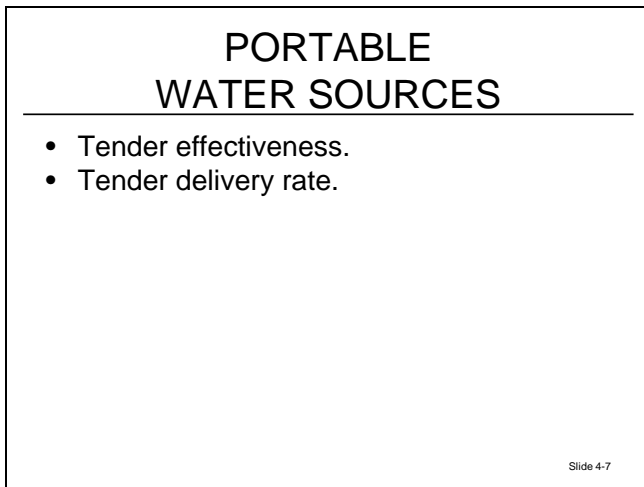
Develop water supply adequate to support all fireground operations.

Slide 4-5

- B. Principle of water supply — develop water supply adequate to support all fireground operations.



C. Example of a relay operation from a lake or hydrant.



D. Establishing water supply using portable systems.

1. Tender effectiveness.
 - a. Must be designed to carry the weight of water.
 - b. Water weighs 8.3 pounds per gallon.
2. Using tenders designed to carry other liquids may be unsafe.
 - a. Quick filling and quick dumping.
 - b. Easily maneuverable.

TENDER DELIVERY CYCLE

The time it takes a tender to set up, dump the water, travel to the fill site, fill up, and return to the dump site.

Slide 4-8

3. Figuring out tender delivery rate.

a. Tender delivery cycle.

- The time it takes a tender to set up, dump the water, travel to the fill site, fill up, and return to the dump site.

TENDER DELIVERY RATE



2,500-gallon tender

$$\text{TDR} = \frac{2,500 \text{ Gallons}}{20 \text{ Minutes}}$$



20 minutes to dump, travel, fill and travel back

$$= \frac{125 \text{ Gallons}}{\text{Minute}}$$

Slide 4-9

b. Tender delivery rate.

- Tender size divided by tender delivery cycle equals the tender delivery rate.

c. If it takes a 2,500-gallon tender 20 minutes to dump, travel, fill, and travel back to the fire, the tender delivery rate for that tender is 125 gallons per minute (gpm).

**SETTING UP FILL
AND DUMP SITES**

- Locate for best access.
- Avoid backing up.
- Assign water supply supervisor.

Slide 4-10

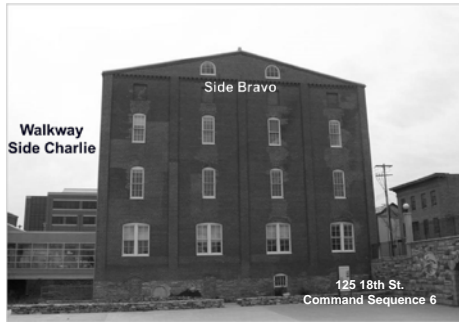
4. Setting up fill and dump sites.
 - a. Fill and dump sites should be located to allow the best access for a tender to get in and out safely.
 - b. When possible, avoid backing up tender to save time.
 - c. In order to achieve an adequate water supply, a water supply group supervisor and fill or dump site supervisor may have to be assigned.
5. By determining the NFF and tender delivery rates, the officer can decide whether enough water can be supplied to control the fire.
6. Some fires may exceed the department's ability to provide enough water to extinguish the fire.

II. COMMAND SEQUENCE 6

Command Sequence 6

Slide 4-11

SIDE BRAVO



Slide 4-15

SIDES BRAVO AND CHARLIE AND EXPOSURE CHARLIE-1



Slide 4-16

SIDES CHARLIE AND DELTA



Slide 4-17

SIDES ALPHA AND DELTA



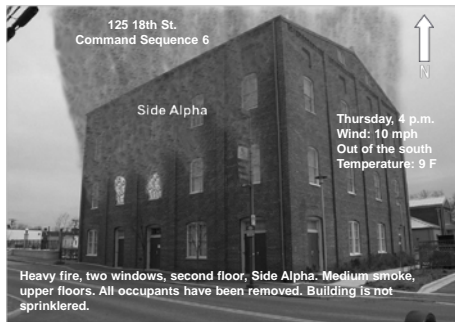
Slide 4-18

COMMAND SEQUENCE 6: FIRST-ALARM RESOURCES

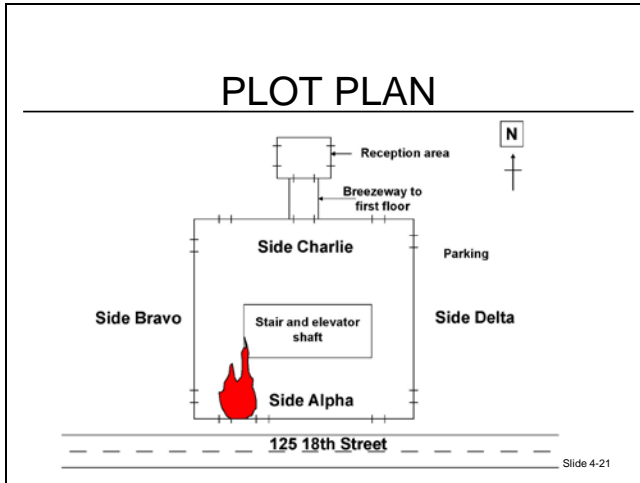
- Engine 1 or E-1.
- E-2.
- E-3.
- Truck 1 or T-1.
- Safety Officer 1.
- Battalion Chief (BC)-1: 30-minute response.

Slide 4-19

FIRE SLIDE



Slide 4-20



SIZE-UP REPORT EXAMPLE

- On location at 125 18th St., four-story building, 60 feet by 80 feet, ordinary construction, occupied as a clothing distributor.
- Heavy fire and smoke from two windows, Division 2, Side Alpha, medium smoke on upper floors.
- All occupants have been removed.

Slide 4-22

SIZE-UP REPORT EXAMPLE (cont'd)

- Exposure Charlie-1 is an attached walkway, no other immediate exposures.
- E-1 is establishing 18th Street Command.

Slide 4-23

**WATER SUPPLY
ACTION PLAN**

- What can be accomplished?
- What needs to be done?
- How are you going to accomplish the strategy?

Slide 4-24

- B. Water supply action plan.
 - 1. Incident size-up.
 - 2. Incident strategy(ies).
 - 3. Incident tactics.

**IMPLEMENT THE WATER
SUPPLY ACTION PLAN**

Communicate assignments clearly to all resources operating on the incident.

Slide 4-25

- C. Implement the water supply action plan — communicate all assignments clearly to all resource units operating on the incident.

**EVALUATE THE WATER
SUPPLY ACTION PLAN**

- Evaluate progress every 10 minutes.
- Obtain feedback reports from resources operating on the incident.
- Develop Conditions, Actions and Needs (CAN) report.

Slide 4-26

D. Evaluate the water supply action plan.

1. Evaluate progress of the plan frequently.
2. Obtain periodic feedback reports from all resource units operating on the incident.
3. Develop Conditions, Actions and Needs (CAN) report.

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ACTIVITY 4.1

Water Supply Operations

Purpose

Learn where to use the command sequence cycle to develop an action plan for water supply operations.

Directions

1. The class will be divided into table groups.
2. A floor plan is in your Student Manual (SM). The floor plan shows the amount of involvement in the building.
3. You will be shown several slides of the building's various sides and at least one slide showing smoke and/or fire.
4. Look at your floor plan.
5. Your group will develop a water supply action plan using the command sequence cycle. Complete the Student Activity Worksheet (SAW).
6. Your group will be required to report your action plan back to the class using the command sequence cycle.

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ACTIVITY 4.1 (cont'd)

567 J Street

Building description: 250 feet by 90 feet, three-story building, fire-resistive construction.

Occupancy type: office building.

Fire location: 567 J St.

Fire is in the first floor, front occupancy. Involvement is approximately 30 percent.

Time: 0700 hours.

Water available: The closest hydrant is 4,000 feet to the south.

Resources available:

First Alarm:

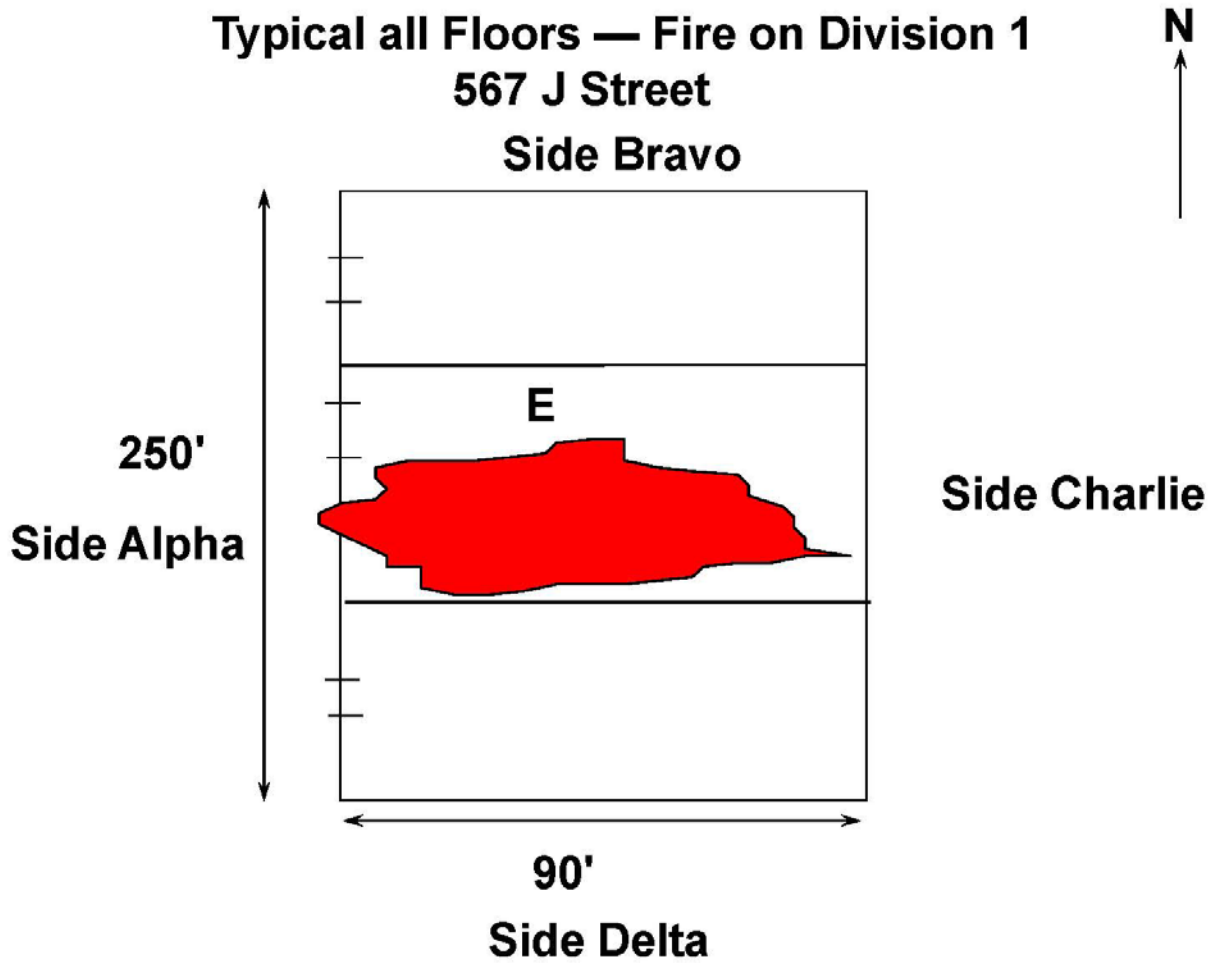
- E-1.
- E-2.
- E-3.
- Safety Officer 1.
- Tender 1 — 2,000 gallons.
- Tender 2 — 2,000 gallons.
- BC-1: 30-minute response.

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ACTIVITY 4.1 (cont'd)

Floor Plan

Typical all Floors — Fire on Division 1
567 J Street
Side Bravo



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ACTIVITY 4.1 (cont'd)

Command Sequence Cycle

Size-up:

Objective(s):

Strategy(ies):

Tactics:

- Exposure protection.

- Confinement/Extinguishment.

- Ventilation.

- Salvage.

Implement:

Evaluate:

III. SUPPORTING AND USING FIXED FIRE PROTECTION EQUIPMENT

SUPPORTING AND USING FIXED FIRE PROTECTION EQUIPMENT

- Automatic sprinkler system.
 - System of piping, valves, and water discharge heads.
 - Highly effective in confining or extinguishing fires.
- Standpipe system.
 - System of piping and valves to provide water supply at fire floor.

Slide 4-35

- A. Automatic sprinkler system.
 - 1. System of piping, valves, and water discharge heads.
 - 2. Highly effective in confining or extinguishing fires.
- B. Standpipe system — system of piping and valves to provide water supply at fire floor.

PREINCIDENT PLANNING

- Normal water supply for system.
- Fire pump.
- Control valves.
- Fire department connection.

Slide 4-36

- C. Preincident planning — fire protection systems.
 - 1. Normal water supply for system.
 - a. Municipal water supply.
 - b. On-site storage tanks.

- c. Fire ponds with pumps.
- 2. Fire pump.
 - a. Reliability of power supply.
 - b. Automatic or manual starts.
- 3. Control valves.
 - a. Outside stem and yoke (OS&Y).
 - b. Wall valves (WV).
 - c. Post indicator valve (PIV).
- 4. Fire department connection.
 - a. Are there multiple systems within the structure?
 - b. Are there multiple fire department connections?
 - c. Are the multiple systems interconnected?
 - d. Is the standpipe connection different than the sprinkler connection?
 - e. Does the fire department connection have clapper (check) valves in the connection?
 - f. Are the hose threads compatible?

CONNECTING TO A FIRE DEPARTMENT CONNECTION

- One of the first-alarm companies must connect to system.
- Check for debris in connections.
- Connection may have only one water supply intake.

Slide 4-37

D. Connecting to a fire department connection.

1. One of the first-alarm engine companies at the structure should connect to and supply the system — National Fire Protection Association (NFPA) 13E, *Recommended Practice for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems* recommends that the supply line should be charged to a pressure of 150 pounds per square inch (psi).
2. Check connections and piping for paper and other debris — if necessary, quickly clear debris from supply connection.
3. Connection with only one water supply intake.
 - a. Connect hose and start pumping.
 - b. Do not exceed 150 psi.

**CONNECTING ATTACK LINE
TO STANDPIPE CONNECTION**

- Standpipe kit.
- Stretch hose up stairs past fire floor.
 - Use Wye for smaller attack lines.
 - Look for fire pump activation (pressure surge).
 - Coordinate pressure with pump operator.

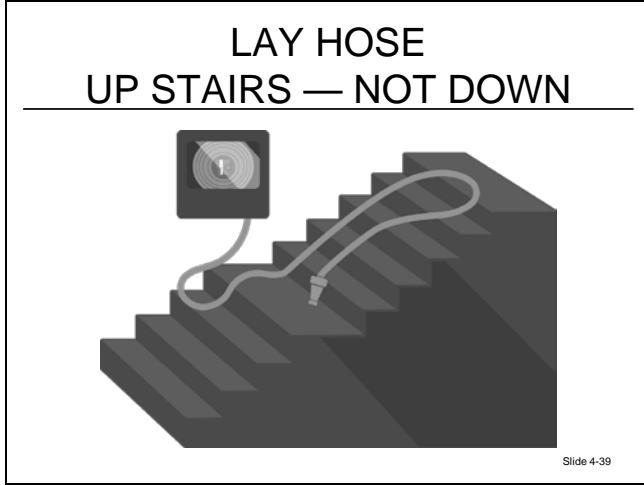
Slide 4-38

E. Connecting attack line to standpipe connection.

Fire department standpipe kit should contain several items.

1. A minimum of 100 feet of fire attack hose. It is recommended to use 1 3/4-inch hose as a minimum size.
2. Appropriate size and type of nozzle for occupancy.
3. Short length of 2 1/2-inch hose.
4. 2 1/2-inch by 1 1/2-inch Wye appliance.
5. Spare control valve handle.
6. Spanner wrench.

7. Pair of locking pliers or small pipe wrench to open stuck valves.



F. If possible, stretch the hose up the stairwell past the fire floor prior to charging the line. It may be easier to drag the line down stairs than up stairs.

1. If using hose with 1 1/2-inch coupling, place Wye onto standpipe connection.
 - a. Short length of 2 1/2-inch hose may be required to make the connection in the hose cabinet.
 - b. Second side of Wye will provide opportunity for the connection of a backup line.
2. If working off a standpipe system with a fire pump that may come on when the pressure is reduced, expect a sudden surge in the pressure when the pump turns on.
3. Coordinate pressure requirements with pump operator.

Once pressure from the fire department pump exceeds normal supply pressure, the normal supply valve will close.

G. Coordination.

1. Company Officers (COs) given a tactical assignment to confine and/or extinguish a fire must coordinate their efforts with all other tactical assignments.
2. Example: It is critical that the assignment of fire confinement be closely coordinated with primary search to protect the search team and/or the victims.

**COORDINATE WITH OTHER
TACTICAL ASSIGNMENTS**

- Other hoselines.
- Water supply.
- Ventilation.
- Ladders.
- Air supply.
- Other support functions.

Slide 4-40

- H. Coordinate with other tactical assignments that will support confinement or extinguishment.
1. Other hoselines.
 - a. All lines should be working together for same objective.
 - b. Opposing hoselines injure firefighters.
 - c. Backup lines to assist with confinement or extinguishment and protect egress.
 2. Water supply.
 - a. A supply must be established to sustain gpm being applied to the fire.
 - b. If possible, backup lines should come from a second water supply.
 3. Ventilation.
 - a. When and where will ventilation be accomplished?
 - b. What type of ventilation will be accomplished to support confinement or extinguishment?
 - c. Is ventilation being started to support life safety, fire confinement or fire extinguishment?
 4. Ladders.

- a. When and where will ladders be accomplished for access to or egress from upper stories?
 - b. Ladder for secondary means of egress.
5. Air supply — when and where will breathing air or spare air bottles be available?
6. Other support functions.
- a. Entry.
 - b. Rehabilitation for personnel.
 - c. Decontamination.
 - d. Fires with asbestos.
 - e. Auxiliary lighting.
 - f. Overhaul.
 - g. Salvage.

SAFETY CONSIDERATIONS

Can risks be managed?

- Coordination.
- Keep the Incident Commander (IC) informed.
- Be aware of time and structural conditions.
- You are the Safety Officer for your crew.
- Consider lead time for relief crews.

Slide 4-41

- I. Can risks associated with the tactical assignment be managed?
1. The greater the risk to personnel, the greater the need to manage the risk.
 2. Coordination with other tactical assignments is critical.
 3. Keep the Incident Commander (IC) informed of your location, progress, and any safety problems anticipated.

4. Be aware of time passing. As structural elements burn, the building weakens. Eventually gravity wins.
5. As the CO, you are the Safety Officer for your company.
6. Consider lead time for relief crews.

IV. COMMAND SEQUENCE 7

COMMAND SEQUENCE 7: WATER SUPPLY FIXED SYSTEMS

- Command Sequence 7.
- 100 R St.

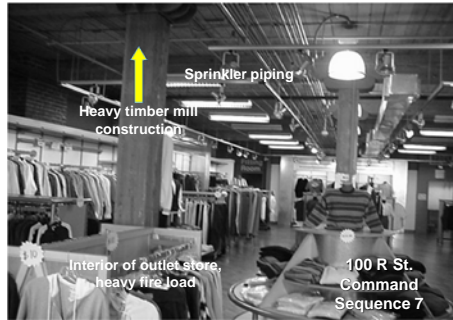
Slide 4-42

- A. Review the walk-around slides, resources, fire slide and plot plan.

SIDES ALPHA AND BRAVO

Slide 4-43

OUTLET STORE INTERIOR, HEAVY FIRE LOAD (cont'd)



Slide 4-50

COMMAND SEQUENCE 7: FIRST-ALARM RESOURCES

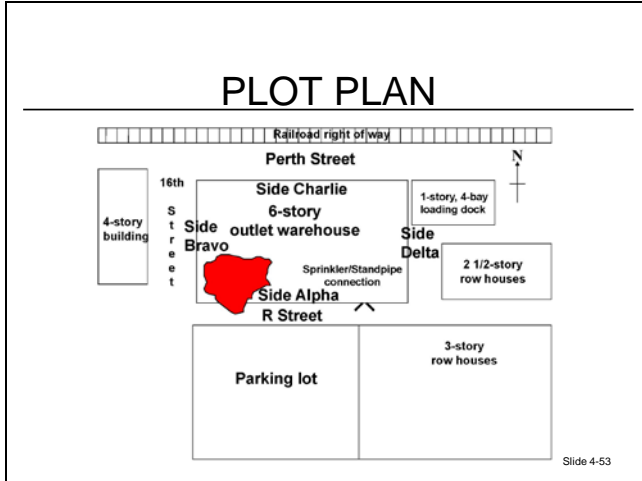
- E-1.
- E-2.
- E-3.
- T-1.
- Safety Officer 1.
- BC-1: 30-minute response.

Slide 4-51

HEAVY FIRE, SIDE ALPHA



Slide 4-52



- ### SIZE-UP REPORT EXAMPLE
- On location at 100 R St., six-story building, 75 feet by 300 feet, mill construction, occupied as outlet stores.
 - Heavy fire and smoke showing from windows, Division 2, Side Alpha.
 - All occupants have been removed.
 - Exposures Side Alpha are three-story occupied dwellings separated by a 20-foot street.
- Slide 4-54

- ### SIZE-UP REPORT EXAMPLE (cont'd)
- Exposure Delta-1 is a one-story loading dock, directly attached.
 - Exposure Delta-2 is 2 1/2-story occupied dwelling located 25 feet from the building.
 - No other immediate exposures.
 - E-1 is establishing R Street Command.
- Slide 4-55

WATER SUPPLY FIXED SYSTEMS ACTION PLAN

- What can be accomplished?
- What needs to be done?
- How are you going to accomplish the strategy?

Slide 4-56

B. Water supply fixed systems action plan.

1. Incident objectives.
2. Incident strategy(ies).
3. Incident tactics.

IMPLEMENT THE ACTION PLAN

- Fixed fire protection system.
- Communicate assignments clearly to all resources operating on the incident.

Slide 4-57

C. Implement the fixed fire protection system action plan.

Communicate all assignments clearly to all resources operating on the incident.

EVALUATE THE FIXED FIRE PROTECTION SYSTEM ACTION PLAN

- Evaluate progress frequently.
- Obtain feedback reports from resources operating on the incident.
- Develop CAN report.

Slide 4-58

D. Evaluate the fixed fire protection system action plan.

1. Evaluate progress of the plan frequently.
2. Obtain periodic feedback reports from all resource units operating on the incident.
3. Develop CAN report.

V. SALVAGE OPERATIONS

SALVAGE OPERATIONS

The tactical operation of protecting property from damage.

Slide 4-59

A. Definition: the tactical operation of protecting property from damage.

PRINCIPLES OF SALVAGE

- To minimize damage to building and contents.
- To protect building from structural damage due to weight of water.

Slide 4-60

B. Principles of salvage.

1. To minimize damage to building and contents caused by fire, smoke and water.
2. To protect building from structural damage due to weight of water.

SALVAGE TACTICS

- Protect building contents:
 - In place.
 - By removal.
 - Control water flow within building.
 - Remove water from building.

Slide 4-61

C. Select appropriate salvage tactics.

1. Protect building contents.
 - a. Protect in place by covering or moving.
 - b. Protect by removal from building to a safe place.
 - c. Control water flow within building.
 - d. Remove water from building.

SALVAGE TACTICS (cont'd)

- Ventilate to remove smoke and heat.
- Remove debris from building.
- Cover building openings to protect from weather.

Slide 4-62

2. Ventilate to remove smoke and heat.
3. Remove debris from building.
4. Protect from weather by covering holes and broken or missing doors and windows.

COORDINATION AND PLANNING

- Rapid extinguishment reduces loss.
- Conserve water during firefighting operations.
- Ventilate early.

Slide 4-63

- D. Coordination and planning.
 1. Salvage operations must be coordinated with all other tactics.
 2. Firefighters performing other tactics, such as extinguishment and ventilation, may help to complete salvage operations.
 - a. Rapid extinguishment reduces property loss.
 - b. Water should be conserved during firefighting operations.

- c. Early ventilation reduces property damage.

VI. COMMAND SEQUENCE 8

**COMMAND SEQUENCE 8:
SALVAGE ACTION PLAN**

Water supply, fixed systems and salvage.

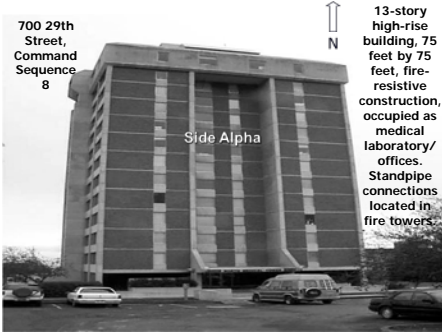
- Command Sequence 8.

Slide 4-64

- A. Water supply, fixed systems and salvage action plan — Command Sequence 8: 700 29th St.

Review the walk-around slides, resources, fire slide and plot plan.

SIDE ALPHA



700 29th Street, Command Sequence 8

Side Alpha

13-story high-rise building, 75 feet by 75 feet, fire-resistant construction, occupied as medical laboratory/offices. Standpipe connections located in fire towers.

Slide 4-65

SIDES ALPHA AND BRAVO



Slide 4-66

SIDE BRAVO



Slide 4-67

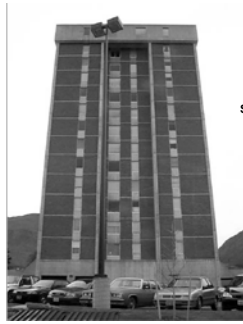
SIDES BRAVO AND CHARLIE



Slide 4-68

SIDE CHARLIE

700 29th
Street,
Command
Sequence
8



Side Charlie

Slide 4-69

SIDE DELTA

700 29th
Street,
Command
Sequence
8



Side Delta

Slide 4-70

COMMAND SEQUENCE 8: FIRST-ALARM RESOURCES

- E-1.
- E-2.
- E-3.
- T-1.
- Safety Officer 1.
- BC-1: 30-minute response.

Slide 4-71

SIZE-UP REPORT EXAMPLE
(cont'd)

- All occupants have been removed.
- No other immediate exposures.
- E-1 is establishing 29th Street Command.

Slide 4-75

WATER SUPPLY, FIXED SYSTEMS
AND SALVAGE ACTION PLAN

- What can be accomplished?
- What needs to be done?
- How are you going to accomplish the strategy?

Slide 4-76

B. Water supply, fixed systems and salvage action plan.

1. Incident objectives.
2. Incident strategy(ies).
3. Incident tactics.

IMPLEMENT THE ACTION PLAN

Water supply, fixed systems and salvage.

- Communicate assignments clearly to all resources operating on the incident.

Slide 4-77

C. Implement the water supply, fixed systems and salvage action plan — communicate all assignments clearly to all resources operating on the incident.

EVALUATE THE ACTION PLAN

Water supply, fixed systems and salvage.

- Evaluate progress every 10 minutes.
- Obtain feedback reports from resources operating on the incident.
- Develop CAN report.

Slide 4-78

D. Evaluate the water supply, fixed systems and salvage action plan.

1. Evaluate progress of the plan frequently.
2. Obtain periodic feedback reports from all resource units operating on the incident.
3. Develop CAN report.

TRANSFER OF COMMAND REPORT PROCEDURE

Delivered to the next commanding officer arriving at an incident:

- Location and extent of fire.
- Control efforts.
- Deployment of resources.
- Need for additional resources.

Slide 4-79

- E. Transfer of command report procedure —deliver to the next commanding officer arriving at an incident:
1. Location and extent of fire.
 2. Control efforts.
 3. Deployment of resources.
 4. Need for additional resources.

ACTIVITY 4.2

Salvage

Purpose

Learn where to use the command sequence cycle to develop an action plan for salvage operations.

Directions

1. The class will be divided into table groups.
2. A floor plan is in your SM. The floor plan shows the amount of involvement in the building.
3. You will be shown several slides of the building's various sides and at least one slide showing smoke and/or fire.
4. Look at your floor plan.
5. Your group will develop a salvage operations action plan using the command sequence cycle. Use the Primary Factors Size-Up Chart, and complete the SAW.
6. Your group will be required to report your action plan back to the class using the command sequence cycle.

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ACTIVITY 4.2 (cont'd)

246 10th Street

Building description: 50 feet by 75 feet, three-story building, ordinary construction.

Occupancy type: office building.

Connected to a three-story warehouse and a two-story warehouse, both of ordinary construction.

Fire location: 246 10th St.

Fire is on the second floor of warehouse. Involvement is approximately 35 percent.

Occupancy below fire area handles water-reactive acids for processing metal products.

Acids are stored directly below the second floor/fire area.

Time: 1000 hours.

Water available: hydrant area — hydrants at every corner. System flow = 8,000 gpm.

Resources available:

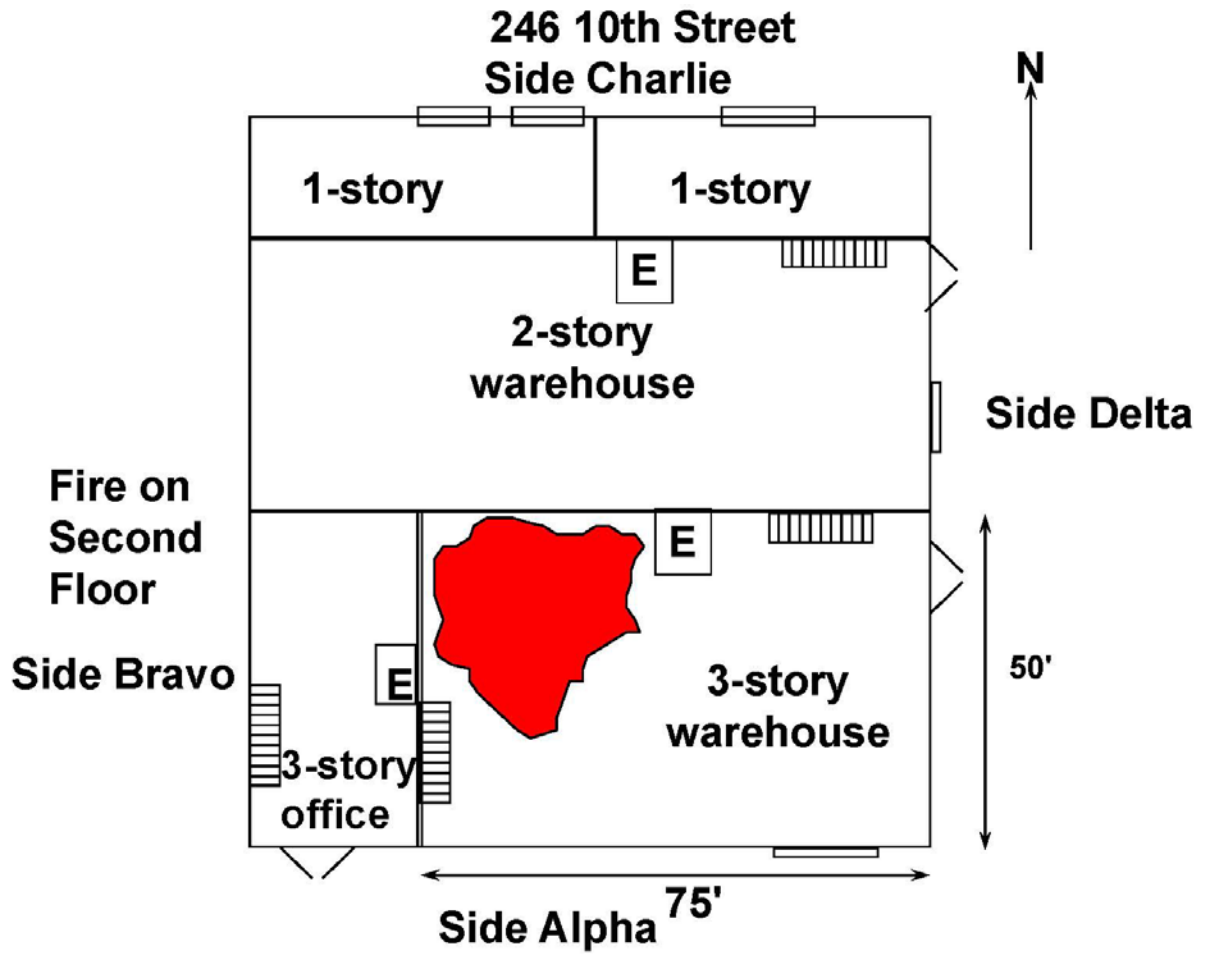
First Alarm:

- E-1.
- E-2.
- E-3.
- T-1.
- Safety Officer 1.
- BC-1: 30-minute response.

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ACTIVITY 4.2 (cont'd)

Floor Plan



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ACTIVITY 4.2 (cont'd)

Command Sequence Cycle

Size-up:

Objective(s):

Strategy(ies):

Tactics:

- Exposure protection.

- Confinement/Extinguishment.

- Ventilation.

- Salvage.

Implement:

Evaluate:

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BIBLIOGRAPHY

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BIBLIOGRAPHY

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ACRONYMS

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ACRONYMS

ASAP	as soon as possible
BC	Battalion Chief
BIR	Brief Initial Report
CAN	Conditions, Actions and Needs
CO	Company Officer
FEMA	Federal Emergency Management Agency
gpm	gallons per minute
HVAC	heating, ventilating, and air conditioning
IAP	Incident Action Plan
IC	Incident Commander
ICP	Incident Command Post
ICS	Incident Command System
IDLH	immediately dangerous to life and health
IG	Instructor Guide
LODD	line-of-duty death
LPG	liquefied petroleum gas
NFA	National Fire Academy
NFF	needed fire flow
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OS&Y	outside stem and yoke
OSHA	Occupational Safety and Health Administration

PIV	post indicator valve
PPE	personal protective equipment
psi	pounds per square inch
QAP	Quick Access Prefire
RECEO-VS	R escue, E xposures, C onfine the fire, E xtinguish, O verhaul, V entilate, S alvage
RIC	Rapid Intervention Crew
SAW	Student Activity Worksheet
SCBA	self-contained breathing apparatus
SLICE-RS	S ize-up, L ocate the fire, I dentify and control flow path, C ool space from safest location, E xtinguish fire, R escue, S alvage
SM	Student Manual
SMART	S pecific, M easurable, A ttainable, R elevant and T ime sensitive
STICO	“Strategy and Tactics for Initial Company Operations”
TIC	thermal imaging camera
WV	wall valves