Wildland Training (FFT2) for Structural Firefighters G-130

Instructor Guide

SEPTEMBER 2008

CERTIFICATION STATEMENT

on behalf of the

NATIONAL WILDFIRE COORDINATING GROUP

The following training material attains the standards prescribed for courses developed under the interagency curriculum established and coordinated by the National Wildfire Coordinating Group. The instruction is certified for interagency use and is known as:

Wildland Training (FFT2) For Structural Firefighters, G-130
Certified at Level III

This product is part of an established NWCG curriculum. This course does not meet the requirements of the NWCG COURSE DEVELOPMENT AND FORMAT STANDARDS – Sixth Edition, 2003 but it has been through a professional evaluation process.

Member NWCG and Training Working Team Liaison

Date 9/24/08

Chairperson, Training Working Team

Date 9/22/08

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Comments regarding the content of this publication should be directed to:
National Interagency Fire Center, Fire Training, 3833 S. Development Ave., Boise, Idaho 83705.
E-mail: nwcg_standards@nifc.blm.gov.

NWCG TRAINING WORKING TEAM
POSITION ON COURSE PRESENTATION AND MATERIALS

The recommended hours listed in the FMCG are developed by Subject Matter Experts based on their estimation of the time required to present all material needed to adequately teach the unit and course objectives. The hours listed may vary slightly due to factors such as number of students, types and complexity of course activities, and the addition of local materials. NWCG is aware that there have been courses presented in an abbreviated form, varying greatly from the recommended course hours. Instructors and students are cautioned that in order to be recognized as an NWCG certified course, certain guidelines must be followed:

- Lead instructors are encouraged to enhance course materials to reflect the conditions, resources and policies of the local unit and area as long as the objectives of the course and each unit are not compromised.

- Exercises can be modified to reflect local fuel types, resources and conditions where the student will be likely to fill incident assignments. The objectives and intent of the exercises must remain intact.

- Test questions may be added that reflect any local information that may have been added to the course. However, test questions in the certified course materials should not be deleted to ensure the accurate testing of course and unit objectives.

- Test grades, to determine successful completion of the course, shall be based only on the questions in the certified course materials.

If lead instructors feel that any course materials are inaccurate, that information should be submitted by e-mail to NWCG Fire Training at nwcg_standards@nifc.blm.gov. Materials submitted will be evaluated and, where and when appropriate, incorporated into the appropriate courses.

COURSE LENGTH FOR NWCG COURSES

If a course is available through PMS, the recommended course hours and the "NWCG Position on Course Presentation and Materials" will be adhered to by the course instructors.

- Unit times represent the allotted time to teach the unit and complete the exercises, simulations, and tests.

- Recommended course hours are given to help the students and the course coordinator with planning travel, room reservations, and facilities usage. This represents the time estimated to present the NWCG provided materials including time for breaks, lunch periods, set-up for field exercises or simulations, etc.

- Actual times for both the unit and the course may vary based on number of students, types and complexity of course activities, and the addition of local instructional materials.

If the course is not available through PMS, e.g., L-380, and has been developed using NWCG course criteria, minimum course hour requirements have been established and must be adhered to by the course developer and course instructors.

Course hours for all NWCG courses can be found in the Field Manager's Course Guide (http://www.nwcg.gov/pms/training/fmcg.pdf). If the hours are a minimum versus recommended they will be stated as such.

PREFACE

Wildland Training (FFT2) for Structural Firefighters, G-130, is identified training in the National Wildfire Coordination Group's (NWCG), Wildland and Prescribed Fire Curriculum. This course was developed from the *Skills Crosswalk,* in cooperation with the United States Fire Administration (USFA) and other parties, and funded by the USFA.

All work was completed with the coordination and assistance of personnel from the following organizations:

United States Fire Administration

International Association of Fire Chiefs

National Fire Protection Association

State Fire Training Directors

NWCG Training Working Team

National Association of State Foresters

The NWCG appreciates the efforts of these personnel and all who have contributed to the development of this training product.

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INTRODUCTION

Wildland Training for Structural Firefighters Gap Courses

The Wildland Training for Structural Firefighters gap courses were designed to help structural firefighters learn the critical wildland firefighting skills needed to be safe and effective in either of two situations: when making an initial attack on a wildland fire in their jurisdiction or when working with state and federal wildland firefighter agencies.

The courses focus on "gaps" in knowledge or experience of structural firefighters and fire officers in meeting the qualifications as specified by NFPA 1001 and NFPA 1021, respectively, or the training standard determined by the Authority Having Jurisdiction.

The four gap courses reflect increased level of skill and responsibility. The table below lists the course, the target audience for the course, and the equivalent NWCG position.

Gap Course	Structural Fire Counterpart Position	Entering Qualifications	NWCG Position
#1	Non-Supervisory Structural Firefighter, Basic	Meets NFPA 1001 for Firefighter 1, or equivalency	Firefighter 2 (FFT2)*
#2	Non-Supervisory Structural Firefighter, Advanced	Meets NFPA 1001 for Firefighter 2, or equivalency	Firefighter 1 (FFT1)*
#3	Driver/Operator/Engineer or Company Officer	Meets NFPA 1021 for Fire Officer 1, or equivalency	Single-Engine Resource Boss (ENGB)
#4	Experienced Lieutenants, Captains, Chief Officers	Meets NFPA 1021 for Fire Officer, or equivalency	Strike Team Leader (STEN)

*NWCG firefighter position designations 1 and 2 are opposite of NFPA designation (Firefighter 1=advanced)

Authority Having Jurisdiction

The designated Authority Having Jurisdiction (AHJ) plays a primary role in the use and administration of the *Skills Crosswalk*. The AHJ is defined by NFPA as an organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, installation, or a procedure. State or local law designates the AHJ for wildland fire protection within a given jurisdiction. Fire department chiefs, state fire marshals, state foresters, training officers, and other qualified fire protection officials are typically designated as the AHJ. The AHJ determines firefighter eligibility for any gap course.

Training Organizations

State fire training authorities, state, county or city municipalities, rural fire districts, individual fire departments, or other agencies and organizations responsible for local firefighter training and certification may use the gap courses as an avenue of equivalency with NWCG standards. Gap courses may also be used to guide local firefighters in the development of wildland firefighting skills.

Instructor Qualifications

Qualifications for instructors to teach the NWCG curriculum are described in the Field Manager's Course Guide, PMS 901-1. Certification of instructor qualifications is the responsibility of the employing agency. All instructors should have training in how to be an instructor and be experienced in the content that they are teaching. For more information consult the Field Manager's Course Guide, PMS 901-1, available on the NWCG Web site at http://www.nwcg.gov/pms/training/training.htm

Structural Firefighters

The gap courses can be used as an NWCG equivalency and certification tool by structural firefighters and fire officers who meet the qualifications of firefighters as specified by NFPA 1001 and NFPA 1021, respectively, or the training standard determined as equivalent by the AHJ.

COURSE INSTRUCTIONS

Prerequisite: This course is for structural firefighters who meet the qualification of firefighters as specified by NFPA 1001 or the training standard determined as equivalent by the AHJ.

This section contains instructions and information essential for the instructors to make an effective presentation. All instructors must be thoroughly familiar with this section and all other course material prior to presenting the course.

I. COURSE INTRODUCTION

This course, Wildland Training (FFT2) for Structural Firefighters, G-130, contains training for structural firefighters to close gaps in their knowledge and skill that exist between their current structural skills and the NWCG wildland skills. It is the first of the four gap courses. The target audience is personnel in the position equivalent to Firefighter (FFT2) under the Wildland Fire Qualification System Guide, PMS 310-1.

The purpose of this course is to train structural firefighters in basic wildland firefighting skills. Firefighters who complete this training and pass the final exam will be qualified to suppress wildland fires WHILE UNDER CLOSE SUPERVISION.

This course was designed to be presented by qualified instructors at any location.

II. COURSE OBJECTIVES

The course objectives are based on gaps identified in the *Skills Crosswalk*. At the completion of this course structural firefighters will:

- Identify the environmental factors of fuels, weather, and topography that affect the start and spread of wildland fire.

- Describe the contributing factors that indicate the potential for increased fire behavior that may compromise safety.

- Explain the LCES (Lookouts, Communications, Escape Routes, and Safety Zones) system and how it relates to the Standard Firefighting Orders.

- Construct firelines to required standards using various methods.

- Strengthen, reinforce, and use holding actions on a fireline.

- Extinguish a fire with or without the use of water.

- Complete assigned tasks in a safe and efficient manner.

- Describe factors in a given wildfire environment that could impact safety.

III. COURSE SCHEDULE

This course is designed to be taught in 2-3 hour blocks of class time:

Class 1: Wildland and Environment – Units 0-3
Class 2: Wildland Weather Factors – Units 4-5
Class 3: Watchout Situations – Unit 6
Class 4: Risk Management – Units 7-8
Class 5: Situation Awareness – Unit 9
Class 6: Suppression – Units 10-11
Class 7: Mop Up, Hoses, and Transportation Safety – Units 12-14

IV. INSTRUCTOR PREREQUISITES

Refer to the Field Manager's Course Guide, PMS 901-1, for Instructor Prerequisites specific to this course. This guide is available on the NWCG Web site at http://www.nwcg.gov/pms/training/training/htm.

It's recommended that a meteorologist instruct the weather sections of this class. All instructors should have successfully completed NWCG's Facilitative Instructor, M-410, or an equivalent instructor training course (reference: Course Coordinator's Guide, PMS 907, only available online).

V. INSTRUCTOR PREPARATION

All instructors must be available for the entire training period. The ideal situation for presentation of this course is to have at least two qualified instructors.

VI. COURSE MATERIALS

A. Instructor Materials

The Instructor Guide contains all the information for the instructors. (See Appendix A for ordering information.) The course is designed to be interactive and allows instructors latitude in the choice of instructional devices.

Notes to the instructors to assist with teaching technique are presented in **BOLD CAPS** in the lesson plan. The Aids & Cues column lists references to remind instructors to display or refer to specific materials, such as the Student Workbook or PowerPoint presentation slides.

The codes used in Aids & Cues are:

IG – Instructor Guide
SW – Student Workbook
HO – Handout
IR – Instructor Reference
SR – Student Reference
PPT – PowerPoint Presentation

B. Student Materials

Student Workbooks should be printed prior to the beginning of the course, one for each student. An electronic version of the Student Workbook is located on the G-130 Course Materials CD-ROM.

VII. STUDENT TARGET GROUP

This course is the first gap course for structural firefighters who meet NFPA 1001 or equivalency. Students who complete Wildland Training (FFT2) for Structural Firefighters, G-130, can apply to their AHJ for NWCG certification as a Firefighter Type 2.

VIII. STUDENT PREREQUISTES

Structural firefighters who meet NFPA 1001 for Firefighter Type 1 or equivalency.

IX. COURSE SELECTION LETTER

See the Course Coordinator's Guide, PMS 907, only available online, for information on selection letters at http://www.nwcg.gov/pms/training/PMS907.pdf

X. MEASURING STUDENT PERFORMANCE

Students must achieve 70 percent or higher on the final exam to receive a certificate of completion for this course. The final exam is the exam for the NWCG position of FFT2. Experienced structural firefighters are expected to have the knowledge for subjects included in the exam that may not be included in this gap course. (See Appendix C for the final exam and answer key.)

XI. COURSE EVALUATIONS

A. Student Final Course Evaluation

The final course evaluation is an opportunity for students to comment on the course and the instructors for the purpose of improving future training sessions. These evaluations are NOT to be forwarded to NIFC.

B. Training Course Evaluation

Comments are to be made on this form by the course coordinator and/or lead instructor and submitted to:

National Interagency Fire Center
Fire Training - Standards Unit
3833 South Development Avenue
Boise, Idaho 83705-5354
or via email: nwcg_standards@nifc.blm.gov

(See Appendix D for the course evaluation forms.)

XII. RECOMMENDED CLASS SIZE

In order to facilitate exercises and discussion, instructors should maintain a 6:1 ratio of students to instructors/coaches. This is to enable strong mentorship to the students. Ideally, class size should be limited to 24 students.

XIII. SPACE AND CLASSROOM REQUIREMENTS

The classroom should be a modern facility, fully accessible, and seat up to 30 people. It should have appropriate logistical support items including a computer with projector, projection screen, and adjustable lighting.

XIII. APPENDICES

The following appendices are located on the G-130 Course CD-ROM:

A. Appendix A – Course Ordering and Support Information. This appendix identifies where to order the items necessary the course.

B. Appendix B – PowerPoint Presentations

C. Appendix C – Final Exam and Answer Key

D. Appendix D – Course Evaluations

The final exam and evaluation forms will need to be duplicated.

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 0 – Introduction

Time 15 Minutes

Objectives

1. Introduce the instructors and students.
2. Discuss administrative concerns.
3. Introduce the course and course materials.
4. Present the course objectives.
5. Explain the evaluation process.
6. Describe the Wildland Training for Structural Firefighters gap courses.

Strategy

The instructor will introduce the gap course, the materials to be used and the course objectives. The instructor will also explain how the course fits into the NWCG Wildland Training for Structural Firefighters curricula and the other gap courses.

Instructional Method(s)

- Informative lecture/discussion

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software

Exercise(s)

- No exercises

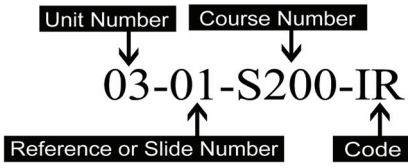
Evaluation Method(s)

- Student's performance will not be evaluated in this unit.

Outline

I. Introductions
II. Administrative Concerns
III. Course Overview
IV. Overview of the Wildland Training for Structural Firefighters Gap Courses

Aids and Cues Codes



The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	IR – Instructor Reference
SW – Student Workbook	SR – Student Reference
HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 0 – Introduction

OUTLINE	AIDS & CUES
MISSION STATEMENT SLIDE.	00-01-G130-PPT
UNIT TITLE SLIDE.	00-02-G130-PPT
WELCOME STUDENTS TO THE G-130 TRAINING COURSE.	
I. INTRODUCE INSTRUCTORS AND STUDENTS	00-03-G130-PPT
FOR INTRODUCTIONS, USE ANY METHOD DESIRED.	
II. ADMINISTRATIVE CONCERNS	
DISCUSS AS APPROPRIATE:	
• Facility logistics	
• Restrooms	
• Smoking policy	
• Phone messages	
• Cell phone use	
• Breaks	

OUTLINE	AIDS & CUES
EMPHASIZE PUNCTUALITY WHEN STARTING CLASS EACH MORNING AND RETURNING FROM BREAKS.	
• Agenda	
INSTRUCTOR MAY REFERENCE THE AGENDA PREPARED BY THE COURSE COORDINATOR. REVIEW COURSE TIMEFRAMES, LESSON PLAN LENGTHS, ETC., WITH STUDENTS.	
III. COURSE OVERVIEW	00-04-G130-PPT
This course is designed to provide basic wildland firefighting skills to structural firefights who meet NFPA 1001 for Firefighter Type 1 or equivalency.	
TO EMPHASIZE THE DANGEROUS NATURE OF FIRE BEHAVIOR, DISCUSS ANY RECENT BURNOVERS, ENTRAPMENTS, AND FATALITIES THAT HAVE OCCURRED LOCALLY OR WITH WHICH STUDENTS MAY BE FAMILIAR.	
THE FOLLOWING WEB SITES HAVE INFORMATION THAT MAY BE USEFUL TO INSTRUCTORS:	
The NWCG Safety and Health Working Team's Entrapment and Fatalities Web site: **http://www.nwcg.gov/teams/shwt/safetygram2.htm**	
The reference materials Web site: http://www.nwcg.gov/teams/shwt/pubs2.htm	

OUTLINE	AIDS & CUES
A. Course Objectives	00-05-G130-PPT
• Identify the environmental factors of fuels, weather, and topography that affect the start and spread of wildland fire.	
• Describe the contributing factors that indicate the potential for increased fire behavior that may compromise safety.	
• Explain the LCES (Lookouts, Communications, Escape Routes, and Safety Zones) system and how it relates to the Standard Firefighting Orders.	
• Construct fireline to required standards using various methods.	00-06-G130-PPT
• Strengthen, reinforce, and use holding actions on a fireline.	
• Extinguish a fire with or without the use of water.	
• Complete assigned tasks in a safe and efficient manner.	
• Describe factors in a given wildfire environment that which could impact safety.	

OUTLINE	AIDS & CUES
B. Course Agenda	00-07-G130-PPT
REVIEW COURSE AGENDA.	
• Class 1 – Wildland and Environment	
• Class 2 – Wildland Weather Factors	
• Class 3 – Watchout Situations	
• Class 4 – Risk Management	
• Class 5 – Situation Awareness	
• Class 6 – Suppression & Firing Devices	
• Class 7 – Mop Up, Hoses, and Transportation Safety	
C. Instructional Methods	
• Facilitation/short lecture with PowerPoint slides	
• Discussions	
• Exercises/Scenarios	
• Review Questions	
D. Measuring Student Performance	00-08-G130-PPT
• There is a final exam for this course.	
• Students must achieve 70 percent or higher to obtain certificates for successfully completing the course.	

OUTLINE	AIDS & CUES
E. Course Evaluation Forms	
TELL STUDENTS THEY WILL HAVE THE OPPORTUNITY TO EVALUATE THE COURSE AND INSTRUCTION. DISTRIBUTE FORMS NOW OR WAIT TILL END OF COURSE.	
IV. OVERVIEW OF THE WILDLAND TRAINING FOR STRUCTURAL FIREFIGTERS GAP COURSES	00-09-G130-PPT
A. Wildfire Training (FFT2) for Structural Firefighters, G-130 This course is designed to provide basic wildland firefighting skills to structural firefighters who meet NFPA 1001 for Firefighter Type 1 or equivalency. The successful completion of the final exam for this course allows the structural firefighter to apply to the appropriate AHJ for NWCG certification as Firefighter Type 2.	
B. Wildfire Training (FFT1) for Structural Firefighters, G-131 This course is designed to provide advanced wildland firefighting skills to structural firefighters who meet NFPA 1001 for Firefighter Type 2 or equivalency. Completion of the Task Book for NWCG Firefighter Type 1 allows the structural firefighter to apply to the appropriate AHJ for that credential.	

OUTLINE	AIDS & CUES
C. Wildfire Training (ENGB) for Structural Firefighters, G-231 This course is designed to provide wildland firefighting skills to structural firefighter drivers, operators, engineers or company officers who meet NFPA 1021 for Fire Officer Type 1 or equivalency. Completion of the Task Book for NWCG Single Resource Boss (Engine) allows the structural firefighter to apply to the appropriate AHJ for that credential.	
D. Wildfire Training (STEN) for Structural Firefighters, G-330 This course is designed to provide wildland firefighting skills to experienced lieutenants, captains, or chief officers who meet NFPA 1021 for Fire Officer Type 1 or equivalency. Completion of the Task Book for NWCG Strike Team Leader allows the structural firefighter to apply to the appropriate AHJ for that credential.	
Each of the gap courses builds upon the previous course. Successful completion of each course qualifies the learner to take the next course.	
ANY QUESTIONS?	00-10-G130-PPT

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 1 – Basic Concepts of Wildland Fire

Time 1 Hour

Objectives

1. Define basic terminology used in wildland fire.
2. Identify the elements of the fire triangle.
3. Describe three methods of heat transfer.

Strategy

This unit addresses the need for structural firefighters to know basic terminology of wildland fires. This is a gap in skill identified by the *Skills Crosswalk*.

Structural firefighters should already be familiar with the fire triangle and methods of heat transfer. Extend student understanding of the fire triangle by placing it in the wildland context. Discuss the wildland fire triangle of topography, fuel, and weather.

Instructional Method(s)

- Informative lecture/discussion

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software

Exercise(s)

- Open book review exercise

Evaluation Method(s)

- Student's performance will not be evaluated in this unit.

Outline

I. Basic Terminology Used in Wildland Fire

II. Elements of the Fire Triangle

III. Three Methods of Heat Transfer

Aids and Cues Codes

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide
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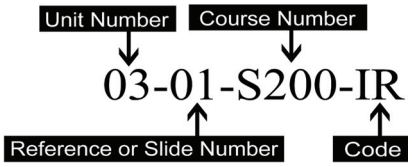
PPT – PowerPoint



UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 1 – Basic Concepts of Wildland Fire

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	01-01-G130-PPT
PRESENT UNIT OBJECTIVES.	01-02-G130-PPT
I. BASIC TERMINOLOGY USED IN WILDLAND FIRE	
A. Parts of the Fire	01-03-G130-PPT
REFER STUDENTS TO THE PARTS OF THE FIRE DIAGRAM. HAVE THEM WRITE IN THE PARTS AS THEY ARE DISCUSSED.	SW p. 1.5
1. Point of origin The precise location where a competent ignition source came into contact with the material first ignited and sustained combustion occurred.	01-04-G130-PPT
2. Head of a fire The side of the fire having the fastest rate of spread.	01-05-G130-PPT
3. Flank of a fire The part of a fire's perimeter that is roughly parallel to the main direction of spread.	01-06-G130-PPT

OUTLINE	AIDS & CUES
4. Rear of a fire • That portion of a fire spreading directly into the wind or down slope. • That portion of a fire edge opposite the head. • Slowest spreading portion of a fire edge. Also called heel of a fire.	01-07-G130-PPT
5. Fire perimeter The entire outer edge or boundary of a fire.	01-08-G130-PPT
6. Fingers of a fire The long narrow extensions of a fire projecting from the main body.	01-09-G130-PPT
7. Pockets of a fire Unburned indentations in the fire edge formed by fingers or slow burning areas.	01-10-G130-PPT
8. Island Area of unburned fuel inside the fire perimeter.	01-11-G130-PPT
9. Spot fire Fire ignited outside the perimeter of the main fire by a firebrand.	01-12-G130-PPT

OUTLINE	AIDS & CUES
DISCUSS SLIDE 13 AND 14 WITH STUDENTS.	01-13-G130-PPT 01-14-G130-PPT
B. Fire Behavior Terms	01-15-G130-PPT
1. Smoldering	01-16-G130-PPT
Fire burning without flame and barely spreading.	
2. Creeping fire	01-17-G130-PPT
Fire burning with a low flame and spreading slowly.	
3. Running fire	01-18-G130-PPT
Behavior of a fire spreading rapidly with a well defined head.	
4. Spotting	01-19-G130-PPT
Behavior of a fire producing sparks or embers that are carried by the wind and which start new fires beyond the zone of direct ignition by the main fire.	
5. Torching	01-20-G130-PPT
The burning of the foliage of a single tree or a small group of trees, from the bottom up.	

OUTLINE	AIDS & CUES
6. Crown fire A fire that advances from top to top of trees or shrubs more or less independent of a surface fire. Crown fires are sometimes classed as running or dependent to distinguish the degree of independence from the surface fire.	01-21-G130-PPT
7. Flare up Any sudden acceleration in the rate of spread or intensification of the fire. Unlike blowup, a flare-up is of relativity short duration and does not change existing control plans.	01-22-G130-PPT
8. Fire whirl Spinning vortex column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris, and flame. Fire whirls range in size from less than one foot to over 500 feet in diameter. Large fire whirls have the intensity of a small tornado.	01-23-G130-PPT
9. Backing fire That portion of the fire with slower rates of fire spread and lower intensity, normally moving into the wind and/or down slope. Also called heel fire.	

OUTLINE	AIDS & CUES
10. Flaming front That zone of a moving fire where the combustion is primarily flaming. Behind this flaming zone, combustion is primarily glowing or involves the burning out of larger fuels (greater than about 3 inches in diameter). Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front.	
DISCUSS SLIDES 24 AND 25 WITH STUDENTS.	01-24-G130-PPT 01-25-G130-PPT
C. Other Useful Firefighting Terms	01-26-G130-PPT
1. Anchor point An advantageous location, usually a barrier to fire spread, from which to start constructing a fireline. The anchor point is used to minimize the chance of being flanked by the fire while the line is being constructed.	
2. Control line An inclusive term for all constructed or natural barriers and treated fire edges used to contain a fire.	

OUTLINE	AIDS & CUES
3. Fireline The part of a containment or control line that is scraped or dug to mineral soil. 4. Mop up Extinguishing or removing burning material near control lines, felling snags, and trenching logs to prevent rolling after an area has burned, to make a fire safe, or to reduce residual smoke. 5. Contained The status of a wildfire suppression action signifying that a control line, which can reasonably be expected to stop the fire's spread, has been completed around the fire and any associated spot fires. 6. Controlled The completion of control line around a fire, any spot fires, and any interior islands to be saved. Burn out any unburned area adjacent to the fire side of the control lines. Cool down all hot spots that are immediate threats to the control line, until the lines can reasonably be expected to hold under the foreseeable conditions.	

OUTLINE	AIDS & CUES
7. Chain Unit of measure in land survey, equal to 66 feet (20 M) (80 chains equal 1 mile). Commonly used to report fire perimeters and other fireline distances. Popular in fire management because of its convenience in calculating acreage (example: 10 square chains equal one acre).	
II. ELEMENTS OF THE FIRE TRIANGLE	01-27-G130-PPT
Three elements must be present and combined before combustion can occur and continue. There must be: • Fuel to burn • Air to supply oxygen for the flame • Heat to start and continue the combustion process These three elements or sides compose what we call the "fire triangle." Remove any single one, and there can be no fire.	
DISCUSS SLIDE 28 WITH STUDENTS.	01-28-G130-PPT

OUTLINE	AIDS & CUES
III. THREE METHODS OF HEAT TRANSFER	01-29-G130-PPT
We have learned that heat is a necessary condition for combustion, and part of the fire triangle.	
There are many methods by which heat can be supplied to a fuel to start a fire. Examples include:	
• Matches	
• Lightning	
• Cigarettes	
More importantly, we must know how the fire spreads once it has started.	
Heat must be able to move from one burning piece to another, or the fire triangle will be broken. This movement is called heat transfer.	
Heat is transferred by three processes:	
• Radiation	
• Convection	
• Conduction	
A. Radiation	01-30-G130-PPT
Think of radiant heat as a ray or wave. Radiant heat warms you as you stand close to a campfire or stand in the sunlight.	
Radiant heat can dry surrounding fuels and sometimes ignite them.	

OUTLINE	AIDS & CUES
B. Convection	01-31-G130-PPT
Think of convection as a smoke column above the fire. Convection occurs when lighter warm air moves upward.	
The hot gases and embers that compose the smoke column can dry and ignite other fuels.	
C. Conduction	01-32-G130-PPT
Think of conduction as a spoon in a hot drink. Heat is conducted from one fuel particle to another in the same way, through direct contact.	
Since wood is a poor conductor (meaning heat will not travel through it easily), this process is the least important of the three to fire behavior.	
DISCUSS SLIDE 33 WITH STUDENTS.	01-33-G130-PPT

OUTLINE	AIDS & CUES
OPEN BOOK EXERCISE (ALLOW 5 MINUTES).	01-34-G130-PPT
1. What are the three methods of heat transfer? • **Radiation** • **Convection** • **Conduction**	
2. The fire triangle consists of oxygen, heat, and _____? • **Fuel**	
3. When is a fire controlled? • **The fire is controlled when it is expected to hold under foreseeable conditions.**	
4. Should you fight fire without an anchor point? • **No** Why? • **To reduce the chance of being outflanked by the fire while the line is being constructed.**	
REVIEW UNIT OBJECTIVES.	01-35-G130-PPT

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 2 – Principles of Wildland Fire Behavior: Topographic Influences

Time 30 minutes

Objectives

- List basic characteristics of topography and describe how they affect wildland behavior.

Strategy

This unit addresses the need for structural firefighters to know how topography affects fire spread. This is a gap in skill identified by the *Skills Crosswalk*.

Instructional Method(s)

- Informative lecture/discussion

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software

Exercise(s)

- No exercises

Evaluation Method(s)

- Student's performance will not be evaluated in this unit.

Outline

- Topography

Aids and Cues Codes

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide
SW – Student Workbook
HO – Handout
IR – Instructor Reference
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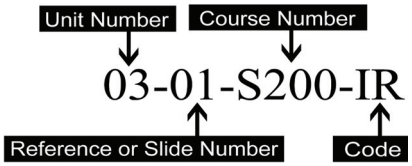
PPT – PowerPoint



UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 2 – Principles of Wildland Fire Behavior: Topographic Influences

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	02-01-G130-PPT
PRESENT UNIT OBJECTIVE.	02-02-G130-PPT
I. TOPOGRAPHY	
Topography is the configuration of the earth's surface including its relief and the position of its natural and man-made features.	
It is much easier to predict the influences that topography will have on a wildfire than the influences of fuel and weather.	
Following are topographic terms and how they affect wildland fire behavior.	
A. Aspect	02-03-G130-PPT
Aspect is the direction a slope is facing (its exposure in relation to the sun).	
The aspect of a slope generally determines the amount of heating it gets from the sun. It, therefore, determines the amount, condition, and type of fuels present.	

OUTLINE	AIDS & CUES
1. South and southwest slopes are normally more exposed to sunlight and generally have: • Lighter and sparser fuels • Higher temperatures • Lower humidity • Lower fuel moisture They are the most critical in terms of start and spread of wildland fires.	
2. North facing slopes have more shade, which causes: • Heavier fuels • Lower temperatures • Higher humidity • Higher fuel moistures A north facing aspect will have less fire activity than a south facing slope.	
DISCUSS SLIDES 4 AND 5 WITH STUDENTS. THE CORRECT ANSWER TO THE QUESTION ON SLIDE 5 IS "A."	02-04-G130-PPT 02-05-G130-PPT

OUTLINE	AIDS & CUES
B. Slope The amount or degree of incline of a hillside (a steep slope). Fires burn more rapidly uphill than downhill. The steeper the slope, the faster the fire burns. This is because the fuels above the fire are brought into closer contact with the upward moving flames. Convection and radiant heat help the fuel catch fire more easily. Another concern about steep slopes is the possibility of burning material rolling down the hill and igniting fuel below the main fire. The position of the fire in relation to the topography is a major factor in the resulting fire behavior. A fire on level ground is primarily influenced by fuels and wind. A fire that starts near the bottom of a slope, during normal upslope daytime wind conditions, will normally spread faster and has more area to spread upslope than a fire that starts near the top of the slope.	02-06-G130-PPT

OUTLINE	AIDS & CUES
C. Shape of the Country – Terrain	02-07-G130-PPT
Certain topographic features can influence the wind speed and direction for small areas, independent of general weather conditions for an area.	
The shape of the country can also influence the direction of fire spread, rate of spread, and the intensity.	
D. Box Canyons	02-08-G130-PPT
Fires starting near the base of box canyons and narrow canyons may react similar to a fire in a wood burning stove or fireplace.	
Air will be drawn in from the canyon bottom creating very strong upslope drafts. These upslope drafts create rapid fire spread up the canyon, also referred to as the chimney effect.	
This effect can result in extreme fire behavior and can be very dangerous.	
THE CHIMNEY EFFECT WILL BE DISCUSSED IN UNIT 5.	
E. Narrow Canyons	02-09-G130-PPT
Fire in a steep narrow canyon can easily spread to fuels on the opposite side by radiation and spotting.	
Wind eddies and strong upslope air movement may be expected at sharp bends in canyon.	

OUTLINE	AIDS & CUES
F. Wide Canyons Prevailing wind direction can be altered by the direction of the canyon. Cross-canyon spotting of fires is not common except in high winds. Strong differences in fire behavior will occur on north and south facing aspects.	02-10-G130-PPT
G. Ridges Fire burning along lateral ridges may change direction when they reach a point where the ridge drops off into a canyon. This change of direction is caused by the flow of air in the canyon.	02-11-G130-PPT
H. Saddle Wind blowing through a saddle or pass in a mountain range can increase in speed as it passes through the constricted area and spreads out on the downwind side with possible eddy action.	02-12-G130-PPT
I. Elevation The height of the terrain above mean sea level, usually expressed in feet (ASL - Above Sea Level). Elevation plays a large role in determining the conditions and amount of fuel.	02-13-G130-PPT

OUTLINE	AIDS & CUES
Because of higher temperatures, fuels at lower elevations dry out earlier in the year than those at higher elevations. In extremely high elevations, there may be no fuel. Elevation affects fire behavior in several other ways like the amount of precipitation received, wind exposure, and its relationship to the surrounding terrain.	
J. Barriers	02-14-G130-PPT
Any obstruction to the spread of fire, typically an area or strip lacking any flammable fuel. Barriers to fire include many things, both natural and man-made. 1. Natural barriers: • Rivers • Lakes • Rock • Slides Fuels which have high moisture content do not burn as well as others in the same area.	

OUTLINE	AIDS & CUES
2. Man-made barriers: • Roads • Highways • Reservoirs • Fireline constructed by fire resources	

OUTLINE	AIDS & CUES
OPEN BOOK EXERCISE (ALLOW 5 MINUTES).	02-15-G130-PPT
1. A barrier is: • **Any obstruction to the spread of fire, typically an area or strip lacking any flammable fuel.**	
2. Under normal conditions, a north facing aspect will have more fire activity than a south facing aspect. a. True **b. False**	
3. A box canyon is dangerous because: • **Upslope drafts create rapid fire spread up the canyon.**	
REVIEW UNIT OBJECTIVE.	02-16-G130-PPT

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 3 – Principles of Wildland Fire Behavior: Fuels

Time 1 hour

Objectives

1. Identify the basic fuel types.
2. Identify the fuel characteristics that influence the behavior of the fire.

Strategy

This unit addresses the need for structural firefighters to understand wildland fuels; specifically knowledge about how wildland fuel size and fuel arrangements affect wildland fire. This is a gap in skill identified by the *Skills Crosswalk*.

Instructional Method(s)

- Informative lecture/discussion

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software

Exercise(s)

- ☐ Small group exercise on local fuels
- ☐ Identification of fuel types

Evaluation Method(s)

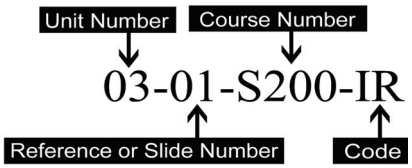
- Student's performance will not be evaluated in this unit.

Outline

I. The Six Basic Fuel Types

II. Fuel Characteristics That Influence the Behavior of the Fire

Aids and Cues Codes



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HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 3 – Principles of Wildland Fire Behavior: Fuels

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	03-01-G130-PPT
PRESENT UNIT OBJECTIVES.	03-02-G130-PPT
I. THE SIX BASIC FUEL TYPES	03-03-G130-PPT
A. Definition of Fuel	
A simple definition of fuel is any burnable material.	
• Wildland fuels are basically live and/or dead plant material	
• Houses, sheds, etc., can also be fuels	
Fuels are the source of energy that drives the fire.	
Regardless of the area of the country, fire behavior is dependent on certain fuel characteristics:	03-04-G130-PPT
• Fuel type	
• Fuel loading	
• Fuel availability	

OUTLINE	AIDS & CUES
B. Fuel Types	
Wildland fuels are grouped into fuel types based on the primary fuel that carries the fire.	
There are six major fuel types:	
• Grass	03-05-G130-PPT
• Grass – Shrub	
• Shrub	03-06-G130-PPT
• Timber – Understory	
• Timber litter	03-07-G130-PPT
• Slash – Blowdown	
Fuels vary in type from one area of the country to another and within the same area.	
Differences in the amount of water in the soil is one reason that types of fuels vary, and elevation changes is another.	
SLIDE 8 IS HYPERLINKED TO SLIDES 9-12, GRASS EXAMPLES. CLICK ON ONE OF THE FOUR DIFFERENT REGIONS FOR AN EXAMPLE OF FUEL TYPE IN THAT REGION.	03-08-G130-PPT thru 03-12-G130-PPT

OUTLINE	AIDS & CUES
1. Grass • Found in most areas • More dominant as a fuel in desert and range areas • Can become prevalent after a fire in timber areas • Burns hottest and fastest	
SLIDE 13 IS HYPERLINKED TO SLIDES 14-17, GRASS-SHRUB EXAMPLES. CLICK ON ONE OF THE FOUR DIFFERENT REGIONS FOR AN EXAMPLE OF FUEL TYPE IN THAT REGION.	03-13-G130-PPT thru 03-17-G130-PPT
2. Grass – Shrub • Found in the plains regions and high deserts • A significant contributor to fire spread due to the fine fuels mixed with the aerial/shrub fuel	
SLIDE 18 IS HYPERLINKED TO SLIDES 19-22, SHRUB EXAMPLES. CLICK ON ONE OF THE FOUR DIFFERENT REGIONS FOR AN EXAMPLE OF FUEL TYPE IN THAT REGION.	03-18-G130-PPT thru 03-22-G130-PPT
3. Shrub • Found throughout most areas	

OUTLINE	AIDS & CUES
• Some highly flammable shrub fuels are: – Palmetto/gallberry in the southeast – Sagebrush in the Great Basin – Chaparral in the southwest and California	
SLIDE 23 IS HYPERLINKED TO SLIDES 24-27, TIMBER EXAMPLES. CLICK ON ONE OF THE FOUR DIFFERENT REGIONS FOR AN EXAMPLE OF FUEL TYPE IN THAT REGION.	03-23-G130-PPT thru 03-27-G130-PPT
4. Timber – Understory • Found throughout most areas • Provides ladder to aerial crown fuels	
SLIDE 28 IS HYPERLINKED TO SLIDES 29-32, TIMBER LITTER EXAMPLES. CLICK ON ONE OF THE FOUR DIFFERENT REGIONS FOR AN EXAMPLE OF FUEL TYPE IN THAT REGION. DISCUSS SLIDE 28 WITH STUDENTS.	03-28-G130-PPT thru 03-32-G130-PPT
5. Timber litter • Most dominant in mountainous topography, especially in the Northwest. • Provides fuel for ground fire	

OUTLINE	AIDS & CUES
SLIDE 33 IS HYPERLINKED TO SLIDES 34-37, SLASH-BLOWDOWN EXAMPLES. CLICK ON ONE OF THE FOUR DIFFERENT REGIONS FOR AN EXAMPLE OF FUEL TYPE IN THAT REGION.	03-33-G130-PPT thru 03-37-G130-PPT
6. Slash – Blowdown	
• Debris left after natural events or human activities:	
– Logging – Road building – Pruning – Thinning – Shrub cutting – Wind – Fire – Snow	
• Debris may include:	
– Logs – Chunks of wood – Bark – Branches – Stumps – Broken understory trees – Shrubs	
• Provides fuel for fire spread	

OUTLINE	AIDS & CUES
EXERCISE 1. Divide students into six groups; assign each group a fuel type. Example: Group 1: Grass Group 2: Grass – Shrub Group 3: Shrub Group 4: Timber litter Group 5: Timber – Understory Group 6: Slash – Blowdown	
For larger classes, more groups may be required; assign fuel types accordingly. For each assigned fuel type, students are to record their answers to the following questions on a flip chart.	03-38-G130-PPT
1. List examples, near your area, where this fuel type occurs. 2. Why is this fuel type a possible concern to firefighters? Allow 10 minutes. Discuss each group's answers with the class (or choose 1 or 2 groups).	

OUTLINE	AIDS & CUES
II. FUEL CHARACTERISTICS THAT INFLUENCE THE BEHAVIOR OF THE FIRE	03-39-G130-PPT
A. Fuel Type *(this was described in the prior section)*	
B. Fuel Loading	03-40-G130-PPT
The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area (tons per acre).	
This may be available fuel (consumable fuel) or total fuel, and is usually dry weight.	
The loading of the fuels in any given area does not necessarily mean the fire will burn with great intensity.	
What is more important is the quantity of fuels available for combustion.	
C. Fuel Availability (for combustion)	03-41-G130-PPT
Many factors are involved when talking about the availability of a fuel for combustion.	
1. Fuel size classes and shape	03-42-G130-PPT
The physical characteristics of fuels, divided into four categories on the basis of their size:	03-43-G130-PPT
a. 1-hour fuels: 0 – 1/4 inch in diameter	
b. 10-hour fuels: 1/4 – 1 inch in diameter	

OUTLINE	AIDS & CUES
c. 100-hour fuels: 1 – 3 inches in diameter	
d. 1000-hour fuels: 3 – 8 inches in diameter	
We will discuss why these size classes are named the way they are in the Fuel Moisture portion of this unit.	
2. Surface area-to-volume ratio	03-44-G130-PPT
• Relates to the amount of the outer surface of the fuel that is exposed to the air.	
• The more surface exposed, the more easily the fuel will dry and burn.	03-45-G130-PPT
• Smaller (fine) fuels have a higher surface area to volume ratio than larger (heavy) fuels.	
DISCUSS SLIDE 46 WITH CLASS.	03-46-G130-PPT
An example to illustrate surface area-to-volume ratio concepts is the process of building a campfire:	
• Start with small fuels (such as dry grass, pine needles, and small twigs), then add larger fuels (such as larger twigs and sticks), and finally add the largest fuel – the logs.	

OUTLINE	AIDS & CUES
The smaller fuels (grass, needles, etc.) have a larger surface area-to-volume ratio than the logs, and therefore ignite more readily than the logs.	
D. Fuel Arrangement	03-47-G130-PPT
The manner in which fuels are spread over a certain area.	
1. Horizontal continuity	
Horizontal continuity affects fire's rate of spread.	
a. Uniform fuels	03-48-G130-PPT
Include all fuels distributed continuously over the area.	
Areas containing a network of fuels which connect with each other to provide a continuous path for a fire to spread are included in this category.	
SLIDE 49 IS HYPERLINKED TO SLIDES 50 THROUGH 53, UNIFORM FUELS EXAMPLES. CLICK ON ONE OF THE FOUR DIFFERENT REGIONS FOR AN EXAMPLE OF FUEL TYPE FOR THAT REGION.	03-49-G130-PPT thru 03-53-G130-PPT

OUTLINE	AIDS & CUES
b. Patchy fuels	03-54-G130-PPT
Include all fuels distributed unevenly over the area, or areas of fuel with definite breaks or barriers present	
Examples:	
• Patches of rock outcroppings	
• Bare ground	
• Areas where another dominant type of fuel is much less flammable	
SLIDE 55 IS HYPERLINKED TO SLIDES 56 THROUGH 59, HORIZONTAL CONTINUITY EXAMPLES. CLICK ON ONE OF THE FOUR DIFFERENT REGIONS FOR AN EXAMPLE OF FUEL TYPE FOR THAT REGION.	03-55-G130-PPT thru 03-59-G130-PPT
2. Vertical arrangement	03-60-G130-PPT
a. Ground fuels	03-61-G130-PPT
All combustible materials lying beneath the surface:	
• Deep duff	
• Tree roots	
• Rotten buried logs	
• Other organic material	

OUTLINE	AIDS & CUES
Ground fire consumes the organic and combustible materials beneath the surface, such as a smoldering duff or peat fire.	
b. Surface fuels	03-62-G130-PPT
All combustible materials lying on or immediately above the ground: • Needles or leaves • Duff • Grass • Small dead wood • Downed logs • Stumps • Large limbs • Low shrubs Surface fire burns surface litter, debris, small shrubs, and other vegetation.	
c. Ladder fuels	03-63-G130-PPT
Combustible materials that aid the spread of fire from the surface to the upper canopy.	

OUTLINE	AIDS & CUES
Ladder fuels can include surface litter, shrubs, and other moderate height vegetation that provides a pathway from the surface to the canopy.	
d. Aerial fuels	03-64-G130-PPT
All green and dead materials located in the upper canopy: • Tree branches and crowns • Snags • Hanging moss • Tall shrubs Crown fire burns through the tops of trees or shrubs, and can advance in conjunction with or be independent of the surface fire.	
SHOW SLIDE 65 AND ASK STUDENTS "WHAT IS THE HORIZONTAL CONTINUITY AND VERTICAL ARRANGEMENT IN THIS PICTURE?" THE VERTICAL ARRANGEMENT RANGES FROM GROUND FUELS TO AERIAL FUELS.	03-65-G130-PPT
3. Fuel moisture	03-66-G130-PPT
The amount of water in a fuel, expressed as a percentage of the oven-dry weight of that fuel.	
• Fuel moisture is expressed as a percent of total weight.	03-67-G130-PPT

OUTLINE	AIDS & CUES
• How well a fuel will ignite and burn is dependent, to a large extent, on its moisture content.	
• Dry fuels will ignite and burn much more easily than the same fuels when they are wet.	
– You don't use wet wood to make a campfire!	
• Before a wet fuel can burn, the moisture it contains must evaporate.	
– This process requires more heat. As fuel moisture increases, the amount of heat required to ignite and burn that fuel also increases.	
• Because of their various sizes and characteristics, different fuels in the same area will have various moisture levels.	03-68-G130-PPT
• Likewise, a similar type of fuel across a broad area will have different moisture levels based on the amount of precipitation received and period of warm, dry weather.	
Remember, light (small) fuels take on and lose moisture faster than heavier (larger) fuels.	

OUTLINE	AIDS & CUES
4. Wet fuels Fuels that have a high moisture content because of exposure to precipitation or high relative humidity.	03-69-G130-PPT
5. Dry fuels Fuels that have low moisture content because of prolonged exposure to sunshine, dry winds, drought, or low relative humidity.	
6. Timelag The rate at which dead fuel gains or loses moisture. Time needed under specified conditions for a fuel particle to lose about 63 percent of the difference between its initial moisture content and its equilibrium moisture content. If conditions remain unchanged, a fuel will reach 95 percent of its equilibrium moisture content after four timelag periods. Firefighters use a concept of "timelag" to identify the different sizes of dead fuels as they relate to increasing moisture or drying-out over time. Smaller fuels can dry out in an hour, larger fuels may take 10 to a 1,000 hours to dry.	03-70-G130-PPT

OUTLINE	AIDS & CUES
One-hour timelag fuels react to changes in relative humidity much faster than 100-hour timelag fuels.	
The timelag categories are:	03-71-G130-PPT
1-hour 0 -1/4 inch in diameter 10-hour 1/4 -1 inch in diameter 100-hour 1 -3 inches in diameter 1000-hour 3 -8 inches in diameter	
SHOW SLIDE 72 AND ASK STUDENTS "WHICH CATEGORY GAINS/LOSES MOISTURE FASTEST? WHY?"	03-72-G130-PPT
EXERCISE 2.	03-73-G130-PPT
There are two parts to this exercise. When students have completed both parts (approximately 15 minutes), review answers with class.	
Part 1	
Students are to view each photo on slides 74-77 and match it to the correct description. Leave each photo on the screen for 30 seconds; coach students to take notes.	03-74-G130-PPT thru 03-77-G130-PPT
Photo #1: B — A. These are patchy fuels. Photo #2: D — B. This is a large volume of fuel. Photo #3: A — C. These are 1-hour timelag fuels. Photo #4: C — D. This is a shrub fuel type.	
Review answers on slide 78.	03-78-G130-PPT

OUTLINE	AIDS & CUES
Part 2 Students are to match the definitions to the correct descriptions. Uniform Fuels C A. The amount of water in a fuel, expressed as a percentage of the oven-dry weight of that fuel. Ladder Fuels F B. Grasses, leaves, pine needles Fuel Timelag E C. Fuels distributed continuously over the area. Light Fuels B D. All combustible materials lying on or immediately above the ground. Fuel Moisture A E. The rate at which dead fuel gains or loses moisture. Surface Fuels D F. Combustible materials that aid the spread of fire from the surface to the upper canopy.	
REVIEW ANSWERS ON SLIDE 79.	03-79-G130-PPT
REVIEW UNIT OBJECTIVES.	03-80-G130-PPT

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 4 – Principles of Wildland Fire Behavior: Weather

Time 2 Hours

Objectives

1. Describe the effect temperature and relative humidity have on wildland fire behavior.
2. Describe the effect of precipitation on wildland fire behavior.
3. Describe the differences between a stable and unstable atmosphere.
4. Describe general and local winds.
5. Describe critical fire weather conditions.
6. List the different types of fire weather forecasts and outlooks available.

Strategy

This unit addresses the need for structural firefighters to be able to:

- Describe how wind affects fire spread.
- Give weather factors which affect fuel moisture.
- Identify principle environmental factors affecting fire behavior.

These are gaps in skill identified by the *Skills Crosswalk*.

This lesson has several PowerPoint slides that contain narrated videos. The instructor has the option of facilitating the lesson through lecture or showing the narrated videos when prompted in the outline. If the instructor does not want to show the narrated videos, use the hide slide option on the PowerPoint tool bar to hide the slide.

Instructional Method(s)

- Informative lecture/discussion

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software

Exercise(s)

- Exercise 1: Temperature and Relative Humidity
- Exercise 2: Atmospheric Stability
- Exercise 3: Winds
- Exercise 4: Critical Fire Weather
- Exercise 5: Types of Weather Products

Evaluation Method(s)

- Student's performance will not be evaluated in this unit.

Outline

I. Weather

II. The Effect Of Temperature and Relative Humidity on Wildland Fire Behavior

III. The Effect of Precipitation on Wildland Fire Behavior

IV. The Differences Between a Stable and Unstable Atmosphere

V. General and Local Winds

VI. Critical Fire Weather Conditions

VII. Different Types of Fire Weather Forecasts and Outlooks

Aids and Cues Codes

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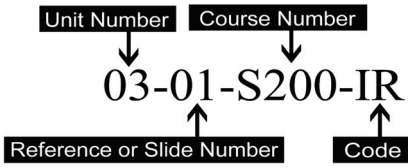


UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 4 – Principles of Wildland Fire Behavior: Weather

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	04-01-G130-PPT
PRESENT UNIT OBJECTIVES.	04-02-G130-PPT
SLIDE 3 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING WEATHER SECTION.	04-03-G130-PPT
I. WEATHER	
Short-term variations in the atmosphere are what we call weather. Weather is one of three components of the fire environment.	Begin video narration
Weather conditions can result in the ignition of fire by lightning from thunderstorms and the rapid spread of fires as a result of strong winds. On the other hand, an increase in humidity or precipitation can slow or extinguish fires.	
Of the three fire environment components, weather is the most variable over time, and at times, difficult to predict.	
Firefighters conducting fire suppression must monitor the weather at all times to make safe and effective firefighting decisions.	
The importance of monitoring weather and predicting the resultant fire behavior cannot be overstressed. It is one of the 10 Fire Orders and 3 of 18 Watchout Situations that all firefighters must obey.	

OUTLINE	AIDS & CUES
The risk involved in fire suppression can be reduced if firefighters and fire managers pay attention and understand weather conditions that impact fire behavior.	
The basic principles and concepts of fire weather as they relate to wildland fire behavior include:	
• Air Temperature and Relative Humidity (RH)	
• Precipitation	
• Atmospheric Stability	
• Wind	End of narration
II. THE EFFECT OF TEMPERATURE AND RELATIVE HUMIDITY ON WILDLAND FIRE BEHAVIOR	
A. Air Temperature	04-04-G130-PPT
Air temperature is the degree of hotness or coldness of the air.	
1. Air temperature varies with:	
• Time	
• Location	
• Height above the earth's surface	

OUTLINE	AIDS & CUES
2. Changes in air temperature near the surface of the earth are caused by: • Changing seasons • Alternations of night and day • Migrating weather systems 3. Seasonal and diurnal temperature changes can be large or small, depending on: • Latitude • Elevation • Topography • Proximity to the moderating influences of nearby oceans or lakes Abrupt changes in temperatures can occur when migrating weather systems transport colder or warmer air into a region. Heating of the earth's surface and the atmosphere is primarily a result of solar radiation from the sun. However, on a smaller scale, heat may be caused by a large fire. In the wildland fire environment, direct sunlight and hot temperatures can preheat fuels and bring them closer to their ignition point, whereas cooler temperatures have the opposite affect.	

OUTLINE	AIDS & CUES
Above average temperatures are common on large fires. Many firefighter fatalities have occurred on fires where record high temperatures were set.	
Temperature is measured with a thermometer calibrated either to the Fahrenheit scale or the Celsius scale.	04-05-G130-PPT
B. Relative Humidity	04-06-G130-PPT
Relative humidity is the amount of moisture in the air divided by the amount the air could hold when saturated at the same air temperature, usually expressed in percent.	
Relative humidity can range from 1 percent (very dry) to 100 percent (very moist). Low relative humidity is an indicator of high fire danger.	
Moisture in the atmosphere, whether in the form of water vapor, cloud droplets, or precipitation, is the primary weather element that affects fuel moisture content and the resulting flammability of wildland fuels.	
The amount of moisture that fuels can absorb from or release to the air depends largely on relative humidity.	
Light fuels, such as grass, gain and lose moisture quickly with changes in relative humidity.	
Heavy fuels respond to humidity changes much more slowly.	

OUTLINE	AIDS & CUES
Firefighters can usually see or feel most of the elements of weather such as: • Wind • Rain • Increasing temperatures Small changes in relative humidity that cannot be felt or seen can have a significant impact on wildland fire behavior. Relative humidity values for extreme wildland fire behavior vary over time and location, and are different for different fuels types. Fuels in the southeast part of the United States and Alaska typically burn with considerably higher levels of relative humidity than fuels in the western U.S. C. Temperature and Relative Humidity Relationships Temperature and relative humidity have an inverse relationship. • When temperature **increases**, relative humidity **decreases**. • When temperature **decreases**, relative humidity **increases**.	

OUTLINE	AIDS & CUES
SLIDE 7 SHOWS A TEMPERATURE/RELATIVE HUMIDITY GRAPH FOR A 24-HOUR PERIOD OF TIME (NOON, MIDNIGHT, AND NOON THE FOLLOWING DAY). THE RED LINE REPRESENTS TEMPERATURE AND THE GREEN LINE INDICATES RELATIVE HUMIDITY.	04-07-G130-PPT
In the early morning hours, temperature typically reaches its lowest point and relative humidity reaches its highest point. As the sun rises and the temperature increases, relative humidity decreases.	
When the temperature reaches its maximum for the day (usually mid to late afternoon) relative humidity decreases to a minimum. This is the time when fine fuel moisture reaches its minimum. As the sun sets the temperature drops and the relative humidity increases.	
There can be a large fluctuation of temperature and relative humidity in time and location. However, the majority of large fire outbreaks occur when air temperature is high and relative humidity is low.	04-08-G130-PPT
It is very important for firefighters to routinely monitor temperature and relative humidity trends. The most common field instrument used to measure and determine these two important weather elements is a sling psychrometer, which is part of the belt weather kit.	

OUTLINE	AIDS & CUES
Exercise 1. Temperature and Relative Humidity	04-09-G130-PPT

1. Temperature is:

   a. The degree of hotness or coldness of a substance.
   b. The amount of moisture in the air.
   c. The amount of moisture in the air divided by the amount the air could hold when saturated at the same air temperature.

2. Relative humidity is:

   a. The degree of hotness or coldness of a substance.
   b. The amount of moisture in the air divided by the amount the air could hold when saturated at the same air temperature.
   c. Expressed in degrees Fahrenheit.
   d. Expressed as a percentage.
   e. B and D

3. As temperature increases, relative humidity:

   a. Increases
   b. Decreases

OUTLINE	AIDS & CUES
III. THE EFFECT OF PRECIPITATION ON WILDLAND FIRE BEHAVIOR	
A. Precipitation	04-10-G130-PPT
Precipitation is liquid or solid water particles that originate in the atmosphere and become large enough to fall to the earth's surface.	
B. Precipitation Amount vs. Duration	04-11-G130-PPT
Fuel moisture is affected by the amount and also the duration of the precipitation.	
Fine fuels react quite rapidly by precipitation since they gain or lose moisture usually within one hour.	
Heavy fuels are not affected as drastically since they gain or lose moisture more slowly.	
A large amount of precipitation in a short time will not raise the fuel moisture as much as less rainfall over a longer period of time where the fuels can absorb more moisture before it runs off.	
IV. THE DIFFERENCES BETWEEN A STABLE AND UNSTABLE ATMOSPHERE	
SLIDE 12 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING ATMOSPHERIC STABILITY SECTION.	04-12-G130-PPT

OUTLINE	AIDS & CUES
A. Atmospheric Stability	
Wildfires are greatly affected by atmospheric motion and the properties of the atmosphere that affect its motion.	Begin video narration
Surface winds, temperature, and relative humidity are most commonly considered and easy to measure in the fire environment.	
Less obvious, but equally important, is atmospheric stability and related vertical air movements that influence wildfire.	
Atmospheric stability is the degree to which vertical motion in the atmosphere is enhanced or suppressed. Stability is directly related to the temperature distribution of the atmosphere.	
The temperature and stability of the atmosphere is constantly changing with variations over time (day-to-day or season-to-season), location, and from one layer of the atmosphere to the next.	End of narration
SLIDE 13 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING STABLE ATMOSPHERE SECTION.	04-13-G130-PPT
B. Stable Atmosphere	
A stable atmosphere is defined as an atmosphere that resists upward motion.	Begin video narration
In a stable atmosphere, the extensive heat of the fire generates vertical motion near the surface, but the vertical motion above the surface is weakened, thus limiting indrafts into the fire at low levels and fire intensity.	End of narration

OUTLINE	AIDS & CUES
C. Visual Indicators of a Stable Atmosphere	04-14-G130-PPT
In the fire environment, visual indicators can give clues about the stability of the atmosphere.	
Keeping in mind that stable air resists upward vertical motion, the following are visual indicators of a stable atmosphere:	
• Clouds in layers	04-15-G130-PPT thru 04-19-G130-PPT
• Stratus type clouds	
• Smoke column drifts apart after limited rise	
• Poor visibility due to smoke or haze	
• Fog layers	
• Steady winds	
SLIDE 20 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING INVERSIONS SECTION.	04-20-G130-PPT
D. Inversions	
The usual temperature structure of the lower atmosphere is characterized by a decrease in temperature with altitude.	Begin video narration
However, a layer where temperature increases with altitude (warm air over cold air) may exist. This layer is referred to as an inversion.	
Warm air ---------- = Inversion (stable condition) Cold air	

OUTLINE	AIDS & CUES
Under an inversion, fuel moisture content is usually higher, thus decreasing fire spread rates and intensities.	
Updrafts containing smoke and warm gases generated by a fire are typically weak and will only rise until their temperature equals that of the surrounding air. Once this occurs, the smoke flattens out and spreads horizontally.	End of narration
When inversions break or lift, as a result of heating the lower atmosphere by the sun or a fire, increased wildland fire behavior is almost certain.	
1. Watch for the following indicators when an inversion breaks:	
• Increase in temperature	
• Decrease in relative humidity	
• Increase and/or shift in wind	
2. There are four types of inversions that may be encountered in the wildland fire environment:	04-21-G130-PPT
• Nighttime (radiation)	
• Subsidence	
• Frontal	
• Marine	

OUTLINE	AIDS & CUES
Though all inversions are important, nighttime and subsidence inversions are most common in the wildland fire environment.	
SLIDE 22 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING NIGHTTIME INVERSIONS SECTION.	04-22-G130-PPT
E. Nighttime (Radiation) Inversions	
Air cooled at night, primarily by contact with cold surfaces, gradually deepens as the night progresses and forms a surface inversion.	Begin video narration
Inversions forming at night near the earth's surface are commonly referred to as a radiation or nighttime inversion.	End of narration
Nighttime inversions develop on calm, clear nights, when radiational cooling of the earth's surface is greatest, and can differ in strength depending on time of year.	
Inversions in the winter are typically stronger than inversions that develop in the summer.	
Nighttime inversions are easy to identify because they trap smoke and gases resulting in poor visibilities in valleys or drainages.	
F. Thermal Belts	04-23-G130-PPT
Nighttime inversions in mountainous regions increase in depth during the night. They form early in the evening at the canyon bottom or valley floor and at first are quite shallow.	

OUTLINE	AIDS & CUES
The cold layer gradually deepens, with the nighttime inversion coming in contact with and reaching farther up the slope below the main ridges. The warmest nighttime air temperatures in valleys are often found at the inversion top.	
The height of the warmest air temperature, at the top of the inversion, can be found by measuring temperature along the slope.	
From the top of the inversion, temperature decreases as one goes farther up or down the slope. This region of warmer air, typically found on the middle third of the slope, is called the THERMAL BELT.	
The thermal belt is characterized by the highest minimum temperature and the lowest nighttime relative humidity.	
Within the thermal belt, wildland fires can remain rather active throughout the night. Below the thermal belt, fires are in cool, humid, and stable air.	
SLIDE 24 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING SUBSIDENCE INVERSION SECTION.	04-24-G130-PPT
G. Subsidence Inversion	
Subsidence is the large-scale sinking of air associated with high pressure systems.	Begin video narration
As air from higher elevations in high pressure systems descends to lower elevations, it warms and dries.	

OUTLINE	AIDS & CUES
The warming and drying of air sinking is so pronounced that saturated air (air with 100 percent RH), can produce relative humidity less than 5 percent in a very short period of time.	End of narration
If a high pressure system persists for a period of days, the subsidence inversion may reach the surface with only very little external modification or addition of moisture.	04-25-G130-PPT
Skies are typically clear or cloudless under these high pressure systems, and extended periods of above average temperatures and below average relative humidity can dry out fuels to the point that burning conditions become severe.	
Subsidence is usually a contributor in the development of foehn winds.	
Foehn winds will be discussed in the wind section of this unit.	
H. Unstable Atmosphere	04-26-G130-PPT
An unstable atmosphere is defined as an atmosphere that encourages upward motion.	
When the atmosphere is unstable, vertical motions increase, contributing to increased fire activity by:	
• Allowing convection columns to reach greater heights, producing stronger indrafts and convective updrafts.	

OUTLINE	AIDS & CUES
• Increasing the lofting of firebrands by updrafts. • Increasing the occurrence of dust devils and fire whirls. • Increasing the potential for gusty surface winds. Wildland fires burn hotter and with more intensity when the air is unstable. Cold air over warm air represents an unstable condition. Cold air ---------- = Unstable condition Warm air	
I. Visual Indicators of an Unstable Atmosphere • Clouds grow vertically and smoke rises to great heights • Cumulus clouds • Good visibility • Gusty winds • Dust devils and fire whirls	04-27-G130-PPT thru 04-30-G130-PPT

OUTLINE	AIDS & CUES
Exercise 2. Atmospheric Stability	04-31-G130-PPT
1. A stable atmosphere:	
a. Encourages upward vertical motion	
b. Resists upward motion	
2. An unstable atmosphere:	
a. Encourages upward vertical motion	
b. Resists upward motion	
3. An inversion is:	
a. A layer of air where temperature increases with altitude	
b. A layer of air where temperature decreases with altitude	
c. A layer of air where there is no temperature change with altitude	
V. GENERAL AND LOCAL WINDS	
SLIDE 32 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING WIND AND WIND DIRECTION SECTION.	04-32-G130-PPT
A. Wind and Wind Direction	
Wind is the horizontal movement of air relative to the surface of the earth.	Begin video narration

OUTLINE	AIDS & CUES
Wind direction is the direction **from** which the wind is blowing (a north wind means the wind is blowing from the north).	
Wind is the most critical weather element affecting wildland fire behavior, the most difficult to predict, and the most variable in both time and location.	
This variability (especially in rough terrain) can pose safety and fire control problems, which can result in firefighter fatalities.	
Wind direction and wind speed must be constantly monitored by all firefighters.	End of narration
B. Characteristics of Wind and its Effect on Wildland Fire	
Wind effects the fire environment by:	04-33-G130-PPT
• Increasing the supply of oxygen to the fire.	
• Determining the direction of fire spread.	
• Increasing the drying of the fuels.	
• Carrying sparks and firebrands ahead of the main fire causing new spot fires.	
• Bending flames results in the preheating of fuels ahead of the fire.	

OUTLINE	AIDS & CUES
• Influencing the amount of fuel consumed by affecting the residence time of the flaming front of the fire. The stronger the wind, the shorter the residence time and the less fuel is consumed.	
C. Wind Systems	
SLIDE 34 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING GENERAL WIND SECTION.	04-34-G130-PPT
1. General wind	
General winds are large scale upper level winds caused by high and low pressure systems.	Begin video narration
If strong enough, these winds can influence wildland fire behavior, but are generally modified in the lower atmosphere by terrain.	End of narration
SLIDE 35 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING LOCAL WIND SECTION.	04-35-G130-PPT
2. Local wind	
Local winds are found at lower levels of the atmosphere.	Begin video narration
Local winds are induced by small-scale (local) differences in air temperature and pressure, and are best developed when skies are clear and general winds are weak.	

OUTLINE	AIDS & CUES
Terrain also has a very strong influence on local winds; the more varied the terrain, the greater the influence.	End of narration
Local winds can be as important to wildland fire behavior as the winds produced by the large-scale pressure patterns.	
In many areas, especially in rough terrain or near large bodies of water, local winds can be the prevailing daily winds.	
The different types of local winds include:	
a. Slope winds	04-36-G130-PPT
Slope winds are local winds that develop in mountainous terrain where the differences in heating and cooling occur.	
During the day, the typical local wind pattern is upslope and downslope during the night. There will be cases where this rule does not apply.	
Local personnel are usually aware of prevailing wind conditions.	
(1) Upslope wind characteristics	

OUTLINE	AIDS & CUES
The air in the valleys becomes warmer than the air on the mountain top and thus rises, producing the upslope wind. • The greatest upslope wind speed occurs about mid-afternoon. • Speeds generally range between 3 and 8 mph and can be gusty. • East facing slopes receive solar energy at sunrise, thus the downslope to upslope change takes place first on east aspects. This change can be gradual and may be characterized by a relative calm for an hour or more as the slope heats. • South and west facing slopes receive heat later in the morning, therefore, the downslope to upslope takes place usually by late morning.	

OUTLINE	AIDS & CUES
(2) Downslope wind characteristics The air along the mountain tops at night cools faster than the air in the valley. The cool air sinks, producing the downslope wind. • The greatest downslope flow occurs before midnight. • Speeds generally range between 2 and 5 mph. • Relative calm takes place before the downslope wind begins. • Because east aspects lose solar energy first, the change from upslope to downslope occurs on east aspects early in the afternoon. • Southwest and west facing slopes receive solar energy through much of the afternoon, thus downslope wind typically begins just after sunset.	

OUTLINE	AIDS & CUES
• The change in wind from downslope to upslope can rapidly change wildland fire behavior from inactive to active in a matter of minutes. • Though the steepness of slope also plays a role, stronger upslope winds lead to faster uphill fire spread. • Downslope winds seldom produce dangerous conditions, however, strong downslope winds, increased by the steepness of the terrain, can result in downhill runs.	
b. Valley winds Valley winds are produced by local temperature and pressure differences within the valley or between a valley and a nearby plain. Though there are exceptions, valley winds flow up valley during the day and down valley at night.	04-37-G130-PPT

OUTLINE	AIDS & CUES
(1) Up-valley wind characteristics As air in the valley warms, temperature and pressure differences within the valley or valley to adjacent plains results in an up-valley wind flow. • The greatest up-valley winds occur mid to late afternoon. • Up-valley wind speeds typically range between 10 and 15 mph. • Because of the large amount of air heated in the valley, up-valley winds develop after the upslope winds. • Up-valley winds typically continue after sunset. (2) Down-valley wind characteristics As the valley loses solar heating, the air in the valley cools. The cool air drains down-valley, resulting in the down-valley wind.	

OUTLINE	AIDS & CUES
• The greatest down-valley winds occur before midnight. • Down-valley wind speeds typically range between 5 and 10 mph. • Because of the large amount of air cooling in the valley, down-valley winds typically do not develop until a few hours after dark, and well after the development of the downslope winds.	
c. Sea and land breezes	04-38-G130-PPT
(1) Sea breeze A daytime breeze in which cooler air from high pressure over the coastal waters moves onshore to replace heated air rising above the warmer land mass. Typical wind speed is between 10 and 20 mph. However, wind speed can reach 20 to 30 mph along the California, Oregon, and Washington coasts.	

OUTLINE	AIDS & CUES
(2) Land breeze A light nighttime breeze which originates over the relatively cool land, flows out over the warmer coastal waters. Typical wind speed is between 3 and 10 mph.	
SLIDE 39 DEPICTS THE 1998 PERRY FIRE.	04-39-G130-PPT
Exercise 3. Winds	04-40-G130-PPT
General winds are:	
a. Found at lower levels of the atmosphere and are induced by small-scale (local) differences in air temperature and pressure.	
b. Large scale upper level winds caused by high and low pressure systems.	
c. Local winds that develop in mountainous terrain where the differences in heating and cooling occur.	
1. The different types of local winds include (circle all that apply):	
a. Upslope wind **b. Downslope wind** **c. Up-valley wind** d. Jet stream **e. Sea breeze**	

OUTLINE	AIDS & CUES
SLIDE 41 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING CRITICAL FIRE WEATHER CONDITIONS SECTION.	04-41-G130-PPT
VI. CRITICAL FIRE WEATHER CONDITIONS	
Fire seasons occur at different times of the year in different regions of the country, depending on seasonal variations in weather.	Begin video narration
The typical fire season at any given location has numerous hot and dry days, yet wildfires are usually clustered within relatively short periods. These periods are characterized by one (or a combination of) critical fire weather conditions:	
• Strong and shifting wind	
• Very low relative humidity	
• High temperature	
• Unstable atmosphere	
• Dry lightning	
Examples of weather phenomena in which one or more of these critical fire weather conditions may occur:	
• Cold fronts	
• Foehn winds	
• Thunderstorms	

OUTLINE	AIDS & CUES
• Dust devils	
• Fire whirls	End of narration
SLIDE 42 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING COLD FRONTS SECTION.	04-42-G130-PPT
A. Cold Fronts	
A cold front is the boundary line between two different air masses, with cooler air behind the front and warmer air ahead of the front.	Begin video narration
The two differing air masses result in pressure differences that can lead to moderate or strong wind speed.	
Frontal winds associated with frontal passages are particularly dangerous, not only for the strength of the wind, but also the shift in direction as the front approaches and passes through the area.	
Along with the shifting winds, atmospheric stability ahead of and behind the front also impacts the fire environment.	
Unstable conditions encouraging upward motion are typically found ahead and along the frontal boundary.	
Stable conditions discouraging upward motion are typical behind the front.	
Historically, firefighter fatalities have occurred in the pre-frontal environment where winds are strong and shifting, and the atmosphere is unstable.	End of narration

OUTLINE	AIDS & CUES
1. Potentially dangerous cold front characteristics: • Light southeasterly winds are common several hundred miles ahead of the front. – Just ahead or along the front, moderate to strong southwesterly winds are common. The strong southwesterly flow ahead of the front will drive the fire head to the northeast. • The air mass ahead of the front is typically very warm and unstable, resulting in an increase in fire behavior. • Relative humidity can be low or high depending on the origin or location of the system. – High relative humidity ahead of the front is more common over the eastern U.S. than the western U.S. • As the front pushes through, the wind can abruptly shift from southwest to northwest, driving the fire head to the southeast.	

OUTLINE	AIDS & CUES
– This can be a great concern to firefighters due to the increased fire behavior on the south flank of the fire as the winds shift.	
• The air mass behind the front is cooler, more stable, and relative humidities are higher, thus fire activity typically decreases.	
• Wind speeds just ahead, along, and behind the front typically range from 15 to 30 mph, and can be gusty.	
2. Cold front indicators:	
• A line of cumulus clouds may be seen approaching from the west or northwest.	
• Large clouds of dust can precede the arrival of a cold front.	
• Winds normally shift from the southeast to the south, to the southwest, and increase in velocity before the arrival of the front.	
• Winds will be strongest and gusty as the front reaches you.	
• Winds will continue to shift as the front passes, generally resulting in strong, gusty, cool wind out of the northwest.	

OUTLINE	AIDS & CUES
SLIDE 43 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING FOEHN WINDS SECTION.	04-43-G130-PPT
B. Foehn Winds	
Foehn winds are strong, dry winds caused by the compression of air as it flows down the lee side of a mountain range. It is usually, but not always, warm for the season.	Begin video narration
Foehn winds can persists for days and frequently reach speeds of 40-60 mph but can be as high as 90 mph. The relative humidity will usually drop with the onset of foehn winds.	
The combination of high wind speeds and low relative humidity can cause high rates of fire spread. When a foehn wind occurs after a long period of dry weather, wildland fire behavior can be extreme.	End of narration
Common foehn winds in the western U.S. are:	04-44-G130-PPT
1. Chinook wind: Found along the east side of the Rockies and east side of the Sierra Nevada.	
2. Wasatch wind: Found on the west side of the Wasatch Range in Utah.	
3. Santa Ana and Sundowner: Southern California.	
4. Mono and North wind: Central and Northern California.	
5. East wind: Western Washington and Western Oregon.	

OUTLINE	AIDS & CUES
C. Thunderstorms A storm is produced by a cumulonimbus cloud and always accompanied by lightning and thunder. 1. Thunderstorms can also produce: • Strong gusty winds • Heavy rain • Hail (sometimes) Thunderstorms are usually of short duration, seldom over 2 to 3 hours for any one storm. 2. The direction of thunderstorm movement is generally in the direction of the winds aloft. • The direction of thunderstorm movement can be determined by the direction the anvil shaped top is pointing. 3. Downdraft winds from thunderstorms that reach the ground usually spread radially in all directions. • These wind velocities will often be 25 to 35 mph and can reach as high as 70 mph.	04-45-G130-PPT

OUTLINE	AIDS & CUES
• Surface winds from a thunderstorm will be the strongest in the direction the thunderstorm is moving.	
• Thunderstorm wind speed and direction can be altered by topography and vegetation.	
4. Thunderstorms are potentially dangerous to firefighters because:	
• Wind associated with thunderstorms, whether indrafts or downdrafts, can change direction and speed, **resulting in sudden changes in the rate and direction of a fire, as well as fire intensity.**	
• Heat rising from a fire can form a convection column strong enough to trigger the development of a thunderstorm, even on an otherwise cloudless day.	
• Thunderstorms, as a result of a convection column, can produce dangerous downdrafts.	
• Thunderstorms produce dangerous lightning that results in new starts. Lightning is also a safety problem and can result in death.	
SLIDE 46 CONTAINS A NARRATED VIDEO FOR THE FOLLOWING DUST DEVILS AND FIRE WHIRLS SECTION.	04-46-G130-PPT

OUTLINE	AIDS & CUES
D. Dust Devils and Fire whirls	
Dust devils are one of the most common indicators of unstable air. They occur on hot days over dry ground when skies are clear and the winds are light.	Begin video narration
Under intense heating, air near the ground rises in upward-spiraling motions in columns or chimneys.	
Fire whirls, generated by intense fires, have been known to twist off trees more than 3 feet in diameter.	
They can pick up large burning embers and spew them far across the fireline causing numerous spot fires.	
In some extreme cases, fire whirls and dust devils have moved across safe zones, and burned and turned over vehicles.	End of narration
• The size of dust devils can range from 10 feet to over 100 feet in diameter with heights from 10 feet to 3,000 or 4,000 feet.	
• Wind speeds in dust devils are often more than 20 mph and in some extreme cases have exceeded 70 mph.	
• A favorite area for fire whirl development is on the wind sheltered (leeward) side of ridges.	

OUTLINE	AIDS & CUES
Exercise 4. Critical Fire Weather	04-47-G130-PPT
1. Chinook and Santa Ana winds are examples of a:	
a. Foehn wind	
b. Cold front wind	
c. Thunderstorm wind	
d. Sea breeze	
2. Cold front winds:	
a. Are strong, dry winds caused by the compression of air as it flows down the lee side of a mountain range.	
b. Are winds associated with a boundary between two dissimilar air masses.	
c. A and B.	

OUTLINE	AIDS & CUES
VII. DIFFERENT TYPES OF FIRE WEATHER FORECASTS AND OUTLOOKS	
A. Predictive Services	04-48-G130-PPT
Predictive Services is a combined group of Interagency Land Management Fire Intelligence Coordinators or Fire Behavior Analysts (FBAN), and Fire Meteorologists.	
1. Predictive Services monitors, analyzes, and predicts:	
• Fire weather	
• Fire danger	
• Interagency fire management resource impact	
2. Predictive Service products and services:	04-49-G130-PPT
• Seasonal assessments	
• 7 Day Significant Fire Potential	
• Monthly Fire Weather/Fire Danger Outlook	
• Weather briefings	
• Daily summaries of National Weather Service fire weather forecasts, both graphical and text	

OUTLINE	AIDS & CUES
• Long-term precipitation monitoring	
• Smoke management summaries	
B. National Weather Service (NWS)	04-50-G130-PPT
There are over 120 National Weather Service offices nationwide that provide a variety of different types of forecasts.	
Another major NWS program includes the fire weather program.	
NWS standardized products include:	
1. Fire Weather Planning Forecasts (FWF)	04-51-G130-PPT
These forecasts can be in tabular or narrative format.	
They include a discussion of the upcoming weather and highlights of any critical fire weather events, as well as many different forecasted elements including:	
• Sky/weather	
• Temperature	
• Relative humidity	
• Wind	

OUTLINE	AIDS & CUES
2. Spot forecasts	04-52-G130-PPT
A spot forecast is a site specific 24- to 36-hour forecast issued to fit time, topography, and weather of a specific location.	
3. Fire Weather Watches/Red Flag Warnings	04-53-G130-PPT
A fire weather watch or red flag warning is issued when the combination of dry fuels and weather conditions support extreme fire behavior or ignition is occurring or expected to occur.	
a. Fire Weather Watch	04-54-G130-PPT
Issued when there is a high potential for the development of a Red Flag Event.	
A Fire Weather Watch is normally issued 24 to 72 hours in advance of the expected onset of criteria.	
b. Red Flag Warning	04-55-G130-PPT
Is used to warn of an impending or occurring Red Flag event.	
Its issuance denotes a high degree of confidence that a Red Flag event will occur in 24 hours or less.	

OUTLINE	AIDS & CUES
Exercise 5. Types of Fire Weather Products	04-56-G130-PPT
1. The seasonal assessment product is issued by: a. The National Weather Service **b. Predictive Services** c. Both A and B	
2. Red Flag Warnings are issued by: **a. The National Weather Service** b. Predictive Services c. Incident Management Teams	
REVIEW UNIT OBJECTIVES.	04-57-G130-PPT

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 5 – Principles of Wildland Fire Behavior: Safety

Time 1 hour

Objectives

1. Identify indications that fire behavior may be increasing.
2. Describe combined influences that may cause extreme fire behavior and safety concerns.
3. List seven fire environment factors to be aware of while monitoring fire behavior.

Strategy

This unit addresses the need for structural firefighters to know how to identify principle environmental factors affecting wildland fire behavior. This is a gap in skill identified by the *Skills Crosswalk*.

Instructional Method(s)

- Informative lecture/discussion

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software
- ☐ Incident Response Pocket Guide (IRPG)

Exercise(s)

- Review exercise

Evaluation Method(s)

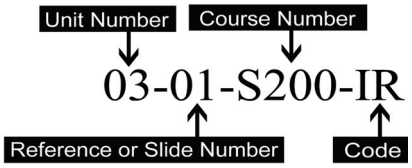
- Student's performance will not be evaluated in this unit.

Outline

I. Monitoring fire behavior

II. The Seven Fire Environment Factors of Look Up, Down, and Around

Aids and Cues Codes



The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	IR – Instructor Reference
SW – Student Workbook	SR – Student Reference
HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 5 – Principles of Wildland Fire Behavior: Safety

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	05-01-G130-PPT
PRESENT UNIT OBJECTIVES.	05-02-G130-PPT
I. MONITORING FIRE BEHAVIOR	05-03-G130-PPT
A. Large Fire Indicators	
Fires rarely just go from small fires to extreme "blow ups." There are indicators that, if monitored, will show when a fire is starting to transition from problem fire behavior to extreme fire behavior.	
B. Problem vs. Extreme Fire Behavior	05-04-G130-PPT
1. Problem fire behavior	
Fire activity that presents potential hazard to fireline personnel if the tactics being used are not adjusted.	
The prediction or anticipation of fire behavior is the key to good tactical decisions and safety.	
2. Extreme fire behavior	
The highest level of problem fire behavior can be described with specific elements:	

OUTLINE	AIDS & CUES
• Rapid rate of spread • Intense burning • Spotting • Crowning	
EMPHASIZE RELATIONSHIP BETWEEN PROBLEM AND EXTREME FIRE BEHAVIOR AND THAT PROBLEM BEHAVIOR TRANSITIONS INTO EXTREME BEHAVIOR.	05-05-G130-PPT
THE INDICATORS THAT STUDENTS ARE ABOUT TO LEARN SHOW HOW TO RECOGNIZE THE TRANSITION.	
PLAY THE VIDEO CLIP IN SLIDE 6 (EXAMPLE OF EXTREME FIRE BEHAVIOR) AND DISCUSS.	05-06-G130-PPT
C. Incident Response Pocket Guide	05-07-G130-PPT
Use the Incident Response Pocket (IRPG) as a field reference to help monitor changing conditions.	
The pages of the Operational section are green and placed in the front for quick reference in the field.	05-08-G130-PPT
The Operational section is where the seven fire environment factors of Look Up, Down, and Around are located. Each factor lists indicators to help individuals monitor the fire environment and become more aware of changes that are occurring.	

OUTLINE	AIDS & CUES
II. THE SEVEN FIRE ENVIRONMENT FACTORS OF LOOK UP, DOWN, AND AROUND	
The fire environment is the conditions, influences, and modifying forces that control fire behavior.	
The fire environment has been described with a triangle showing weather, fuels, and topography (terrain).	05-09-G130-PPT
There are seven factors within this fire environment that fireline personnel must monitor:	05-10-G130-PPT
• Fuel Characteristics	
• Fuel Moisture	
• Fuel Temperature	
• Topography (Terrain)	
• Wind	
• Atmospheric Stability	
• Fire Behavior	
These seven factors and their corresponding indicators provide clues when monitoring the fire and anticipating what might happen.	
THE INDICATORS LISTED IN BOLD REQUIRE SPECIAL ATTENTION. IT IS IMPORTANT TO EMPHASIZE THESE TO THE STUDENTS.	

OUTLINE	AIDS & CUES
A. Fuel Characteristics	05-11-G130-PPT
1. Continuous fine fuels	
Fire is able to change and spread rapidly in these fuels, especially when combined with slope and/or wind.	
2. Heavy loading of dead and down	05-12-G130-PPT
Large amounts of readily available fuel.	
3. Ladder fuels	05-13-G130-PPT
Allow the fire to readily spread into the canopy, launching firebrands (spots) into the air.	
4. Tight crown spacing	05-14-G130-PPT
Allows fire to move from bush to bush (or tree to tree) more easily.	
5. Special conditions	
a. Firebrand sources	05-15-G130-PPT
Burning material that is carried by the wind ahead of the fire or outside of control lines.	
Potential firebrand sources are:	
• Pine bark plates	
• Manzanita leaves	
• Eucalyptus leaves	

OUTLINE	AIDS & CUES
• Maple leaves • Oak leaves	
b. Numerous snags Fire can become established in these dead or partially dead trees, making them very hazardous. These can launch firebrands into the air as well as fall across control lines.	05-16-G130-PPT
c. Frost and bug kill More available fuel to be consumed by the fire.	05-17-G130-PPT
d. Preheated canopy Caused by a lower intensity fire burning the fuels near the ground. Heat from the fire dries the fuels above it, making those fuels available to burn.	05-18-G130-PPT
e. Unusual fine fuels Light flashy fuels mixed with high energy fuels, such as continuous grass mixed with sage.	05-19-G130-PPT
f. High dead to live ratio Greater amounts of potentially available fuel.	05-20-G130-PPT

OUTLINE	AIDS & CUES
B. Fuel Moisture	05-21-G130-PPT
1. Low RH (<25 percent) The lower the humidity, generally, the more available the fine fuels are to carry fire. The 25 percent RH indicator is a general threshold for much of the U.S. In the East, Alaska, and Hawaii, the threshold is generally higher.	
2. Low 10 hr FMC (< 6 percent) 10 hour fuels are just one good indicator of how available fuels are to burn.	05-22-G130-PPT
3. Drought conditions and seasonal drying Both are indicators that fuels are more receptive to ignition and carrying the spread of fire.	05-23-G130-PPT 05-24-G130-PPT
EMPHASIZE THAT FUEL MOISTURES ARE IMPORTANT FOR BOTH FINE AND LARGE FUELS BUT AT DIFFERENT RATES.	
C. Fuel Temperature	05-25-G130-PPT
1. High temps (> 85° F) Increasing the temperature of the fuels closer to the point of ignition.	

OUTLINE	AIDS & CUES
2. High percent of fuels with direct sun	05-26-G130-PPT
On any given slope, are a majority of the fuels in the sun or the shade?	
3. Aspect fuel temperature increasing	05-27-G130-PPT
Which slopes tend to have higher fuel temperatures in the morning?	
Which are higher in the afternoon?	
Why is this important?	
a. South and southwest slopes:	
• Are normally more exposed to sunlight	
• Generally have lighter and sparser fuels	
• Have higher temperatures, lower humidity, and lower fuel moisture	
• Are the most critical in terms of start and spread of fire	
b. North facing slopes have more shade, which causes:	
• Heavier fuels	
• Lower temperatures	

OUTLINE	AIDS & CUES
• Higher humidity	
• Higher fuel moistures	
Being aware of which slopes are "hotter" throughout the day allows firefighters to monitor where the potential for the greatest fire behavior is.	
D. Topography (Terrain)	
1. Steep slopes (>50 percent)	05-28-G130-PPT
Provides for rapid rates of fire spread due to convective heating and increased potential for rollouts below the fire.	
2. Chutes – Chimneys	05-29-G130-PPT
Provides potential for rapid rates of fire spread by combining steep terrain with updrafts of air.	
3. Saddles	05-30-G130-PPT
Fire is pushed faster through these during uphill runs.	
4. Box canyons	05-31-G130-PPT
All provide for rapid rates of fire spread due to the channeling of wind and heat.	
5. Narrow canyons	05-32-G130-PPT
a. Radiant and convective heating could increase spotting across the canyon.	

OUTLINE	AIDS & CUES
b. Fire can burn down to the bottom of the canyon and then crossover to the other side. This is known as "slope reversal."	
EMPHASIZE THAT TERRAIN CAN CHANGE FIRE DIRECTION AND BEHAVIOR.	
E. Wind	
WIND IS AN IMPORTANT FACTOR TO EMPHASIZE SEVERAL TIMES THROUGHOUT THIS SEGMENT.	
Wind is the primary factor that influences fire spread.	
1. Surface winds above 10 mph	05-33-G130-PPT
THE PHOTO ON SLIDE 33 IS A BURNOUT OPERATION WITH STEADY 15 TO 20 MPH WINDS. NOTICE HOW WIND HAS LEANED THE COLUMN OF SMOKE.	
These winds help determine the direction of fire spread, help to carry firebrands ahead of the fire, and increase the supply of oxygen to the fire.	
2. Lenticular clouds	05-34-G130-PPT
Indicates high winds aloft with the potential to surface.	
3. High, fast moving clouds	05-35-G130-PPT
Indicates a potential for wind shifts.	

OUTLINE	AIDS & CUES
4. Approaching cold fronts Wind will increase in speed and change direction with the advance of a cold front.	05-36-G130-PPT
5. Cumulonimbus development Indicates possible wind speed and direction and potential for erratic winds.	05-37-G130-PPT
6. Sudden calm Be alert for a wind change.	05-38-G130-PPT
7. Battling or shifting winds Winds that change direction and go back to the original direction are battling. This is an indication of a probable change in wind speed and direction. Changes in wind speed and direction affect everyone on the fire from individual firefighters to fire managers on many portions of the fire. A sudden change in wind direction can cause firebrands to cross control lines. Increasing winds could cause previously quiet parts of the fire to increase in intensity.	05-39-G130-PPT

OUTLINE	AIDS & CUES
F. Atmospheric Stability	
Indicators of an **unstable atmosphere** and the potential for large fire growth:	
1. Good visibility	05-40-G130-PPT
2. Gusty winds and dust devils	05-41-G130-PPT
3. Cumulus clouds	05-42-G130-PPT
4. Castellatus clouds in the a.m.	05-43-G130-PPT
5. Smoke rises straight up	05-44-G130-PPT
REINFORCE THAT STABILITY INDICATORS 1-5 SHOW THAT AN AIR MASS IS UNSTABLE AND FIRE HAS THE INCREASED POTENTIAL TO GROW RAPIDLY.	
6. Inversion beginning to lift	05-45-G130-PPT
This is an indication of a transition from a stable to an unstable atmosphere and the potential for fire growth.	
7. Thermal belt	05-46-G130-PPT
An area of lower nighttime relative humidity and higher temperatures. Fires will generally burn more actively in these areas at night.	

OUTLINE	AIDS & CUES
G. Fire Behavior	
Indicators of a rapidly changing, wind-driven fire with intense burning:	
1. Leaning column	05-47-G130-PPT
2. Sheared column	05-48-G130-PPT
3. Well-developed column	05-49-G130-PPT
4. Changing column Fire behavior is usually increasing.	05-50-G130-PPT
5. Trees torching	05-51-G130-PPT
The fire is beginning to transition from a surface fire to a crown fire.	
Observe if just one tree is torching or small groups of trees are catching fire.	
Note if there is wind present and how fast it is blowing.	
6. Smoldering fires picking up	05-52-G130-PPT
Fire behavior is increasing. What else might be occurring to cause this?	
It is possible that the:	
• Inversion is lifting	
• Wind is increasing	

OUTLINE	AIDS & CUES
• Shading has decreased on that aspect and temperature is increasing	
• Relative humidity has decreased	
7. Small fire whirls beginning	05-53-G130-PPT
The fire is increasing in intensity.	
8. Frequent spot fires	05-54-G130-PPT
The fire is spreading and increasing in complexity	
H. Review the Seven Fire Environment Factors	
REVIEW HOW THE SEVEN FACTORS ARE USED TO EVALUATE PROBLEM AND EXTREME FIRE BEHAVIOR.	
• Important to not just monitor one or two factors but all of them.	
• Equally important to monitor the trends of each indicator as well.	

OUTLINE	AIDS & CUES
EXERCISE.	
Have students list the seven fire environment factors.	
1. Fuel Characteristics	
2. Fuel Moisture	
3. Fuel Temperature	
4. Topography (Terrain)	
5. Wind	
6. Stability	
7. Fire Behavior	
REVIEW ANSWERS ON SLIDE 55.	05-55-G130-PPT
REVIEW UNIT OBJECTIVES.	05-56-G130-PPT

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 6 – Risk Management: Watchout Situations and Fire Orders

Time 3 Hours

Objectives

1. Identify the common denominators on tragedy fires.
2. Given a scenario, identify the appropriate watchout situations.
3. Identify the wildland/urban interface watchout situations.
4. Apply the appropriate Standard Firefighting Orders to minimize the potential for serious injury or death.

Strategy

This unit addresses the need for structural firefighters to know the life threatening situations in wildland fires. This is a gap in skill identified by the *Skills Crosswalk*.

Units 6, 7, 8, and 9 in this course are designed to explain the risk management process outlined in the Incident Pocket Response Guide (IRPG). These concepts are interrelated and can prove challenging to present.

The risk management process is introduced by combining Step 2, Hazard Assessment, represented by the Watchout Situations, and Step 3, Hazard Control, represented by the Standard Firefighting Orders found in the IRPG. Many of the Watchout Situations pertain to concepts presented in Units 1 through 5. The instructor is encouraged to let the students work through the Watchout Situations by using what they learned thus far to discover why this situation presents hazards for the firefighter. The Standard Firefighting Orders will illustrate the process used by firefighters to develop the controls designed to minimize the risks associated with the identified hazards. Lookouts, communications, escape routes, and safety zones (LCES) will be covered in detail in Unit 7.

Instructional Method(s)

- Informative lecture/discussion
- Instructional DVD/video

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software
- ☐ Standard Firefighting Orders and Watchout Situations decal and card
- ☐ Common Denominators of Fire Behavior Pamphlet
- ☐ "Risk Management for S-130" DVD
- ☐ Incident Response Pocket Guide (IRPG)
- ☐ Fireline Handbook (FHB)

Exercise(s)

- Small group exercise on Watchout Situations

Evaluation Method(s)

- Student's performance will not be evaluated in this unit.

Outline

I. Introduction

II. Watchout Situations

III. The Wildland/Urban Interface

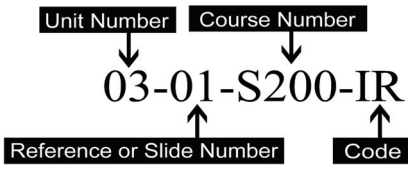
IV. Standard Firefighting Orders

V. Summary

Aids and Cues Codes

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	IR – Instructor Reference
SW – Student Workbook	SR – Student Reference
HO – Handout	PPT – PowerPoint



UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 6 – Risk Management: Watchout Situations and Fire Orders

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	06-01-G130-PPT
PRESENT UNIT OBJECTIVES.	06-02-G130-PPT
I. INTRODUCTION	
DISCUSS THE RELATIONSHIP BETWEEN THE FHB AND THE IRPG. EMPHASIZE THE POINTS BELOW.	
• Fireline Handbook focuses primarily on organizational and strategic issues of firefighting.	
• Fireline Handbook contains pertinent information for firefighters at all levels and is a good reference to either carry on the fireline or have access to in a vehicle.	
• Incident Response Pocket Guide focuses primarily on the tactical issues of firefighting.	
• Incident Response Pocket Guide fits nicely into a shirt pocket and is easily transported and referred to anywhere on the fireline.	

OUTLINE	AIDS & CUES
• All firefighters should carry the Incident Response Pocket Guide with them at all times. Wildland firefighting is a dangerous job. It requires that you be thoroughly familiar with the hazards in the fire environment. Your safety and the safety of others may depend upon your ability to recognize fire environment factors that can threaten your life. All fire personnel have the obligation to work safely and to protect themselves and others from injury. Safety is our #1 priority.	
Fatal and near-fatal fires have occurred in most geographic areas and with most fuel types.	
HAND OUT A STANDARD FIREFIGHTING ORDERS AND WATCHOUT SITUATIONS DECAL AND CARD AND A COMMON DENOMINATORS OF FIRE BEHAVIOR PAMPHLET TO EACH STUDENT.	Risk Management for S-130 DVD, Part 1
START PART 1 OF THE RISK MANAGEMENT FOR S-130 DVD (INTRODUCTION). STOP DVD AFTER THIS SECTION.	IRPG (Green - Operational)
There are four major common denominators of fire behavior on fatal and near-fatal fires. Such fires often occur:	
• On relatively small fires or isolated areas of large fires	
• In deceptively light fuels, such as grass, herbs, and light brush	
• When fire responds to topographic conditions and runs uphill	

OUTLINE	AIDS & CUES
• When there is an unexpected shift in wind direction or in wind speed	
Alignment of topography and wind during the burning period should always be considered a trigger point to re-evaluate strategy and tactics.	
Fatalities have occurred during mop up and prescribed burning operations. The same fire environmental factors are present as with a wildfire. The fire environment may endanger safety and therefore demands the same respect as a wildfire.	
II. WATCHOUT SITUATIONS	IRPG (back cover)
The conditions or situations which we must be aware of and recognize are called **Watchout Situations**. Eighteen conditions or situations have been identified. The failure to recognize and respond to each of these situations has resulted in fatalities. The Watchout Situations are signs or warnings that if positive action is not immediately taken you will endanger yourself or your coworkers.	
EMPHASIZE YOU DON'T VIOLATE THE WATCHOUT SITUATIONS. THEY SIMPLY OCCUR IN THE FIRE ENVIRONMENT. YOU MAY FAIL TO RECOGNIZE THEM OR FAIL TO PROPERLY RESPOND.	
REFER STUDENTS TO IRPG TO SHOW WHERE WE ARE IN THE RISK MANAGEMENT PROCESS.	IRPG (Green - Operational)
The response to the Watchout Situations is to take positive action which will minimize the potential for serious injury or death. The actions you take are called the Standard Firefighting Orders or Hazard Controls. These will be discussed later in the unit.	

OUTLINE	AIDS & CUES
START PART 2 (WATCHOUT SITUATIONS) OF THE DVD. STOP DVD AFTER THIS SECTION.	Risk Management for S-130 DVD, Part 2
IN GROUPS OF 3-5 STUDENTS, ASSIGN EACH GROUP THREE OR FOUR OF THE WATCHOUT SITUATIONS. HAVE THE GROUPS DEVISE RESPONSES TO THE QUESTIONS INCLUDED IN THEIR WORKBOOKS FOR THEIR ASSIGNED SITUATIONS.	SW p. 6.3 thru 6.9
ALLOW 10 MINUTES FOR THE GROUPS TO COMPLETE THEIR ASSIGNMENT. GROUPS MAY CREATE DRAWINGS TO ILLUSTRATE THEIR ANSWERS.	
HAVE GROUPS PRESENT THEIR RESPONSES. TOPICS AND QUESTIONS ARE PRESENTED BELOW FOR INSTRUCTOR INPUT.	
A. Watchout Situations	
1. FIRE NOT SCOUTED AND SIZED UP	06-03-G130-PPT
Why is this important?	
• Identify hazards	
• Understand what you are up against	
2. IN COUNTRY NOT SEEN IN DAYLIGHT	06-04-G130-PPT
Why is this important?	
• Identify hazards	

OUTLINE	AIDS & CUES
• Identify escape routes and safety zones • Overall safety of the suppression action What can you do if you cannot wait to see the country in daylight? • Get briefing from someone who has worked the area.	
3. SAFETY ZONES AND ESCAPE ROUTES NOT IDENTIFIED. Why is this important? • Need to know where to go to be safe • When time frames are tight need to act	06-05-G130-PPT
REINFORCE THAT REGARDLESS OF THE SITUATION, ESCAPE ROUTES AND SAFETY ZONES MUST BE AN INTEGRAL PART OF <u>EVERY</u> FIRE. THIS WILL BE DISCUSSED MANY TIMES IN THIS COURSE.	
4. UNFAMILIAR WITH WEATHER AND LOCAL FACTORS INFLUENCING FIRE BEHAVIOR Why is it important? • Difficult to predict fire behavior	06-06-G130-PPT

OUTLINE	AIDS & CUES
• Weather is the most variable factor affecting fire behavior	
Weather patterns - Do all fires have them?	
• Yes, to some degree, some are very pronounced	
How do you obtain this local information?	
• Information from local fire personnel	
• Weather reports including "spot weather forecasts"	
5. UNINFORMED ON STRATEGY, TACTICS AND HAZARDS	06-07-G130-PPT
What does strategy mean?	
• Overall plan to achieve the fire suppression objectives.	
What are tactics?	
• Specific actions to suppress the fire; e.g., use air tankers to cool down west flank or construct 5 ft. wide handline across east flank.	
What hazards need to be identified?	
• Heavy fuel concentrations	

OUTLINE	AIDS & CUES
• Chimneys where firefighters may get trapped	
• Snags or hazardous trees near work areas	
• Falling operations	
• Dangerous terrain	
• Any hazards which may endanger workers	
What questions can be asked to reduce the risks?	
• Have strategy, tactics or hazards changed since last informed?	
• Can you get a briefing from your supervisor?	
EMPHASIZE THE IMPORTANCE OF GETTING A COMPLETE BRIEFING.	
6. INSTRUCTIONS AND ASSIGNMENTS NOT CLEAR	06-08-G130-PPT
What should your instructions include?	
• Who's in charge?	
• Location of work assignment	
• Hazard identification	

OUTLINE	AIDS & CUES
• Communication - type, radio frequency, contacts, what to communicate • Escape routes and safety zone location • Tactics to employ • Fire weather/behavior expected • Exactly what you are supposed to be doing • Status of adjoining forces	
7. NO COMMUNICATION LINK WITH CREW MEMBERS/SUPERVISOR Why must you be in communication? • To be alert to changing conditions • To be alert to problems developing • To be alert to blowup • To maintain control and prevent panic	06-09-G130-PPT
8. CONSTRUCTING FIRELINE WITHOUT SAFE ANCHOR POINT What is a safe anchor point? • Point or location not currently, or likely in the future to be, threatened by fire spread	06-10-G130-PPT

OUTLINE	AIDS & CUES
• Place to begin your fireline where you're likely to hold your line	
9. BUILDING FIRELINE DOWNHILL WITH FIRE BELOW	06-11-G130-PPT
TALK ABOUT THE SERIOUSNESS OF THIS WATCHOUT SITUATION.	
What is the danger in building line downhill?	
• Potential for rapid uphill run of the fire - cannot predict lateral spread	
• Cannot assure safe escape from fire traveling uphill	
• Inability to establish a safe anchor point	
Can you ever build line downhill?	
• Yes, see IRPG, Downhill Checklist	IRPG (Green Operational)
10. ATTEMPTING FRONTAL ASSAULT ON FIRE	06-12-G130-PPT
What are the dangers involved with a frontal assault?	
• No anchor point	
• Lateral spread of fire - out flanked	

OUTLINE	AIDS & CUES
• Rapid movement of fire toward, over you • Heat and smoke intensity • Inability to utilize satisfactory escape routes and safety zones	
11. UNBURNED FUEL BETWEEN YOU AND THE FIRE Why is this a Watchout Situation? • Wind switch or change in burning conditions can cause fire to blow up, which can endanger workers as well as spread the fire across the fireline How can you prevent this potential problem? • Burn out to your fireline	06-13-G130-PPT
12. CANNOT SEE MAIN FIRE, NOT IN CONTACT WITH ANYONE WHO CAN Why is this important? • Need to know current fire behavior, direction of spread • Need to know if you or crew might be in danger • Need to know if you or crew should move to the safety zone	06-14-G130-PPT

OUTLINE	AIDS & CUES
13. ON A HILLSIDE WHERE ROLLING MATERIAL CAN IGNITE FUEL BELOW What are the consequences? • Loss of control line • Rapid fire spread uphill • Endanger self and crew	06-15-G130-PPT
14. WEATHER IS GETTING HOTTER AND DRIER Why is this a Watchout Situation? • Increase in fuel combustion and fire behavior • Increased chance for blowups, spotting How can you tell if it is getting hotter and drier? • Your senses • Weather forecasts/spot weather • Observing fire behavior - more intense burning • Taking weather periodically with weather kit	06-16-G130-PPT

OUTLINE	AIDS & CUES
15. WIND INCREASES AND/OR CHANGES DIRECTION Why is this a Watchout Situation? • More oxygen - increases fire intensity • Increased chance for spotting - fire brands • Increases likelihood for fire spread • Increases likelihood for "reburns"	06-17-G130-PPT
16. GETTING FREQUENT SPOT FIRES ACROSS LINE What are the consequences of spot fires? • A spot below you (or other location) can run uphill and endanger crew/person • Indicator of increased fire behavior • Increases element of complexity to suppression effort	06-18-G130-PPT
17. TERRAIN AND FUELS MAKE ESCAPE TO SAFETY ZONES DIFFICULT Why is this a Watchout Situation? • Personnel should be able to escape with "reasonable ease"	06-19-G130-PPT

OUTLINE	AIDS & CUES
• Time needed for escape will be increased	
• Clear identification will take more work e.g., more flagging, glow sticks, saw work, etc.	
• Trigger point for re-evaluation will be moved up	
18. TAKING A NAP NEAR THE FIRELINE	06-20-G130-PPT
Although this is a convenient place what danger might there be?	
• Mechanized equipment traveling this route	
• Danger of burning snags/trees falling	
B. Watchout Situations Checklist Scenario Exercise	
REFER STUDENTS TO STUDENT WORKBOOK AND READ INSTRUCTIONS.	06-01-G130-IR SW p. 6.17 thru 6.18
ANSWER ANY QUESTIONS STUDENTS MAY HAVE AND START PART 3 OF THE VIDEO/DVD. STOP VIDEO/DVD AFTER THIS SECTION.	Risk Management for S-130 DVD, Part 3

OUTLINE	AIDS & CUES
AS A GROUP REVIEW AND DISCUSS THE SCENARIO USING THE QUESTIONS ON THE LAST PAGE. SUGGESTED ANSWERS ARE PROVIDED TO ASSIST INSTRUCTORS, BUT ANSWERS FROM THE CLASS MAY VARY BASED ON DIFFERENT PERSPECTIVES.	SW p. 6.19 06-02-G130-IR 7
EXERCISE SHOULD TAKE APPROXIMATELY 15 MINUTES.	
III. THE WILDLAND/URBAN INTERFACE	IRPG (Green - Operational)
RELATE INTERFACE EXPERIENCES THROUGHOUT THIS UNIT TO REINFORCE THE LECTURE.	
Wildland/urban interface – the "zone where human-made improvements intermix with wildland fuels."	
Improvements can range from expensive homes to declining outbuildings. As more and more people move into rural interface areas, wildfires are threatening and destroying structure each fire season at an alarming rate.	
A. Three Categories of Tactical Plans in the Interface	06-21-G130-PPT
1. Defensive Mode	
Protect structures but make little direct effort to contain the wildland fire. This may be the only option, but firefighters should not get stuck in a defensive mode when other options are possible.	

OUTLINE	AIDS & CUES
2. Offensive Mode Control the wildland fire before it reaches the structures. 3. Combined Mode Holding a portion of the wildland fire edge to reduce the number of structures threatened. Firing out from control lines at the structure perimeter or holding the fire at the structure or road may actually control a significant portion of the fire.	
HAVE STUDENTS REFERENCE THE INCIDENT RESPONSE POCKET GUIDE FOR THE "WILDLAND/URBAN WATCHOUTS."	IRPG (Green - Operational)
B. Watchout Situations in the Wildland/Urban Interface	
1. Wooden Construction and Wood Shake Roofs	06-22-G130-PPT
• Easy targets for firebrands and burning fuel adjacent to structures • Typically not treated with flame-resistant compounds • Fireline intensity is frequently high enough where radiant heat can preheat the structure until it reaches combustion temperatures	

OUTLINE	AIDS & CUES
• Openings in buildings provide entry points for fire (Check eaves, roof, roof vents, and decks for smoldering or flames) • Remove combustible furniture and objects from decks, and place them inside the structure • Do not remove anything from a burning, or at risk, structure because of legal constraints • Structure situations to avoid: – Structure windows are bulging and the roof has not been vented (Hot gases exist in a closed environment within the structure, a sudden influx of oxygen can lead to a backdraft) – Structure windows are black or smoked over, which is an indication that the interior is burning – When more than 1/4 of the roof is directly involved in windy conditions, the situation is usually considered hopeless	

OUTLINE	AIDS & CUES
2. Poor Access and Narrow Congested One-Way Roads Problems associated with the use of roads in the wildland/urban interface: • Traction Traction can be compromised when road bed material is made of parent material or loose gravel, loosely compacted rock base material and sand, decomposed granite, and clay. These road beds can deteriorate creating road hazards: i.e., washouts, washboards and large potholes. Such hazards can delay egress and threaten your safety. • Road width Narrow and winding roads become obscured during smoky conditions. Driving becomes dangerous because the driver is not able to see the edge of the road or oncoming traffic. A narrow road creates congestion by vehicles not being able to pass. This can be compounded when residents are trying to evacuate and large Type 1 Structural Engines are trying to get to the fire.	06-23-G130-PPT

OUTLINE	AIDS & CUES
A good safety practice is to secure the road by controlling traffic at each end with common communications. Many times this will be the responsibility of law enforcement agencies.	
• Position on slope Roads built in the middle or upper slopes are exposed to convective and radiant heat. These are often poor barriers to stop fire spread and hence a bad place to be located when a fire front passes.	
• Adjacent fuels Be aware of fuel characteristics such as: fuel types, fuel moisture, loading and arrangement along the roadway. When burning, these fuels could block your egress. However, some fuels may be an advantage for burning out along roads to secure a safety zone.	
• Roads in the wildland/urban interface are often: – Private roads with one way in and one way out – Less than 16 feet wide – Have a road grade between 10-20 percent	

OUTLINE	AIDS & CUES
– Dead end roads or cul-de-sacs	
– Have driveways that provide poor access and turn-arounds for fire vehicles (Do not allow vehicles to block an egress)	
– Contain bridges or culverts that cannot support the weight of fire equipment such as an engine	
3. Inadequate Water Supply	6-24-G130-PPT
The amount of water available is always a critical factor. It must be constantly evaluated for flow and total amount available.	
The flow at hydrants can be interrupted or experience a serious decrease in pressure resulting from heavy use of fixed water supplies. Be especially wary during power outages which can occur at any time during interface fires.	
• Do not waste water by wetting down roofs or ground fuels too far in advance of a fire front	
• Know your pump capacity and hose complement setup	
• Know the limits of your water supply, and top off your tank at every opportunity	

OUTLINE	AIDS & CUES
• A rule is to keep a reserve of 100 gallons in your tank for your own protection	
4. Natural Fuels 30 Feet or Closer to Structures	06-25-G130-PPT
Fuels that surround or are downslope of a structure present a situation where structure survivability is low and firefighter risk is high.	
• Beware when there is no defensible space (an area large enough to safely defend a structure) around the structure and no safety zone for personnel. If you do not have the ability to establish a safety zone, your location should be re-evaluated.	
• Always position engines and/or vehicles facing out the driveway for easy egress.	
• Watchout for the common practice by residents of stacking highly flammable firewood next to structures. Pre-treat firewood with foam if possible and time allows.	
• If time allows, remove fuel away from the structure with power and hand tools. Be aware that there may be times when residents try to stop firefighters from doing this.	

OUTLINE	AIDS & CUES
5. Extreme Fire Behavior *This behavior has been responsible for major losses of life and property within the wildland/ urban interface.* Conditions contributing to extreme fire behavior development: • Fuels are dry and plentiful • The atmosphere is either unstable or has been unstable for hours, and possibly days, prior to the fire • Topography is aligned with wind and aspect during the peak burning period • The eye level wind speed is greater than 15 miles per hour • Note: Dangerous and erratic fires have also burned at low wind speeds Characteristics of extreme fire behavior are: • High rates of spread • Crown fire development • Long and short distance spotting • Fire whirls • Intense burning	06-26-G130-PPT

OUTLINE	AIDS & CUES
Extreme fire behavior will create a complex and dangerous fire situation. Factors that create safety hazards and limit the effectiveness of firefighting resources are: • Safe egress of personnel may be in jeopardy if conditions worsen • The risk of being overrun may be high • When winds become gusty and erratic, the use of air attack becomes null • When fire behavior is increasing before peak burning conditions have arrived Firefighting efforts should be kept mobile and flexible. Resources should not be committed to a single water source. Do not allow other vehicles to block your escape routes. Firefighters must know when it is time to pull back to a safety zone. If necessary, the inside of a structure can be used as a safety zone while the fire front passes.	

OUTLINE	AIDS & CUES
6. Strong Winds	06-27-G130-PPT
• Increase rates of spread	
– The head and flanks will become more active	
– Both ground and aerial fuels may be involved resulting in crown fire development	
– Firebrands can be transported longer distances	
• The angle of the flame in relation to fuel is closer enhancing convective heat transfer	
• Increased air velocity supplies oxygen to fire which will increase fireline intensity	
• Create indrafts on one or both flanks or entire fire area	
7. Evacuation of Public (Panic)	06-28-G130-PPT
The basic reason for evacuation is to guarantee residents a safe and orderly egress from a fire threatened area, prior to the arrival of the fire front. This allows fire personnel to concentrate on fire operations and personal safety. Evacuation is usually handled by law enforcement agencies.	

OUTLINE	AIDS & CUES
• Evacuation is controversial. Law enforcement agencies are disinclined to force residents to evacuate. During initial attack, minimal lead time creates more of a panic flight than an evacuation. • During large fire scenarios with a command structure, contingency plans are prepared before evacuations. The Incident Management Team holds briefings about the fire situation for the general public. • During evacuations be aware that many law enforcement personnel lack the training and personal protective equipment for firefighting. They should have common communications and may also have to evacuate themselves during extreme fire situations.	
8. Structures Located in Chimneys, Box or Narrow Canyons, Saddles, or on Steep Slopes (30 percent or more) in Flashy Fuels Homes in these conditions have the lowest survivability and present the highest safety risk to firefighting personnel. Multiple Watchout Situations may exist due to the nature of topography and the potential for erratic fire behavior.	06-29-G130-PPT

OUTLINE	AIDS & CUES

• Chimneys are a path of least resistance for heat, smoke, and lethal gases
 	
• Box or narrow canyons
 	
  – Winds normally get channeled upslope in narrow canyons resulting in rapid rates of spread
 	
  – Radiant heat transfer from one slope to another is great. Fire easily spots across the canyon
 	
• Steep slopes in flashy fuels
 	
  – Accelerated rate of spread due to increased heat transfer through radiation and convection
 	
  – Spot fires can out flank the main fire
 	
  – Burning materials can roll downhill
 	
• Personnel safety concerns
 	
  – Chances of entrapment are extremely high
 	
  – Egress problems
 	
  – Extreme fire behavior	

OUTLINE	AIDS & CUES
– Lack of good safety zones	
– Fire can make several runs at structures from different directions	
9. Bridge Load Limits	06-30-G130-PPT
• Fire vehicles may exceed the weight limits of many rural bridges	
• Construction of bridges may be wooden beams and cross members, weakened by environmental conditions, age, or by the fire itself	
• Bridge width may not be adequate	
IV. STANDARD FIREFIGHTING ORDERS	
START THE LAST SECTION OF THE DVD (KREB'S INTERVIEW).	Risk Management for S-130 DVD, Part 4
1. Keep informed on fire weather conditions and forecasts.	Fire Behavior, Orders 1-3 06-31-G130-PPT
2. Know what your fire is doing at all times.	
3. Base all actions on current and expected behavior of the fire.	
4. Identify escape routes and safety zones, and make them known.	Fireline Safety, Orders 4-6 06-32-G130-PPT
5. Post lookouts when there is possible danger.	
6. Be alert. Keep calm. Think clearly. Act decisively.	

OUTLINE	AIDS & CUES
7. Maintain prompt communications with your forces, your supervisor and adjoining forces.	Organizational Control, Orders 7-9 06-33-G130-PPT
8. Give clear instructions and insure they are understood.	
9. Maintain control of your forces at all times.	
10. Fight fire aggressively, having provided for safety first.	Overall intent, Order 10 06-34-G130-PPT
The **Standard Firefighting Orders** were developed by a Task Force commissioned by Forest Service Chief Richard E. McArdle in 1957. The task force reviewed the records of 16 tragedy fires that occurred from 1937 to 1956. Both the Blackwater Fire of 1937 on the Shoshone National Forest and the Mann Gulch Fire at the Gates of the Mountains in 1949 contributed to the wisdom contained in the Standard Firefighting Orders.	
For the Standard Firefighting Orders to make sense, you must understand the intent of their sequencing, and grouping which provide a process for engagement and re-evaluation. The Standard Firefighting Orders are in fact your rules of engagement. Remember, the orders are designed to move up and down in sequence in an engagement and re-evaluation process.	
AT THE COMPLETION OF THE VIDEO REFER STUDENTS TO IRPG TO SHOW WHERE WE ARE IN THE RISK MANAGEMENT PROCESS.	IRPG (Green-Operational)

OUTLINE	AIDS & CUES
INVOLVE STUDENTS IN DISCUSSION OF THE STANDARD FIREFIGHTING ORDERS. RELATE THESE TO THE WATCHOUT SITUATIONS AND TO MATERIAL PRESENTED IN PREVIOUS UNITS. ENGAGE THE STUDENTS BY USING THE QUESTIONS IN THE OUTLINE. PROVIDE EXAMPLES BASED ON YOUR EXPERIENCE.	SW p. 6.11 thru 6.15
A. <u>#1 Keep informed on fire weather conditions and forecasts.</u>	
Weather will most often dictate where and how your fire will move.	
What weather factors are most important to know?	
• Temperature	
• Relative humidity	
• Wind (velocity, direction, changes)	
What personal observations can you make?	
• General assessment of temperature, dryness, and wind	
• Weather measurements on site	
• Observing on-site fire behavior	
– Flame length	
An 8' flame above a tree may not be a problem, where as 2' flame laying over the fireline may cause a change in tactics.	

OUTLINE	AIDS & CUES
– Smoke color – Ease/difficulty to extinguish fuels • Wind patterns in relation to local topography • Cloud type and extent of cover. Where might you obtain "off-site" weather information? • Daily weather - agency radio transmission • Request spot weather forecast • Incident facilities • Briefing from supervisor B. <u>#2 Know what your fire is doing at all times</u>. Observe, use lookouts and scouts. This is the basic order that all orders fall back on. What current information on the fire's status do you need to know? • Location of fire perimeter • How fast it is spreading • Direction of spread • Fuel related information (type, arrangement, etc.) • Fire behavior	

OUTLINE	AIDS & CUES
• Location of fuel or natural breaks • If it is spotting How do you obtain this information? • Personal observation • Scouts • A lookout or observer C. <u>#3 Base all actions on current and expected behavior of the fire.</u> Fire is not static. It will constantly move and grow until it is controlled. Once you have sized up the fire, begin to anticipate its movements. Current and expected fire behavior will help you do this. When applying this Standard Firefighting Order, what fire environment elements are considered? • Weather • Topography • Fuels What time of the day are burning conditions most active and why? • 1000-1700 (varies with geographic area and time of year) • Warmer temperatures	

OUTLINE	AIDS & CUES
• Lower humidity levels • Increased winds Where would most active burning take place for any operational period? • Above inversion layers • Thermal belts or mid-slope zones on night shift D. <u>#4 Identify escape routes and safety zones, and make them known.</u> This order must be in place before firefighters can become engaged. If the fire situation deteriorates, you can always move to a safety zone until the situation becomes clear to you. What would you consider when identifying escape routes and safety zones? • Escape routes clearly marked and identified to all; reassess as necessary • Safety zones of proper size considering number of personnel and fuel types **EMPHASIZE THAT ESCAPE ROUTES AND SAFETY ZONES MAY CHANGE DURING AN OPERATIONAL PERIOD.**	

OUTLINE	AIDS & CUES
E. #5 Post lookouts when there is possible danger. A lookout will be able to tell you **what your fire is doing**. The lookout can also take weather readings to help you predict future fire behavior. What things would you consider when assigning a lookout? • Must have communication with the crew/supervisor • Must have good fire knowledge and experience • Must be able to recognize hazardous situations F. #6 Be alert. Keep calm. Think clearly. Act decisively. You must first be clear and calm in your own mind to be safe and effective. If you are confused then move to a safety zone until the situation is clear again. Remember all of us, no matter what our experience level, will be confused and unsure of ourselves at times on the line. There are often just too many variables changing too fast for our minds to process. If you are confused, then move to your safety zone to watch and learn. What factors in the fire environment might adversely affect our alertness, thinking, judgment, and decision making ability?	

OUTLINE	AIDS & CUES

• Fatigue
 	
• Heat stress
 	
• Smoke (Carbon Monoxide)
 	
• Stress
 	
What can you do to prevent or reduce the effect of the following factors?
 	
• Fatigue and heat stress
 	
  – Maintain a good physical conditioning program.
 	
  – Maintain a proper diet
 	
  – Replace liquids
 	
  – Get sufficient rest and sleep
 	
• Carbon Monoxide
 	
  – Reduce intake/exposure
 	
• Stress
 	
  – Know and understand the situation
 	
What should you do to increase your decision making ability?
 	
• Maintain self control
 	
• Develop contingency plans
 	
• Become more cautious	

OUTLINE	AIDS & CUES
• Monitor the situation more closely • Double check critical information, calculations, etc. • Seek information and advice from others • Know your own limitations G. <u>#7 Maintain prompt communications with your forces, your supervisor and adjoining forces.</u> If your communication lines are broken then stop and take time to re-evaluate until the lines are open again. Who do you need to stay in communication with? • Crew members • Observers/lookouts • Supervisor What information do you need? • Instructions • Status changes/progress reports • Warnings Test radio equipment, carry extra batteries, establish contact schedules and contingency plan.	

OUTLINE	AIDS & CUES
Proper communications and information are vital to retaining control of personnel.	
H. #8 Give clear instructions and ensure they are understood.	
When in doubt, ask for clarification of instructions.	
Whose responsibility is it to ensure instructions are given and understood?	
• Your supervisor	
• You	
How do you "ensure understanding"?	
• Ask questions	
• Repeat feedback instructions or information	
I. #9 Maintain control of your forces at all times.	
How do you "maintain control"?	
• Ensure that assignments/instructions are clear and understood	
• Establish and maintain communication	
• Know location of your crewmembers at all times	
• Know current fire status	

OUTLINE	AIDS & CUES
J. <u>#10 Fight fire aggressively, having provided for safety first.</u> What safety considerations need to be taken into account prior to fighting fire aggressively? • Take action only after thoroughly scouting the area • Receive and understand instructions and assignments • Ensure lookouts alert personnel to danger • Maintain good communications • Ensure that strategy and tactics do not endanger firefighters • Know where your escape routes and safety zones are Before fully engaging, the **Standard Firefighting Orders** must be fully considered. If a safety problem arises at any point during engagement, then stop and re-evaluate the situation. Safety is written throughout the **Standard Firefighting Orders**. Always be prepared to re-evaluate and follow the sequence back through the orders at any time.	

OUTLINE	AIDS & CUES
V. SUMMARY Firefighter fatalities have occurred because firefighters, or those in charge, failed to recognize life threatening situations or they failed to take proper action once a life threatening situation was recognized. In the 1950s, the Standard Firefighting Orders were introduced as guidelines to prevent future fire fatalities. Fire fatality investigations, since that time, have proven conclusively that if **Watchout Situations** had been recognized, and proper **Standard Firefighting Orders** applied, the accidents could have been prevented.	
REVIEW UNIT OBJECTIVES.	06-35-G130-PPT

WATCH OUT SITUATIONS SCENARIO

The scenario you are about to see portrays a tragic fire that occurred in the eastern region of the United States. Watch Out Situations were not observed and/or mitigated. Firefighters lost their lives.

In analyzing this scenario, you are reaping the only benefit that can ever be salvaged from a fire tragedy: a learning experience, to minimize the possibility that this could
happen to you.

You will have the opportunity to recognize and react to "Watch Out Situations." Awareness of these hazardous situations is your key to survival in the wildland fire environment.

It is important that you look and listen at a high sensitivity level. Clues, both visual and verbal, will be apparent in this scenario, providing indicators that "Watch Out Situations" are present. Use the checklist on the following page to record your observations.

When the video/DVD is shut off, the class will work together as a group to answer the attached questions.

WATCH OUT SITUATIONS CHECKLIST

_____1. Fire not scouted and sized up.

_____2. In country not seen in daylight.

_____3. Safety zones and escape routes not identified.

_____4. Unfamiliar with weather and local factors influencing fire behavior.

_____5. Uninformed on strategy, tactics and hazards.

_____6. Instructions and assignments not clear.

_____7. No communication link with crew members/supervisor.

_____8. Constructing fireline without safe anchor point.

_____9. Building fireline downhill with fire below.

_____10. Attempting frontal assault on fire.

_____11. Unburned fuel between you and the fire.

_____12. Cannot see main fire, not in contact with anyone who can.

_____13. On a hillside where rolling material can ignite fuel below.

_____14. Weather is getting hotter and drier.

_____15. Wind increases and/or changes direction.

_____16. Getting frequent spot fires across line.

_____17. Terrain and fuels make escape to safety zones difficult.

_____18. Taking a nap near the fireline.

WATCH OUT SITUATIONS SCENARIO QUESTIONS

1. Which Watch Out Situations did you observe?

2. Was there an adequate briefing with Engine 731?

3. Why should weather and fuel conditions be part of the daily briefing?

4. What can crew members do if information is missing from the briefing?

5. Describe any other events you observed that contributed to the tragedy.

6. Why is it important to know what is happening on other divisions of the fire?

7. What is your number one priority?

WATCH OUT SITUATIONS SCENARIO ANSWERS

1. **Which Watch Out Situations did you observe?**
   #3 Safety zones and escape routes not identified.
   #5 Uninformed on strategy, tactics and hazards.
   #6 Instructions and assignments not clear.
   #7 No communications link with crew members/supervisor.
   #11 Unburned fuel between you and the fire.
   #14 Weather is getting hotter and drier.
   #15 Wind increases and/or changes direction.
   #16 Getting frequent spot fires across line.
   #17 Terrain and fuels make escape to safety zones difficult.

2. **Was there an adequate briefing with Engine 731?**
   No, very little information was exchanged and no confirmation of the communication was ever received.

3. **Why should weather and fuel conditions be part of the daily briefing?**
   The elements of weather and fuel conditions contribute significantly to fire behavior. Awareness is a major key.

4. **What can crew members do if information is missing from the briefing?**
   Ask questions, follow along with the Briefing Checklist in the Incident Response Pocket Guide to assure information is provided.

5. **Describe any other events you observed that contributed to the tragedy.**
   Multiple answers may apply here - discuss any that have not been touched on in #1 above.

6. **Why is it important to know what is happening on other divisions of the fire?**
   The activity on the other divisions can affect your safety and operations.

7. **What is your number one priority?**
   Safety.

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 7 – Risk Management: LCES

Time 1 Hour

Objectives

1. Describe how Lookouts, Communications, Escape routes and Safety zones (LCES) is related to the Standard Firefighting Orders.
2. Define escape route, escape time, and safety zone.
3. Identify travel barriers that will affect escape time.
4. List the three types of safety zone categories and describe one example of each.
5. Describe a general guideline for determining safety zone size to avoid radiant heat injury.
6. Identify the limitations of utilizing the Incident Response Pocket Guide safety zone guidelines.
7. Describe the difference between deployment sites and safety zones.

Strategy

This unit teaches the following skills identified as gaps for structural firefighters in the *Skills Crosswalk*:

- Follow established procedures in securing the fireline.
- Follow established procedures when working around fireline equipment.
- Identify hazards and safety procedures when working around fireline machinery.

Units 6, 7, 8, and 9 in this course are designed to explain the risk management process outlined in the Incident Pocket Response Guide (IRPG). These concepts are interrelated and can prove challenging to present.

In this unit, LCES is presented as the operational components of the Standard Firefighting Orders. It is important that the students understand this relationship to the Standard Firefighting Orders. These are the actions, the things firefighters do, to help control the hazards on the fireline.

Instructional Method(s)

- Informative lecture/discussion
- Instructional DVD/video

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software
- ☐ LCES video
- ☐ Incident Response Pocket Guide

Exercise(s)

- No exercises

Evaluation Method(s)

- Student's performance will not be evaluated in this unit.

Outline

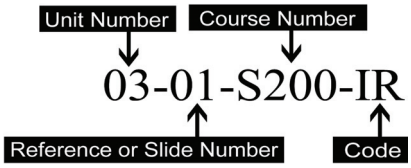
I. LCES and the Standard Firefighting Orders

II. Deployment Sites vs. Safety Zones

Aids and Cues Codes

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	IR – Instructor Reference
SW – Student Workbook	SR – Student Reference
HO – Handout	PPT – PowerPoint



UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 7 – Risk Management: LCES

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	07-01-G130-PPT
PRESENT UNIT OBJECTIVES.	07-02-G130-PPT 07-03-G130-PPT
I. LCES AND THE STANDARD FIREFIGHTING ORDERS	
HAND OUT ONE LCES DECAL TO EACH STUDENT.	
HAVE STUDENTS REFER TO LCES CHECKLIST IN IRPG.	IRPG (Green - Operational)
Firefighters operating in high-risk environments have developed some basic rules of engagement on the fireline. These rules were derived over time from wildland firefighters' experiences. Consequently their research and development cost was high, paid for by the mistakes of many firefighters. These are the Standard Firefighting Orders. These orders, if applied diligently, provide firefighters with a framework for organizing and assessing information concerning the fireline.	
Within the Standard Firefighting Orders, our basic rules of engagement are LCES, which represent the four key operational components of the Orders. LCES was developed by Paul Gleason.	07-04-G130-PPT

OUTLINE	AIDS & CUES
LCES must always be in place when working on the fireline. It is a tool that looks at the Watchout Situations to evaluate the assignment, identify the hazards, analyze the risks, and implement steps to ensure safety by interconnecting with the Standard Firefighting Orders, as its operational component.	
To reduce the risks of fire entrapment, lookouts must be posted with communications to each firefighter, and have a minimum of two escape routes from the firefighter's work location to a safety zone (not a shelter deployment site).	
The nature of wildfire suppression dictates continuous evaluation of LCES and the constant re-evaluation and establishment of LCES as the fire grows.	
Generally, the end goal of the 10 Standard Firefighting Orders and LCES is hazard control on the fireline; more specifically entrapment avoidance.	
MANY OF THE SITUATIONS REQUIRING LCES ARE RELATED TO THE WATCHOUT SITUATIONS. THESE CAN BE REFERENCED ON THE BACK COVER OF THE IRPG.	
THE LCES VIDEO IS TO BE SHOWN IN FOUR PARTS. SHOW PART ONE OF THE VIDEO (LOOKOUTS).	LCES Video Part 1
USE QUESTIONS BELOW TO DISCUSS POINTS OF THE VIDEO.	SW p. 7.3
A. Lookouts	
Black Water Fire - 1937, Wyoming. 15 Civilian Conservation Crew members killed.	

OUTLINE	AIDS & CUES
1. What would have posting lookouts done for the firefighters in this case? Provided advanced warning allowing time to avoid entrapment.	
2. What does the lookout need to be able to see? Lookout needs to be in a position where both the hazard and the firefighters can be seen.	
3. Who should be selected as a lookout? Selected individuals must be trained and skilled in observing the wildland fire environment and recognizing and anticipating changes in wildland fire behavior.	
DISCUSS VARIOUS POSITIONS THAT CAN BE USED AS LOOKOUTS/SCOUTS. FOR EXAMPLE, EXPERIENCED FIELD OBSERVERS, SINGLE RESOURCE OPERATIONS PERSONNEL, FIRE MONITORS.	
4. How many lookouts are needed? The number of lookouts needed is determined by the size of the fire and the terrain it covers.	
SHOW PART TWO OF THE LCES VIDEO (COMMUNICATIONS).	LCES Video Part 2
USE QUESTIONS BELOW TO DISCUSS POINTS OF THE VIDEO.	SW p. 7.4

OUTLINE	AIDS & CUES
B. Communications	
Battlement Creek Fire - 1976, Colorado. Three hotshots killed.	
1. What was the main contributing factor to this accident?	
Miscommunication	
2. What are some barriers to communication?	
Language, ego, work cultures, terminology	
3. The method used to alert firefighters of approaching hazards must be what?	
Prompt and clear	
4. What communication devices/methods could be used?	
Radios, phones, word-of-mouth, flagging, face-to-face communication is the most effective.	
REITERATE TO STUDENTS THAT IF THEY HAVE DOUBTS ABOUT THEIR ABILITY TO COMMUNICATE, BACK OFF. TAKE THE TIME TO GET IT RIGHT—COMMUNICATION NEEDS TO BE CLEAR AND CONCISE!	
SHOW PART THREE OF THE LCES VIDEO (ESCAPE ROUTES).	LCES Video Part 3

OUTLINE	AIDS & CUES
USE THE QUESTIONS BELOW TO DISCUSS POINTS OF THE VIDEO.	SW p. 7.4 thru 7.5
C. Escape Routes	
Loop Fire - 1966, California. 12 hotshot crew members killed and another 9 were injured.	
1. What was this crew attempting to do?	
Construct line downhill	
2. What happened?	
Firefighters where entrapped and burned over.	
3. How could escape routes have been established to avoid this tragedy?	
Under the conditions present at the time, i.e., mid-afternoon, the lack of adequate escape routes in this steep topography should have prompted managers and firefighters to consider other alternatives. If the hazards could not be mitigated, the mission should have been turned down. This tragedy is an example of a failure to implement hazard assessment and control.	
4. How would you define an escape route?	
An escape route is a path the firefighter takes from a location exposed to danger to an area of safety.	

OUTLINE	AIDS & CUES
5. What is escape time? The time it takes for all involved to make it to an area of safety. 6. What are some travel barriers you might encounter that will increase escape time? Loose soil, rocky and difficult terrain, vegetation, uphill routes, downed timber, creek crossings, heavy smoke, night operations, panic of personnel, and potentially dangerous wildlife. 7. When might you need to re-evaluate or change your escape routes? Situation changes, i.e., changing weather conditions, forecasts, fire behavior, location/topography, fuels. 8. How many escape routes should be available to the firefighter? Why? More than one. Evaluate locations in front, to the rear, and on both sides of the firefighter. Fireline constructed indirect attack or parallel (leaving unburned fuel between you and the fire) to the fire, may compound situations. Unless safety zones have been identified ahead, behind, and to the sides, firefighter retreat may not be possible.	

OUTLINE	AIDS & CUES
DISCUSS WHY FIREFIGHTERS MAY BE INSTRUCTED TO DISCARD EQUIPMENT (HANDTOOLS, SAWS, ETC.) AND PACKS (TO LIGHTEN THEIR LOAD AND DECREASE TIME NEEDED TO REACH SAFETY ZONES). AT ALL COSTS, DO NOT DISCARD THE FIRE SHELTER.	
SHOW PART FOUR OF THE LCES VIDEO (SAFETY ZONES).	LCES Video Part 4
USE THE QUESTIONS BELOW TO DISCUSS POINTS OF THE VIDEO.	SW p. 7.6 thru 7.8
D. Safety Zones	
1. What is a safety zone?	
A safety zone is a place where a fire shelter is not needed. Safety zones are locations where the threatened firefighter may find refuge from danger.	
There are a variety of areas that will work as safety zones. They fall into general categories - natural and constructed.	
THROUGH CLASS INTERACTIONS AND THE SLIDES PRESENTED, DISCUSS THE QUALITIES UNIQUE TO EACH TYPE OF SAFETY ZONE.	
2. Safety zone categories	
a. The burn	
b. Natural features	
c. Constructed features	

OUTLINE	AIDS & CUES
3. Examples of these types of safety zones may include:	
a. The Burn: The burn, or commonly referred to as the black. What is unique about this photo is there is nothing left to burn, it is true black. There are no visible smokes and no open flame, indicating that there is little or no heat present at this safety zone.	07-05-G130-PPT
b. Natural: This large green meadow is an excellent example of a natural safety zone. It is large in size and devoid of any heavy fuel accumulation. If needed, it may be prepped by burning the grass. But in general, it represents a safety zone that needs little or no preparation.	07-06-G130-PPT
c. Natural: This photo was taken at a ridge-top meadow that would be more than adequate as a safety zone. Despite the large pine trees, the ground fuels are short and could easily be burned off, eliminating any chance of a surface fire reaching up into the pines.	07-07-G130-PPT
d. Natural: This photo represents another common natural safety zone. What are some of the factors that should be considered while viewing this photo?	07-08-G130-PPT

OUTLINE	AIDS & CUES
e. Constructed: Burning-out, commonly referred to as the blackline concept, is securing control lines by removing fuels between the fire and the control line. What is unique about this is that the fuels are removed as firefighters progress and there is nothing left to burn, it is true black. Fire intensities decrease as fuels burn up and heat dissipates over time as this safety zone is constructed.	07-09-G130-PPT
f. Constructed: This site was constructed with fire equipment. This historic photo illustrates the classic safety zone construction. Bulldozers are excellent in removing any combustible fuels from the safety zone.	07-10-G130-PPT
g. Constructed: This photo taken at the Silver Creek spike camp/ helispot. It has been burned out and the rock slope is free of burnable fuels.	07-11-G130-PPT
h. Constructed (agricultural): These orchards may provide an excellent safety zone for firefighters. The obvious safety zone would be deep into the orchard. The only preparation for this sites would be to turn on the sprinkler system if available.	07-12-G130-PPT

OUTLINE	AIDS & CUES
*Note: Years with extreme drought conditions might cause this area to not be a safety zone, i.e., Wenatchee Heights burnover.	
i. Constructed (agricultural): This is a grazed area. What would need to be done to this site to ensure its use as a safety zone?	07-13-G130-PPT
j. Constructed (forestry): This is a clear cut. Is this a good safety zone? If the answer is yes, what preparation needs to take place. Discuss.	07-14-G130-PPT
k. Constructed (urban): Shown in the next two photos are existing roads and highways that may serve as safety zones. What do these photos have in common? Are they adequate safety zones? Would they be adequate to support engine crews and/or hand crews? Is there any preparation that can be done?	07-15-G130-PPT 07-16-G130-PPT
4. Determining the size and location of an effective safety zone. Determining the actual size of a safety zone is no easy task. There is no black and white answer to determine how big a safety zone must be in order to be effective. However, the Incident Pocket Response Guide provides firefighters with guidance for safety zone assessment.	IRPG (Green-Operational, Safety Zone Guidelines)

OUTLINE	AIDS & CUES
Effective safety zones must be preplanned. This requires that safety zones be completed before they are needed. Firefighters must feel confident all safety issues have been identified and mitigated. Safety zones must be pre-located to avoid: • Locations that are downwind from the fire • Locations that are in chimneys, saddles or narrow canyons • Locations that require a steep uphill escape route (greater than 50 percent slope) • Exposure to heavy fuel concentrations on the windward side of ridges, rocks and other solid objects Effective safety zones must be of sufficient size to mitigate the effects of radiant and convective heat while providing adequate space for the number of occupants. **EMPHASIZE THAT THE IRPG GUIDELINES ONLY IDENTIFY THE SEPARATION DISTANCE NEEDED TO REDUCE THE EFFECT OF RADIANT HEAT TRANSFER.**	

OUTLINE	AIDS & CUES
The IRPG table assumes no slope or wind. Convection is not addressed. Convective heat transfer from wind, fire whirls and terrain influences will significantly increase the total heat transfer to firefighters and thus require significant increases in the distance separation guidelines.	
5. Scenario - Safety Zones	
During the fire season of 2001, fourteen firefighters and two civilians deployed their fire shelters while battling the Thirtymile Fire on the Okanogan-Wenatchee National Forest. Their only escape route was cut off and they retreated up canyon to what was believed to be a safety zone.	
SHOW SLIDES OF THE SITE AND DISCUSS.	07-17-G130-PPT 07-18-G130-PPT
The site was approximately ½ acre (100 feet by 100 feet) in size located adjacent to a rock talus and riparian vegetation. The fire burned as a crown fire resulting in flame lengths 60-100 feet high.	
HAVE CLASS USE IRPG TO DETERMINE MINIMUM SAFETY ZONE SIZE. **AT MINIMUM (WITH NO SLOPE AND NO WIND) THESE FIREFIGHTERS NEEDED A SEPARATION DISTANCE EXCEEDING 400 FEET (12 ACRES) TO REDUCE THE THREAT OF INJURY.**	IRPG (Green-Operational, Safety Zone Guidelines)

OUTLINE	AIDS & CUES
REFER TO SLIDES, DISCUSS PROCESS OF REASSESSING SITUATION WHEN CONDITIONS CHANGE, AND REITERATE THE IMPORTANCE OF PREPLANNING SAFETY ZONES. LINK TO LCES TO ENSURE NEW INFORMATION IS CONSIDERED.	
II. DEPLOYMENT SITES VS. SAFETY ZONES	
A. What is a deployment site and when should it be used?	
1. Deployment sites are used when fire conditions are such that escape routes and safety zones have been compromised.	
2. Deployment sites are last resort locations with generally light fuels in which a firefighter must deploy a fire shelter to aid in survival.	
3. REMEMBER....Safety zones are locations where the threatened firefighter may find refuge from danger without the aid of a fire shelter.	
B. Determining when to seek refuge may or may not be easily identifiable to all fire fighters.	
1. Stay alert to changing fire conditions and safety zone locations.	
2. As line construction proceeds, your position changes in relation to safety zones and escape routes.	

OUTLINE	AIDS & CUES
3. Quality LCES will help ensure timely warnings and adequate escape times.	
REFER TO SLIDE AND DISCUSS DECISION PROCESS.	07-19-G130-PPT
C. Scenarios	SW p. 7.9
THROUGH CLASS INTERACTIONS AND SLIDE PRESENTATION DISCUSS THE CONCEPTS AND QUESTIONS PRESENTED BELOW.	
1. This photo of the Butte Fire shows the steep ridge with continuous heavy fuels below the ridge line. Crews assigned to this section of the control line were to fire off and secure control lines. What factors need to be evaluated to determine if this is a deployment site or a safety zone? Flame lengths, rate of spread, wind speed, wind direction, relative humidity, fuel loading, horizontal arrangement, vertical continuity, and slope. Two crews effectively used the large clear cut for a safety zone.	07-20-G130-PPT
2. We have previously identified these photos as natural safety zones. In the first photo if the large pine trees torched out would your opinion change? Why?	07-21-G130-PPT 07-22-G130-PPT

OUTLINE	AIDS & CUES
The second photo shows timber in the background that may be prone to extreme fire behavior. Would time of day affect your opinion of this meadow as a safety zone? Why?	
REVIEW UNIT OBJECTIVES.	07-23-G130-PPT 07-24-G130-PPT

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 8 – Risk Management: Fire Shelters

Time 2 Hours

Objectives

1. Explain the two most important functions of the fire shelter.
2. Discuss the inspection and care of the fire shelter.
3. Discuss the last resort survival options.
4. Discuss entrapment and deployment site.
5. Demonstrate the correct deployment procedures for the fire shelter in 25 seconds or less.

Strategy

This unit addresses the need for structural firefighters to know how to use a fire shelter. This is a gap in skill identified by the *Skills Crosswalk*.

Units 6, 7, 8, and 9 are designed to explain the risk management process outlined in the Incident Pocket Response Guide (IRPG). These concepts are interrelated and can prove challenging to present.

This unit discusses the use of the fire shelter and entrapment, and last resort survival alternatives.

Instructional Method(s)

- Informative lecture/discussion

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software
- ☐ Appropriate version of a practice fire shelter
- ☐ "Using Your Fire Shelter": 2001 edition, video and Your Fire Shelter: 2001 edition, pamphlet

OR

- ☐ "The New Generation Fire Shelter" DVD and The New Generation Fire Shelter pamphlet

Exercise(s)

- Practice fire shelter deployment

Evaluation Method(s)

- Student's performance of fire shelter deployment will be evaluated.

Outline

I. Introduction

II. Shelter Inspection and Care

III. Last Resort Survival Options

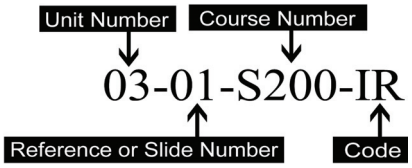
IV. Summary and Review

V. Application/Evaluation

Aids and Cues Codes

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	IR – Instructor Reference
SW – Student Workbook	SR – Student Reference
HO – Handout	PPT– PowerPoint



UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 8 – Risk Management: Fire Shelters

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	08-01-G130-PPT
PRESENT UNIT OBJECTIVES.	08-02-G130-PPT
THIS LESSON IS BASED ON THE FIRE SHELTER PAMPHLET AND VIDEO OR DVD. THE TYPE OF FIRE SHELTER BEING USED [“OLD VERSION” VERSUS “NEW GENERATION FIRE SHELTER”] WILL DETERMINE THE APPROPRIATE VIDEO/ DVD AND PAMPHLET TO USE IN THIS LESSON. SEE APPENDIX A FOR ORDERING INFORMATION. INFORMATION PROVIDED HERE MAY NEED TO BE UPDATED BASED ON THE FIRE SHELTER BEING USED.	
STUDENTS MUST BE ADVISED THAT THEY WILL BE REQUIRED TO DEMONSTRATE PROPER FIRE SHELTER DEPLOYMENT AND ENTRAPMENT PROCEDURES IN 25 SECONDS OR LESS TO PASS THIS LESSON.	
STUDENTS FAILING TO SUCCESSFULLY DEMONSTRATE PROPER FIRE SHELTER DEPLOYMENT WILL BE GIVEN ADDITIONAL TRAINING UNTIL PROFICIENT AT DEPLOYMENT IN 25 SECONDS OR LESS.	

OUTLINE	AIDS & CUES
CONSIDER SHELTER DEPLOYMENT PRACTICE IN TERRAIN SIMILAR TO THOSE FOUND IN FIRE SUPPRESSION ENVIRONMENTS (INCLUDING STEEP, UNEVEN GROUND AND WINDY CONDITIONS).	
I. INTRODUCTION	
A fire shelter is an item of PPE, used only as a last resort. Use can increase your chances of surviving a life threatening burnover situation. However, the fire shelter is not a means to take chances and is not a substitute for following the Standard Firefighting Orders and Watchout Situations. It is intended to be used as YOUR LAST RESORT to survive fire entrapment.	
HAND OUT THE APPROPRIATE FIRE SHELTER PAMPHLET TO EACH STUDENT.	Your Fire Shelter pamphlet OR New Generation Fire Shelter pamphlet 08-03-G130-PPT
A. Two Most Important Functions of the Fire Shelter	
1. To reflect radiant heat. It is NOT designed for direct flame contact.	
2. To provide cooler, breathable air to protect your lungs and airway.	
You can survive third-degree burns; you can't survive scorched lungs and airway.	

OUTLINE	AIDS & CUES
B. Mandatory Carrying	08-04-G130-PPT
A fire shelter will be carried by:	
• All fireline personnel during all phases of fire suppression and prescribed fire operations.	
• All fire support personnel, such as drivers, who may be required to enter a fire area.	
C. Items to Wear and Take into Fire Shelter	08-05-G130-PPT
1. Gloves. Without gloves on it is very difficult to hold down the shelter while entrapped.	
2. Radio. Maintain communications with other trapped firefighters by radio. If radio is unavailable, shout back and forth.	
3. Hard hat. The hard hat will help keep the shelter away from your head and provide protection from radiant heat.	
4. Water. Water is vital during entrapment. Drinking water allows your body to continue to sweat, aiding in the natural cooling process. Never wet clothing or wear moistened respiratory protection (wet bandana).	

OUTLINE	AIDS & CUES
SHOW THE APPROPRIATE FIRE SHELTER VIDEO/DVD. UPDATE STUDENTS ON CURRENT SHELTERS AND TECHNIQUES.	Using Your Fire Shelter: 2001 ed., Video OR The New Generation Fire Shelter DVD
REFER STUDENTS TO PAMPHLET WHILE DISCUSSING THE FOLLOWING INFORMATION.	Fire Shelter pamphlet
II. SHELTER INSPECTION AND CARE	
A. Visual Inspection of the Shelter in the Polyethylene Case (should be made):	
1. When the fire shelter is issued to you.	
2. At the beginning of each fire season.	
3. Every two weeks during the fire season.	
B. Fire Shelter Damage	
1. Abrasion is the most common damage. Signs of abrasion include:	
a. Gray vinyl bag through which you cannot see the shelter, or visible dark gray stains.	
b. Aluminum particles in the bottom of the bag.	

OUTLINE	AIDS & CUES
2. Other signs of damage include:	
a. Tears along folded edges exceeding 1/4".	
b. Dents or punctures in the foil over one-inch wide.	
c. One-half inch or more of foil is missing.	
Remove the shelter from service if any of the above damages are detected. Any shelter that has been opened for inspection or used for demonstration will need to be replaced.	
Pinholes and small tears will not reduce your protection. You are still better off inside your shelter.	
PROVIDE EXAMPLES OF NEW AND DAMAGED FIRE SHELTERS IF POSSIBLE.	
C. Care and Handling	08-06-G130-PPT
1. Keep the shelter away from sharp objects that may puncture it.	
2. Do not load heavy objects on top of the shelter.	
3. Avoid as much rough handling as possible.	
4. Do not lean against objects when wearing the shelter.	

OUTLINE	AIDS & CUES
5. Do not sit on the shelter or use it as a pillow.	08-07-G130-PPT
6. Carry the fire shelter in the polyethylene liner provided.	
7. Fire shelters should be carried where they can be quickly reached, even on the run. NEVER inside your pack.	
8. Treat your fire shelter with respect. It is a vital item of your personal safety gear.	
III. LAST RESORT SURVIVAL OPTIONS	
REFER STUDENTS TO GRAPHIC DEPICTING MISTAKES THAT LEAD TO ENTRAPMENT. STRESS THE IDEA THAT ENTRAPMENT AVOIDANCE RESULTS FROM DISCIPLINED SITUATIONAL AWARENESS COUPLED WITH A RESPECT FOR FIRE AS A NATURAL FORCE.	08-08-G130-PPT
A. Introduction	
1. Stay alert, keep calm, think clearly and act decisively. DON'T PANIC.	08-09-G130-PPT
2. Full Personal Protective Equipment (PPE) is required, especially a hard-hat and gloves!	
3. Protect your airway. People have been burned severely on other parts of the body and have completely recovered.	

OUTLINE	AIDS & CUES
4. Escape if possible. Outrun the flanks and get below the fire. If in light fuels and you can see the other side of the flame front run through the flames into the black. The fire shelter can also be used as a heat shield when moving. Always try to get to the best clearing possible with the time available.	
5. Make it a habit and part of your situational awareness to note survivable deployment sites throughout the work day, e.g., clearings, meadows, rocks, caves, mine-shafts, lee sides of ridges, streams, rivers, lakes, and swamps.	
6. Never plan to share a shelter. The shelter is designed for one person; the extra space is needed for insulation. Two people have survived in one shelter, but the risk of injury dramatically increases.	
VISUALIZATION IS A TECHNIQUE DESCRIBED IN USING YOUR FIRE SHELTER. THIS IS NOT A REPLACEMENT FOR HANDS ON TRAINING, BUT CAN BE USED TO COMPLEMENT HANDS ON TRAINING.	
B. Entrapment is imminent, but there is **Time to Prepare**.	08-10-G130-PPT

OUTLINE	AIDS & CUES
1. Drop any gear that will not be needed in the site preparation, e.g., packs, saws, and fuel and fusees (keep fusees if considering burnout). The bare minimums should be the fire shelter, a tool for removing ground fuel, and some drinking water. Dropping your gear will increase your speed in moving to a better area to deploy your shelter and your ability to get into the shelter.	
2. Avoid hazardous terrain and heavy fuels, e.g., narrow/box canyons, chimneys, saddles, debris filled rock piles, and areas with heavy concentrations of fuel. Be aware of snags, rolling rocks and any area that may have vehicle travel. If needed, block the roadway to prevent injury from any vehicles.	
3. Rivers, streams, ponds, lakes	
a. About 2 feet in water depth that will cover your body, can save your life.	
b. Cover your head with your shelter to create an airway.	
c. Use caution in deep pools, rapid currents, and near waterfalls.	

OUTLINE	AIDS & CUES
4. Site preparation can reduce the potential fire intensity by improving the radiant heat distance separation. Cut and scatter as many of the fuels as possible. Remember time is a huge factor in this task. So your situation must be constantly reassessed based on the fire behavior observed.	
5. Individual site preparation considerations:	
a. Seek the lowest point.	
b. Greatest distance from the nearest fuels.	
c. Smooth surface textures for shelter seal.	
d. Utilize heat barriers.	
e. Remove ground fuels (4' x 8').	
f. Prepare to deploy as a crew with shelters grouped as close together as possible.	
6. Consider starting a burnout if you have time.	
a. Burnouts:	
• Aid in fuel reduction	

OUTLINE	AIDS & CUES
• Reduce radiant heat • Help avoid direct flame impingement b. Be aware that a burnout might pull the advancing main fire toward you at a greater rate of spread. c. Burnouts must not jeopardize other individuals. d. Consider burnouts only in light fuels. 7. Air resources may be an option, but may not always be available. 8. Do not wait until the flame front is upon you to get into the shelter. C. No Time for Preparation, and the **Fire is on You**. 1. Immediately deploy if there are hot embers raining down on you. Quickly find a depression, road cut, large boulder, or a dirt berm to use as a heat barrier. 2. You will be hit with a blast of superheated air before the flame front reaches you. To avoid the impact: a. Drop to the ground as quickly as possible and do whatever it takes to get into your shelter.	

OUTLINE	AIDS & CUES
b. Find the lowest point available and get face down into the dirt.	
c. Dig a shallow hole and use a dry bandana to breathe through.	
3. Position your feet toward the fire.	
4. At all costs hang onto the shelter; the winds will be turbulent and powerful.	
5. Be prepared for the long-haul; entrapments have lasted up to 90 minutes. Drink water and stay calm.	
6. **Stay in your shelter.** The hardest thing you will be faced with is the natural instinct to flee or to help your fellow firefighters. Think about your family or your crew. STAY FOCUSED AND DO NOT LEAVE YOUR SHELTER.	
7. The noise will be horrendous. As the front passes the noise will lessen and the winds will decrease. Do not let this fool you. Another wave of fire may be on its way. At this point lift up a small portion of your shelter and take a look. WHEN IN DOUBT WAIT IT OUT.	
8. Do not leave your shelter until it is cold to the touch, or told to do so by a supervisor.	

OUTLINE	AIDS & CUES
D. Heat Barrier Options	08-11-G130-PPT
THE FOLLOWING ITEMS DISCUSSED CAN OFFER A TEMPORARY BARRIER FROM HEAT AND FLAMES AS THE FIRE FRONT PASSES. THEY ARE MENTIONED ONLY AS LAST RESORT SURVIVAL ALTERNATIVES!	
1. Vehicles as barriers	
a. If possible, consider driving out of the area.	
b. Vehicles such as crew rigs and engines can provide some heat barrier protection in LIGHT FUELS.	
c. Always try to move the vehicle away from fuels to the clearest area possible.	
d. Close all doors windows and vents. Line windows with your shelter to reflect the radiant heat.	
e. Lie down on the floor and face away from the flame front; protect your airway.	
f. Hazards associated with remaining in the vehicle include toxic smoke, melting plastic, etc. If forced to exit the vehicle due to hazards or flame impingement, exit rapidly away from the flaming front and deploy you a shelter.	

OUTLINE	AIDS & CUES
2. Dozers, tractor plows, and water-tenders as barriers a. Fuels can be removed by using the dozer or grader. b. Heavy equipment does not move quickly. c. If time allows, construct a berm to use as a heat barrier and deploy behind it. d. Keep the blade facing toward the fire. e. Use caution in seeking refuge inside the enclosed cabs in these vehicles. Temperatures will be much higher at cab height than ground level. f. Additional hazards include shattered windows, ruptured hydraulic lines, and toxic smoke emitted from burning plastics. g. Distance yourself from the vehicle but allow it to act as a heat barrier when deploying your shelter. h. Remember to only consider this option in LIGHT FUELS.	

OUTLINE	AIDS & CUES
3. Structures as barriers a. Structures can offer a good heat barrier. They may eventually burn down but will offer protection as flaming front passes. b. Consider the size and construction materials, e.g., wood, bricks, concrete, metal. Vinyl siding is toxic when burning. c. Stay outside to protect the structure, but allow for ample time to enter when the front hits. d. Be aware of electrical and chemical hazards. e. Preparation includes moving flammables away from the structure. f. Burn out around the structure if possible. g. Stay on the floor, near an exit, away from the flame front and away from windows if possible. h. Stay calm, close all shades and wait for the front to pass.	

OUTLINE	AIDS & CUES
i. Be prepared to exit quickly if heat and smoke become too much. Once outside, stay low, move away from the structure, protect your airway and deploy your shelter.	
The Standard Firefighting Orders, LCES, and the Watchout Situations are tools that must be used on every assignment. If they are used properly, the LAST RESORT SURVIVAL techniques should not be needed. Learn to use them!	08-12-G130-PPT
IV. SUMMARY AND REVIEW	
INVOLVE THE STUDENTS IN A DISCUSSION FOR SUMMARY AND REVIEW.	
A. What is a Fire Shelter?	
1. An aluminized, heat reflective, personal, protective pup-tent.	
2. Required when performing fireline work.	
3. Simple to use.	
4. Proven to work in actual field conditions.	
5. DOES NOT GUARANTEE YOUR SAFETY. IT IS A LAST RESORT.	
6. Has two important functions:	
a. Provides cooler, breathable air to protect your lungs and airways.	

OUTLINE	AIDS & CUES
b. Reflects radiant heat.	
B. What a Fire Shelter is Not:	
1. Reason to ignore erratic and extreme fire behavior indicators.	
2. A substitute for the Standard Firefighting Orders.	
3. A replacement for the Watchout Situations.	
4. An alternative for LCES.	
5. Not intended to have prolonged direct flame contact. It is important not to set up next to jackpot fuels.	
C. Your Fire Shelter Must be Available and in Good Condition.	
The fire shelter is intended to be used as YOUR LAST RESORT.	
D. Fire Shelter Training Recommendations	
1. Shelter training is mandatory every year.	
2. Shelter deployment practice should occur several times during the fire season.	
REVIEW UNIT OBJECTIVES.	08-13-G130-PPT

OUTLINE	AIDS & CUES
V. APPLICATION/EVALUATION **HAVE SEVERAL PRACTICE FIRE SHELTERS AVAILABLE FOR THE STUDENTS TO WORK ON DEPLOYMENT TECHNIQUES IN PAIRS OR SMALL GROUPS.** **INSTRUCTOR SHOULD DEMONSTRATE THE CORRECT DEPLOYMENT PROCEDURES FOR THE FIRE SHELTER IN 25 SECONDS OR LESS.** **HAVE EACH STUDENT CORRECTLY DEPLOY A FIRE SHELTER WEARING ALL PPE UNTIL PROFICIENT IN 25 SECONDS OR LESS.**	

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 9 – Risk Management: Hazards and Human Factors on the Fireline

Time 3 Hours

Objectives

1. Define safety.
2. Define Situation Awareness and describe why it is important.
3. State the five communication responsibilities.
4. Identify potential hazards in the fire environment.
5. Define the Risk Management Process and describe why it is important.
6. Describe actions that foster teamwork.

Strategy

This unit addresses the need for structural firefighters to identify wildland fire situations that warrant immediate action and/or reporting. This is a gap in skill identified by the *Skills Crosswalk*.

Units 6, 7, 8, and 9 of this course are designed to explain the risk management process outlined in the Incident Pocket Response Guide (IRPG). These concepts are interrelated and can prove challenging to present.

This unit introduces students to key concepts regarding situation awareness, communication responsibilities, and teamwork. Even though the firefighter will typically be a follower in the fire environment, it is important for them to understand they have a role in assisting the decision maker by providing input, identifying hazards, asking questions for clarification, and showing initiative to accomplish the leader's intent.

Instructional Method(s)

- Informative lecture/discussion
- Instructional video

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software

- ☐ Fireline Handbook - FHB
- ☐ Incident Response Pocket Guide - IRPG
- ☐ "Human Factors on the Fireline" video, L-180

Exercise(s)

- No exercises

Evaluation Method(s)

- Student's performance will not be evaluated in this unit.

Outline

I. Introduction

II. Safety

III. Human Factors on the Fireline

IV. The Fireline Environment

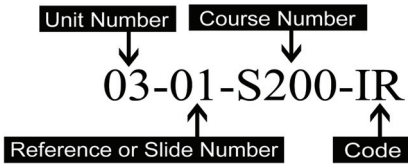
V. Risk Management Process

VI. Teamwork

Aids and Cues Codes

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	IR – Instructor Reference
SW – Student Workbook	SR – Student Reference
HO – Handout	PPT– PowerPoint



UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 9 – Risk Management: Hazards and Human Factors on the Fireline

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	09-01-G130-PPT
PRESENT UNIT OBJECTIVES.	09-02-G130-PPT
I. INTRODUCTION	
Wildland firefighting is a dynamic and dangerous job. It requires that you be thoroughly familiar with the hazards of the fireline and the surrounding area.	
Your life and the lives of others may depend upon your ability to recognize a dangerous situation long before it develops. "Safety is a matter of common sense. Use it and you will keep yourself and others out of trouble and get the job done safely."	
All personnel have an obligation to work safely and to protect themselves and others from injury.	
During recent years, firefighters have been injured or killed because of their failure to adequately recognize and respond appropriately to hazards to themselves and others working around them. The trend in wildland fires for the 21st century is for increased severity and occurrence. This increase is due to several factors.	

OUTLINE	AIDS & CUES
Two of the most important reasons are the continued expansion of home building in areas surrounded by wildland fuels (the wildland/urban interface), and wildland fuel accumulations resulting from 100 years of fire suppression. This translates into the need for more firefighters to combat the increased severity and occurrence of fires resulting in an overall increase in exposure to hazards.	
You, as a firefighter, must remain alert and aware of all hazards to which you might be exposed.	
II. SAFETY	
Defined in Webster's Dictionary as:	
A. The condition of being safe from undergoing or causing hurt, injury, or loss.	
B. A device on a piece of equipment to reduce hazard.	
C. Freedom from exposure to danger, exemption from injury, and protected from injury.	
WITH THESE DEFINITIONS IN MIND, ASK THE STUDENTS TO CONSIDER:	
IS SAFETY SOMETHING WE DO? OR IS SAFETY THE RESULT OF DOING THINGS RIGHT?	
THE BEST ANSWER SHOULD BE THE RESULT OF DOING THINGS RIGHT. SAFETY TAKES DOING THINGS THE CORRECT AND PROVEN WAY WHICH MINIMIZES RISK (BY CONTROLLING EXPOSURE TO KNOWN HAZARDS) AND ULTIMATELY RESULTS IN THE STATE OF BEING SAFE.	

OUTLINE	AIDS & CUES
Our greatest chance of obtaining the desired state of safety as defined by Webster is the application of our most powerful tool – the brain of the wildland firefighter individually and collectively!	
REFER STUDENTS TO THE FRONT AND BACK COVERS OF THE FHB.	FHB
III. HUMAN FACTORS ON THE FIRELINE	
A. Introduction	
As stated before, wildland firefighting is high-risk work done in a hazardous environment where individuals, such as beginning firefighters, can be killed or seriously injured.	
Most fatalities and accidents are the direct result of errors in human judgment. This lesson is designed to introduce you to some of the Human Factors commonly encountered on the fireline.	
The intent of this lesson is for you to become familiar with Human Factors which affect firefighter safety and productivity, and understand the implications of not recognizing the impact of these factors.	
SHOW VIDEO SEGMENT 1 FROM THE "HUMAN FACTORS ON THE FIRELINE" COURSE. USE THE FOLLOWING QUESTIONS TO DISCUSS AND REINFORCE THE MATERIAL PRESENTED IN THE VIDEO TO THE STUDENTS.	Human Factors on the Fireline Video Segment 1

OUTLINE	AIDS & CUES
STRESS TO THE STUDENTS THAT WHILE THE VIDEO WILL CONTAIN CONCEPTS GEARED TOWARD THE ADVANCED FIREFIGHTER AUDIENCE, MOST OF THE MATERIAL IS RELEVANT TO FIREFIGHTERS AT ALL LEVELS OF THE ORGANIZATION.	
B. Situation Awareness	
<u>DISCUSSION QUESTIONS FOR VIDEO SEGMENT 1</u>	
CALL ON STUDENTS TO ANSWER QUESTION, OR ALLOW 5 MINUTES PER GROUP OF QUESTIONS TO ALLOW STUDENTS TO WRITE DOWN THEIR THOUGHTS.	SW p. 9.3 thru 9.4
1. What concepts discussed in this first video segment do you think are relevant to the job of firefighting?	
• High risk environment	
• Requires teamwork	
• Subject to extreme conditions	
• Potential consequences are high if accidents do occur	
2. How much "human factor" do you think is involved in a wildland firefighter's job?	
• A high percentage	

OUTLINE	AIDS & CUES
3. Do you perceive human error as being a major factor when accidents occur? Do you think it will be any different on the fireline? • Most wildland fire accidents are rooted in human error. 4. What is situation awareness (SA)? • Gathering information by observation and communication • Foundation of all the decision making • Ongoing cycle 5. Why should you, as a beginning firefighter, maintain good situation awareness? • You cannot depend entirely on your supervisor to see everything that is out there • Each individual must start taking ownership in their safety from their first fire • SA enables us to detect problems early	

OUTLINE	AIDS & CUES
6. Do you think maintaining your situation awareness on the fireline will be difficult? Why? • Inexperience • Stress (both personal and job related) • Fatigue • Distractions (environmental, personal, etc.) • Attitude 7. What happens when you become distracted in any work environment? • You become focused on less important things and may not notice a problem or hazard • Decision making capability is reduced • Your ability to filter for the important information is diminished	
C. Communication	
SHOW VIDEO SEGMENT 2 FROM THE "HUMAN FACTORS ON THE FIRELINE" COURSE. USE THE FOLLOWING QUESTIONS TO DISCUSS AND REINFORCE THE MATERIAL PRESENTED IN THE VIDEO TO THE STUDENTS.	Human Factors on the Fireline Video Segment 2

OUTLINE	AIDS & CUES
DISCUSSION QUESTIONS FOR VIDEO SEGMENT 2	SW p. 9.4 thru 9.5
1. What is it about communication that is so important to you as beginning firefighters?	
• Communication is required for you to receive orders and instructions	
• Communication is required for you to be aware of many new hazards and safety concerns	
• Communication is required for you to make others aware of what you see in a situation	
• Communication will be how you will learn about the business of firefighting	
2. What is required for effective communication to take place?	
• Sender (talker), receiver (listener), and an exchange of information	
• Feedback of important information through the chain of command	

OUTLINE	AIDS & CUES
3. What can you do as a beginning firefighter to help ensure that there is clear communication between you and your supervisor or if you are unsure of a situation? • Be focused and pay attention • Clarify any unclear information • Ask questions • Repeat instructions back to your supervisor • Switch roles frequently back and forth during the communication process	
EMPHASIZE THERE ARE FOUR THINGS THE STUDENTS ALWAYS NEED TO KNOW: **1. WHAT TASK AM I TO PERFORM?** **2. WHAT ARE THE KNOWN HAZARDS?** **3. WHERE DO I GO TO BE SAFE?** **4. HOW DO I GET THERE?**	
4. What are some common communication barriers that you have experienced in your day-to-day lives? • Preconceived opinions • Distractions • Filtering information	

OUTLINE	AIDS & CUES
• Not listening, thinking about your response while the sender is talking • Having an attitude either toward the sender themselves or the message they are sending	
SHOW VIDEO SEGMENT 3 FROM THE "HUMAN FACTORS ON THE FIRELINE" COURSE. USE THE FOLLOWING QUESTION TO DISCUSS AND REINFORCE THE MATERIAL PRESENTED IN THE VIDEO TO THE STUDENTS.	Human Factors on the Fireline Video Segment 3
<u>DISCUSSION QUESTION FOR VIDEO SEGMENT 3</u>	SW p. 9.5
5. As a beginning firefighter, you would most likely prefer to be addressed on the fireline with direct statements. Why are direct statements important? • Allow for clear and effective communication	
SHOW VIDEO SEGMENT 4 FROM THE "HUMAN FACTORS ON THE FIRELINE" COURSE. USE THE FOLLOWING QUESTIONS TO DISCUSS AND REINFORCE THE MATERIAL PRESENTED IN THE VIDEO TO THE STUDENTS.	Human Factors on the Fireline Video Segment 4

OUTLINE	AIDS & CUES
PROVIDE EXAMPLES OF LOCAL COMMUNICATION STANDARD OPERATING PROCEDURES AND GUIDELINES USED ON THE FIRELINE, E.G., ESTABLISHED HAND SIGNALS SUCH AS FOR HELICOPTER AND WATER HANDLING OPERATIONS, "LAY OUT A PROGRESSIVE HOSELAY," "COLD TRAIL THIS PIECE OF LINE," "THE STRUCTURES ARE SECURE."	
<u>DISCUSSION QUESTIONS FOR VIDEO SEGMENT 4</u>	SW p. 9.5
6. Have any of you used standardized communication procedures in your work environments prior to firefighting?	
SCENARIO: GIVE THE STUDENTS THE FOLLOWING INSTRUCTIONS USING TYPICAL FIRE TERMINOLOGY: "BUMP UP THE LINE TO THE DIVISION BREAK AND GRID FOR SPOTS BACK TO THE ANCHOR POINT." HAVE THE STUDENTS ASK FOR CLARIFICATION ON THESE UNCLEAR INSTRUCTIONS. USING A FLIP CHART EXPLAIN BRIEFLY TO THE STUDENTS THE FOLLOWING:	
• **WHAT DOES "BUMP UP THE LINE" MEAN?** • **WHAT IS A "DIVISION BREAK"?** • **WHAT IS MEANT BY "GRIDDING FOR SPOTS"?** • **WHAT IS AN "ANCHOR POINT"?**	

OUTLINE	AIDS & CUES
WITH EXPERIENCE AND TRAINING THIS PROCESS WILL BECOME STREAMLINED AND RESULT IN EFFICIENT COMMUNICATION ON THE FIRELINE. THIS ILLUSTRATES THE CONCEPT OF STANDARD OPERATING PROCEDURES THAT ARE CONTAINED IN TYPICAL FIRE TERMINOLOGY.	
SHOW VIDEO SEGMENT 5 FROM THE "HUMAN FACTORS ON THE FIRELINE" COURSE. USE THE FOLLOWING QUESTIONS TO DISCUSS AND REINFORCE THE MATERIAL PRESENTED IN THE VIDEO TO THE STUDENTS.	Human Factors on the Fireline Video Segment 5
<u>DISCUSSION QUESTIONS FOR VIDEO SEGMENT 5</u>	
7. Of the five communication responsibilities (briefing, debriefing, communicate hazards, acknowledge messages, ask if you don't know) which do you feel will apply most directly to you as a beginning firefighter? • All of them, but particularly the following: – Communicating hazards – Acknowledging messages – Asking if you don't know	SW p. 9.5 thru 9.6
8. As a beginning firefighter, would you ever feel reluctant to point out hazards to a more experienced crew member?	

OUTLINE	AIDS & CUES
• Yes, you probably will. However, emphasize that even experienced crew members may not necessarily see all the hazards in the fire environment. 9. Should you be encouraged to ask questions in situations where you are unsure of what you are supposed to do? • Yes, good leaders want their firefighters to know what to do. However, this is not a perfect world and many insecure leaders feel that withholding information makes them more in control. 10. How would you deal with a situation where you were discouraged from asking questions? **NO TEXTBOOK ANSWER, INSTRUCTOR SHOULD SOLICIT ANSWERS FROM THE STUDENTS.** **EMPHASIZE THEY CAN TRY ASKING THE SAME QUESTIONS TO EXPERIENCED CREW MEMBERS OR ASKING THEM AGAIN AT THE "AFTER ACTION REVIEW." STUDENTS WILL NEED TO LEARN TO DISTINGUISH BETWEEN QUESTIONS OF URGENCY VERSUS QUESTIONS OF CURIOSITY.**	

OUTLINE	AIDS & CUES
IV. THE FIRELINE ENVIRONMENT	09-03-G130-PPT
A. Hazards in the fireline environment can be organized into two categories:	
1. Subjective hazard: one has direct control over it; e.g., condition of equipment, the decision to turn back. (Subjective - the firefighter is in control and should work to eliminate these.)	
2. Objective hazard: one has no control over the risks inherent to firefighting; e.g., environment. (Objective – recognize and mitigate.)	
Four frequently encountered and potentially fatal hazards in the fire environment:	
a. Lightning	FHB (Firefighter Safety chapter)
b. Fire weakened timber	
c. Rolling rocks, logs	
d. Entrapment by fires	
USE CLASS DISCUSSION TO IDENTIFY SPECIFIC HAZARDS WITHIN EACH OF THE FOLLOWING AREAS. CONSIDER LISTING STUDENT RESPONSES ON A FLIPCHART AND POSTING THEM ON THE WALLS. ALLOW 10 TO 15 MINUTES FOR EXERCISE.	

OUTLINE	AIDS & CUES
THE LIST OF HAZARDS BELOW IS NOT ALL INCLUSIVE OF EVERY POSSIBLE HAZARD ENCOUNTERED IN FIREFIGHTING. STUDENT DISCUSSION SHOULD EXPAND ON THIS LIST. FOR ADDITIONAL REFERENCE USE FIRELINE HANDBOOK.	FHB (Firefighter Safety chapter)
B. Fire Environment Hazards	09-04-G130-PPT
1. The actual fire (running, smoldering, creeping)	
2. Burns	
3. Smoke (poor visibility)	
4. Unexpected or erratic winds	
5. Steep terrain	
6. Falling snags	
7. Low relative humidity, high temperatures	
C. Human Related Hazards	
1. Attitude (poor morale, fear, over-confidence, etc.)	
2. Physical condition	
3. Experience level	
4. Training level	
5. Fatigue	
6. Critical stress	

OUTLINE	AIDS & CUES
D. Other Environmental Hazards	
1. Heat stress	
2. Hypothermia	
3. Darkness	
4. Carbon monoxide	
5. Dust	
E. Biological Hazards	
1. Snakes	
2. Insects (bees, ticks, etc.)	
3. Animals (bears, moose, etc.)	
4. Plants (poison oak, ivy, etc.)	
5. Microorganisms (giardia)	
6. Viral Infections (colds, influenza, etc.)	
F. Equipment Hazards	
1. Hand tools (pulaski, shovel, saws, tools)	
2. Burns from mufflers (pumps, saws, firing devices, etc.)	
3. Noise (hearing impairment levels)	
4. Foreign objects thrown from moving parts	

OUTLINE	AIDS & CUES
G. Vehicle Hazards (trucks, dozers, tractor/plows)	
1. Operating around personnel	
2. Mechanical failure (brakes)	
3. Shifting cargo	
4. Unskilled/inattentive or fatigued operator	
H. Aircraft (Rotor and Fixed-Wing) Hazards	09-05-G130-PPT
1. Retardant drops	
2. Bucket drops (water)	
3. Sling loads	
4. Helicopter rotor wash breaking trees and snags (tops, branches, limbs, etc.)	
5. Personnel working around aircraft	
I. Base Camp Related Hazards	
1. Selection of sleeping areas	
2. Sanitation. Maintaining personal hygiene helps prevent gastrointestinal and respiratory disorders.	
3. Incorrectly handled food	

OUTLINE	AIDS & CUES
J. Wildland/Urban Interface Hazards	
1. Powerlines	
2. HAZMAT (covered in depth in Unit 13)	
3. Propane tanks	
4. Panicked public	
5. Traffic	
MENTION THAT HAZARDS SHOULD BE FLAGGED WHENEVER POSSIBLE AND COMMUNICATED TO ALL FIREFIGHTERS IN THE AREA.	
K. Tree and Snag Hazards	
The hazards associated with trees and snags deserve special mention. Throughout the years that firefighters have engaged in organized fire suppression actions, snags and trees have remained a constant source of hazards resulting in fireline accidents.	
This hazard group is second only to aviation accidents when accounting for the fatality and injury rate due to fire suppression activities.	
Since all trees and snags cannot be eliminated from the fire environment, it is important that we become familiar with identifying and mitigating this hazard.	
REFER TO FHB FOR SAFETY FLAGGING STANDARDS.	FHB (Firefighter Safety chapter)

OUTLINE	AIDS & CUES

Visible categories or conditions of trees
 	
• Living
 	
• Dead (snags)
 	
1. Hazards to be aware of when working around trees
 	
  • Felling operations
 	
  • Aircraft working above (retardant and bucket drops)
 	
  • Strong winds
 	
  • Mechanized equipment, e.g., dozers, (damaged root system due to line construction, broken tops)
 	
  • Cat faces and fire scars (fire inside)
 	
  • Branches, limbs, and tops (loose cracked, widow-makers, etc.)
 	
  • Heavy lean
 	
  • Hang ups
 	
  • Ground disturbance (erosion)
 	
  • Shallow, exposed, or burned roots
 	
  • Natural damage (evidence of insect activity, disease, and decay). Indicators are conks, dead and downed trees, and discoloration	

OUTLINE	AIDS & CUES
2. Dead (snags) concerns • Snags may fall without warning or external disturbance • Trees that are burned out at the base or anywhere on the trunk or branches are **extremely dangerous!** Trees and snags that have been exposed to fire may have more than one hazard, whether it is a visible hazard or a potential hazard. Any change in windspeed or direction may cause sound-looking, burned trees to fall. Firefighters must remain aware of these hazards at all times in their work area.	
SUMMARIZE THE FIRELINE ENVIRONMENT SECTION. • Any hazard or potential hazard should be reported to your immediate supervisor and coworkers • If the area is unsafe to work in or around, it should be flagged so others are aware of any dangers • There are two options for an unsafe area: – Make the area safe before entering	

OUTLINE	AIDS & CUES
– Avoid the area if it cannot be made safe	
MENTION THE IMPORTANCE OF INFORMING YOUR SUPERVISOR OF ANY DANGEROUS OR UNSAFE CONDITION. ALSO, THE HAZARDS OF WORKING ALONE NOT ONLY ENDANGER YOU, BUT OTHERS AS WELL.	
THE STUDENTS SHOULD BE BEGINNING TO FORM AN IMPRESSION OF WHAT THE FIRELINE IS LIKE AND WHAT IT WILL TAKE TO OPERATE SAFELY THERE.	
ASK THE STUDENTS TO SUMMARIZE THE FIRE ENVIRONMENT IN ONE SENTENCE. SOLICIT AND DISCUSS ANSWERS FROM THE GROUP. EMPHASIZE THEIR RECOGNITION OF THE FIRELINE AS A <u>HIGH RISK</u> ENVIRONMENT.	
V. RISK MANAGEMENT PROCESS	IRPG (Green - Operational)
HAVE STUDENTS LOOK AT THE RISK MANAGEMENT PROCESS IN THE INCIDENT RESPONSE POCKET GUIDE. EXPLAIN THAT THIS IS A TOOL TO BE USED TO HELP SUPERVISORS MAKE BETTER DECISIONS ON THE FIRELINE.	
IT IS THE PROCESS FOR APPLYING THE 18 WATCHOUTS, THE STANDARD FIREFIGHTING ORDERS, AND LCES.	
EMPHASIZE THAT THE STUDENTS, AS BEGINNER FIREFIGHTERS, HAVE A PROFESSIONAL RESPONSIBILITY TO BEGIN TO UNDERSTAND THE RISKS THEY WILL ENCOUNTER ON THE FIRELINE.	

OUTLINE	AIDS & CUES
USE THE FOLLOWING POINTS TO INTRODUCE AND DISCUSS THE RISK MANAGEMENT PROCESS.	
A. STEP 1 - SITUATION AWARENESS	09-06-G130-PPT SW p. 9.8 thru 9.9
Is there any specific information that you, as a beginning firefighter, will want to know from your supervisor on every assignment?	
• What specific task am I to perform?	
• What are the known hazards at the work location?	
• Where do I go to be safe if there is a problem (safety zone)?	
• How do I get there (escape route)?	
B. STEP 2 - HAZARD ASSESSMENT	
1. There are specific tools that help you identify hazards on the fireline work environment.	
• Watchout Situations	
• Four Common Denominators	
• Situational Awareness	
2. Do you have a professional responsibility to begin to learn how to identify hazards as a beginning firefighter?	
• Yes	

OUTLINE	AIDS & CUES
C. STEP 3 - HAZARD CONTROL	
1. We have basic rules of engagement on the fireline. These rules provide the primary hazard control/mitigations for all operations on the fireline.	
• Standard Firefighting Orders	
2. There are four key operational components of the Standard Firefighting Orders that must always be in place when working on the fireline.	
• Lookouts, Communication links, Escape routes, and Safety Zones.	
D. STEP 4 - DECISION POINT	
1. Will you be making tactical decisions on the fireline?	
• Not right away	
2. Should you ask questions if you do not understand a decision being made?	
• Yes	
3. If your supervisor tells you this is not a good time to ask questions because of the situation at hand, when is another time you could bring up your question?	

OUTLINE	AIDS & CUES
• If you are unsure of what to do next or have a concern about your safety, be persistent and communicate that to your supervisor. Remember the four questions that were just discussed for situation awareness.	
• If you are asking a question because you are curious to learn, ask at the "after action review" or post fire critique.	
E. STEP 5 - EVALUATE	
1. Why do you think the risk management process must be continually evaluated?	
• The fire is continually changing	
• Your location on the fire may change	
• Fire personnel may become distracted, fatigued, and/or stressed	
2. Do you, as well as your supervisor, have a responsibility to continually evaluate the risks in your work environment?	
• Yes	

OUTLINE	AIDS & CUES
VI. TEAMWORK	09-07-G130-PPT

EMPHASIZE THE FOLLOWING KEY POINTS TO THE STUDENTS.

- Firefighting is not an individual undertaking
- Being a successful team member is one of the foundations of safe and effective firefighting
- The measure of success a team will attain is dependent on the level of participation of each member
- Participation is based on having a good attitude, a willingness to learn, and a willingness to get along and work together with others
- Good team members help each other and look out for each other's safety

USE THE FOLLOWING QUESTIONS FOR DISCUSSION AND TO REINFORCE THE TEAMWORK CONCEPT.

A. What are some successful teams you have seen or been involved with prior to today?

- No textbook answer, solicit answers from the students

B. What were some characteristics of successful teams you have seen or been involved with?

- Continuous and effective communication
- Continual experimentation in order to improve performance

OUTLINE	AIDS & CUES
• High performance is expected by team members as well as team leaders	
• Needs of the team come before the needs of individuals	
• Cohesion among team	
C. What were some characteristics of unsuccessful teams you have seen or been involved with?	
• Poor communication	
• Attitudes or conflicts causing cliques to develop	
• Poor work ethic	
• Lack of respect for other team members	
• Failure to strive to improve performance or learn new tasks	
• Shifting blame to others for poor performance	
• Team members putting own needs first before the team	
D. Why is teamwork so important in firefighting?	
• Individuals cannot know all the hazards in the work environment	
• Individuals cannot by themselves accomplish most tasks that are assigned to a crew	

OUTLINE	AIDS & CUES
• Good teamwork goes hand in hand with good communication • A crew is only as strong as its weakest member	
RECAP THE TEAMWORK DISCUSSION BY REVIEWING TEAMWORK GUIDELINES.	09-01-G130-IR SW p. 9.11
PROVIDE EXAMPLES FROM HIS/HER EXPERIENCE THAT REINFORCE THESE GUIDELINES. KEY POINTS TO EMPHASIZE: • **STUDENTS ARE RESPONSIBLE FOR THEIR ACTIONS AND THEIR ACTIONS WILL BE THE DETERMINING FACTOR FOR THE SUCCESS OF ANY TEAM THEY WORK ON.** • **UNLIKE PREVIOUS TEAMS THEY MAY HAVE PARTICIPATED ON, THIS HAS PARTICULAR IMPORTANCE IN FIREFIGHTING DUE TO THE HIGH RISK ENVIRONMENT IN WHICH THEY WILL WORK.**	
ALLOW FOR QUESTIONS AND DISCUSSION AS TIME PERMITS.	
REVIEW UNIT OBJECTIVES.	09-08-G130-PPT

TEAMWORK GUIDELINES

1. **Know Yourself and Seek Improvement.**
   Responsibility to learn and improve.

2. **Be Technically and Tactically Proficient.**
   Responsibility to reduce errors.

3. **Comply With Orders and Initiate Appropriate Actions in the Absence Of Orders.**
   Understand the intent of your assignment.

4. **Develop a Sense of Responsibility and Take Responsibility for Your Actions.**
   Admit your mistakes and learn from them.

5. **Make Sound and Timely Decisions and Recommendations.**
   Responsibility to be aware of your situation (S.A.) Responsibility to minimize risk. Learn the risk management process.

6. **Set the Example for Others.**
   Make sure your actions as a firefighter are professional.

7. **Be Familiar with Your Leader and Their Job, and Anticipate Their Requirements.**
   Responsibility to learn and improve.

8. **Keep Your Leader Informed.**
   Provide feedback when asked.

9. **Understand the Task and Ethically Accomplish It.**
   Seek clarification when intent is unclear.

10. **Be a Team Member - But Not a "Yes Person."**
    Responsibility to work as a team member. Use all the communication tools.

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 10 – Risk Management: Suppression

Time 1 to 1½ Hours

Objectives

1. Describe three methods for breaking the fire triangle.
2. Describe three methods of attack on a fire.
3. List three suppression techniques and describe their uses.
4. Describe the blackline concept.
5. Describe four kinds of fire control line.
6. Name four threats/hazards to an existing control line when fire is burning inside the line.
7. Describe the proper follow-up procedures for a dozer or tractor plow fireline.
8. Describe two kinds of coordinated crew techniques used for fireline construction and with at least four additional personnel, construct a fireline utilizing these techniques.
9. Describe safety procedures to follow when in an area where retardant/water drops are being made.
10. Describe five safety procedures to follow when working around engines, tractor plows, and dozers.
11. Demonstrate the proper use of appropriate hand tools during fire suppression activities.
12. Demonstrate the construction of a cup trench on a steep slope.

Strategy

This unit addresses wildland skills needed by structural firefighters as identified in the *Skills Crosswalk*. They are:

- Black lining
- Coordinated fire crew methods: leap frog and bump up
- Safety procedures around engine, dozers and tractor plows

- Safety procedures for retardant/water drops

Instructional Method(s)

- Informative lecture/discussion

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software
- ☐ Hand tools
- ☐ Fireline Handbook
- ☐ Field location

Exercise(s)

- The Suppression Performance Evaluation at the end of this unit is an exercise for students to demonstrate proper use of tools and line construction to accomplish objectives 8, 11, and 12.

Evaluation Method(s)

- Performance evaluation and/or written quiz.

Outline

I. Introduction

II. The Fire Triangle and Fireline Construction Methods

III. Methods of Attack

IV. Suppression Techniques and Uses

V. Blackline Concept

VI. Types of Fire Control Line (to mineral soil, permafrost or water level)

VII. Threats to Existing Control Line

VIII. Dozer or Tractor Plow Fireline Follow Up Procedures for Fireline Personnel

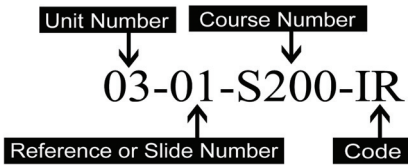
IX. Types of Coordinated Crew Techniques

X. Retardant/Water Drop Safety Procedures

XI. Safety Procedures Used Around Fireline Equipment

XII. Application/Evaluation

Aids and Cues Codes



The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	IR – Instructor Reference
SW – Student Workbook	SR – Student Reference
HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 10 – Risk Management: Suppression

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	10-01-G130-PPT
PRESENT UNIT OBJECTIVES.	10-02-G130-PPT thru 10-04-G130-PPT
ADVISE STUDENTS THEY WILL BE REQUIRED TO PASS A PERFORMANCE EVALUATION AND A WRITTEN QUIZ (OPTIONAL) ADMINISTERED AT THE COMPLETION OF THIS UNIT. SUCCESSFUL COMPLETION OF THIS UNIT REQUIRES 100 PERCENT CORRECT PERFORMANCE AND A SCORE OF AT LEAST 35 OF 50 POINTS (70 PERCENT) ON THE UNIT QUIZ (IF INSTRUCTOR CHOOSES TO GRADE THE QUIZ).	
A STUDENT FAILING THE PERFORMANCE EVALUATION OR WRITTEN QUIZ (OPTIONAL) WILL NEED ADDITIONAL TRAINING AND TESTING UNTIL PROPER PERFORMANCE IS ACHIEVED.	
I. INTRODUCTION	
The ultimate objective in firefighting is <u>to control the fire</u>. This unit introduces a variety of methods, techniques, skills, and knowledge about the firefighter's job in fire suppression and tells how to do this job safely and efficiently.	
The terms control line and fireline are both used throughout this unit and the course. The terms are defined as follows:	

OUTLINE	AIDS & CUES
• Control Line: Comprehensive term used for all the constructed or natural fire barriers and treated fire edges used to control the fire	
• Fireline: Any cleared strip or portion of a control line from which flammable material has been removed by scraping or digging down to mineral soil	
II. THE FIRE TRIANGLE AND FIRELINE CONSTRUCTION STANDARDS	
A. Elements of the Fire Triangle	10-05-G130-PPT
1. Oxygen - in the air	
2. Heat - a source of ignition	
3. Fuel - any combustible materials Suppressing and extinguishing a fire is accomplished by removing one or more legs of the fire triangle	
B. Methods for Breaking the Fire Triangle	10-06-G130-PPT
1. Oxygen - Suffocate the fire with dirt or water to rob the fire of oxygen	
2. Heat - Cool the fire by applying water, dirt, retardant or a combination	
3. Fuel - Separate the fuel to prevent combustion or remove fuel during fireline construction	

OUTLINE	AIDS & CUES
Heat can also be removed during night mop up by chunking fuels, allow to burn down, and then spreading hot materials to expose them to the cooler night air.	
C. Fireline Construction Standards	10-07-G130-PPT
Some factors that likely will influence standards for line construction are:	
1. Fuel type of the area (forest, desert, arctic tundra).	
2. Fuel moisture. The lower the fuel moisture the greater the chances for combustion and fire spread.	
3. Continuity and arrangement of fuels. The closer and more continuous the fuels, both horizontally and vertically, the greater the chance for combustion and fire spread (heavy fuel loading, ladder fuels).	
4. Temperatures will inversely affect fuel moisture. The higher the temperatures the lower the fuel moisture. As fires burn more intensely, more heat is produced and combustion and fire spread increase.	
5. Increases in wind will increase the amount of oxygen available and preheat fuels, increasing the chances for combustion and fire spread.	

OUTLINE	AIDS & CUES
All the above may or may not affect the standards for fireline construction, depending on the fuel type and situation. They should all be considered in fireline construction. Your supervisor should provide you with the fireline construction standards that will be needed to control the fire spread.	
INVOLVE THE STUDENTS IN A DISCUSSION OF OTHER FACTORS/CONDITIONS THAT MAY INFLUENCE FIRELINE CONSTRUCTION STANDARDS IN THEIR LOCAL AREA AND/OR OTHER AREAS.	
INSTRUCTOR MAY WANT TO DISCUSS LOCAL RATES OF SPREAD. CONSIDER DEFINING TYPES OF EXTREME FIRE BEHAVIOR OR ANY LOCAL TERMS.	
III. METHODS OF ATTACK	FHB (Initial Attack Chapter)
These methods relate to the location of firefighters constructing a fireline.	10-08-G130-PPT
A. Direct Attack	
Constructing a fireline right on the fire perimeter. Keep one foot in the black and one foot in the unburned area.	

OUTLINE	AIDS & CUES
B. Indirect Attack	
Constructing a fireline some distance from the fire perimeter. Should use a barrier (natural or constructed) in fireline construction, if available. Intervening strip is wide and fuels are burned out. Allows choice of timing for burning out.	
C. Flanking/Parallel Attack	
Constructing a fireline by working along the flanks from an anchor point. May be either direct or indirect. Distance from control line is dependent on fire intensity. Intervening strips of narrow fuels are immediately burned out.	
INSTRUCTOR SHOULD DISCUSS THE APPROPRIATE SITUATIONS FOR USING EACH STRATEGY.	
IV. SUPPRESSION TECHNIQUES AND USES	
A. Hotspotting	10-09-G130-PPT
Checking the spread of fire at points of more rapid spread or special threat. Is usually the initial step in prompt control with emphasis on first priorities.	
Used during suppression to cool the fire edge and to allow personnel engaged in line construction to get close enough to attack the fire directly. Can also be used when certain areas of the fireline are hotter than others, thereby hitting these areas early enough to prevent the fire from “making a run,” or to slow the rate of spread.	

OUTLINE	AIDS & CUES
DESCRIBE LOCAL SPECIFICATIONS.	
B. Cold Trailing	10-10-G130-PPT
A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hands to detect any fire, digging out and extinguishing every live spot, and lining any live edge.	
C. Scratch Line	10-11-G130-PPT
Used as an expedient method for a fuel break in light fuels until a wider line can be constructed.	
D. Fireproofing Fuel	10-12-G130-PPT
Used to reduce the chance of igniting fuels outside the control line by spraying them with water or chemicals or covering them with dirt.	
E. Burning Out	10-13-G130-PPT 10-14-G130-PPT
Setting a fire inside the control line to consume the fuel between the fire and the control line.	
V. BLACKLINE CONCEPT	
Fuels that remain between the main fire and the control line are burned out, or allowed to burn to the control line. This method ensures that fuels and heat remain inside the control line and prevents the fire from making a run at the control line. This action provides for safety of the control forces and security of the control lines.	

OUTLINE	AIDS & CUES
CHECK WITH LOCAL AGENCY TO DETERMINE LINE CONSTRUCTION REQUIREMENTS, I.E., AGENCY GUIDELINES FOR MINIMUM IMPACT SUPPRESSION TACTICS.	
VI. TYPES OF FIRE CONTROL LINE (TO MINERAL SOIL, PERMAFROST, OR WATER LEVEL)	
A. Constructed Fireline	10-15-G130-PPT
• Hand line (cup trench, underslung)	10-16-G130-PPT
• Machine line	
• Wet line	
• Retardant line	
• Detonation cord line	
• Blackline	
B. Natural Control Line	10-17-G130-PPT
• Cold fire edge	
• Fuel break (streams, lakes, ponds, rock slides, and areas of sparse fuels)	
• Previously constructed barriers (roads, canals, etc.)	
VII. THREATS TO EXISTING CONTROL LINE	10-18-G130-PPT
Once the control line is completed, it has to be secured by mopping up inward from that line to prevent the fire from jumping the line in one of the following manners.	

OUTLINE	AIDS & CUES
A. Spotting Wind gusts or convection column can pick up embers and carry them across control lines. B. Rolling Debris Fires on steep slopes need a good trench to catch debris from rolling across constructed lines. C. Creeping Root systems may burn under control line. Lines not built to mineral soil, water level, or permafrost may allow fire to creep across or under the control line. D. Radiant Heat Build up of unburned fuel inside and/or adjacent to the control line could ignite and become hot enough to radiate heat and ignite fuels on the other side of the line.	
VIII. DOZER OR TRACTOR PLOW FIRELINE FOLLOW UP PROCEDURES FOR FIRELINE PERSONNEL A. Clean Up Ensure that all combustible materials are removed from the control line. Control line extended to mineral soil, permafrost, or water level.	10-19-G130-PPT

OUTLINE	AIDS & CUES
B. Break Up Machine Piles and Berms These may contain burning fuels that could smolder for months and start a fire at a later date. Use machines whenever possible. C. Fireproof Needed Areas Include adjacent areas outside the control line that may be endangered from radiant heat inside the control line. D. Prepare and Burn Out Control Line Utilize the blackline concept to secure the line. E. Secure the Control Line Limb up any trees that may threaten the security of the control line. Snags that threaten the security of the control line should also be knocked down. F. Mop up the Interior Ensure that there are no threats to the control line from inside the fire area. G. Patrol the Control Line This is to ensure that any spots or areas that remain hot after completion of the control line will be located and extinguished.	

OUTLINE	AIDS & CUES
IX. TYPES OF COORDINATED CREW TECHNIQUES	10-20-G130-PPT
EXPLAIN THAT THESE TECHNIQUES MAY NOT ALWAYS INVOLVE AN ORGANIZED 20 PERSON CREW. CREW SIZE MAY BE SMALLER DEPENDING ON THE SITUATION AND AVAILABILITY OF PERSONNEL. COORDINATED CREW EFFORTS REMAIN IMPORTANT IN ALL SITUATIONS.	
DEFINE PROPER MIX AND ORDER OF TOOLS WITHIN THE CREW WHEN CONSTRUCTING A FIRELINE.	
A. One-lick (Progressive)	
Each crew member does one to several licks or strokes of work and moves forward a specific distance. Distances are determined by the number of crew members, types of tools, and number of licks needed per area of fireline to complete the work for that tool.	
B. Bump-up (Leap frog)	
Each member completes a given section of line unless "bumped-up" by another crew member before completion.	
X. RETARDANT/WATER DROP SAFETY PROCEDURES	FHB (Firefighting Safety Chapter) 10-21-G130-PPT
A. Retardants and water are useful tools in the suppression of wildfire, but can be dangerous to personnel working in the drop area.	

OUTLINE	AIDS & CUES
Retardants will reduce the rate of spread but rarely extinguish a fire. An airplane traveling at 130 knots and dropping 2,000 gallons (as much as 10 pounds per gallon) can do a lot of damage to the drop area. Such as: 1. Uprooting brush and small trees 2. Breaking large trees 3. Moving rocks and debris B. If you have prior information that there will be a drop in your area: 1. Indicate your presence (usually a supervisor responsibility). 2. Move out of the area. At least 200 feet perpendicular to the drop. 3. Remain clear of large old trees, snags, etc. Maintain a distance 1½ times the height of the nearest tree. 4. Determine when drops are completed. 5. Move back into the area quickly to take advantage of the retardant/water effects on the fire. 6. Remember that the area may be slick after retardant drop.	

OUTLINE	AIDS & CUES
C. Retardant drops from air tankers can be dangerous. A low drop has sufficient velocity and mass to not only knock you off your feet but also to throw you a considerable distance. Bodily injuries can be caused by low drops in the following examples: 1. Being thrown against rocks, trees, etc. 2. Being struck by flying debris knocked out of trees by the retardant. 3. Being struck by tools or debris kicked up by the retardant. D. If you are unable to move clear of the drop area, follow accepted agency procedures for protecting yourself and others. 1. Lie down facing oncoming aircraft, helmet on with chin strap, feet spread, goggles in place. 2. Hold hand tool at side, grab something solid such as a rock, tree, or shrub to break the force of a low drop. If available or possible, get behind tractor, brush guard, etc. 3. After the initial drop move out of area until you have received assurance that no more drops are to be made in that area.	

OUTLINE	AIDS & CUES
XI. SAFETY PROCEDURES USED AROUND FIRELINE EQUIPMENT	10-22-G130-PPT
Heavy equipment such as tractor plows, engines, and dozers is helpful and reduces the time needed to construct a control line and to mop up after a fire. However, it may be dangerous when crews or individuals are working in the same area.	
Certain safety procedures should be followed for each type of machinery.	
A. Engines	FHB (Firefighting Safety Unit)
1. Be alert when an engine is moving.	
2. Be alert to hazards of charged hoseline.	
3. Nozzle operators and personnel nearby must wear eye protection.	
4. Be alert and on the lookout for rolling materials when working uphill or downhill of equipment.	
5. Be alert during night operations.	
6. Take extra precautions when visibility is poor.	
7. Be alert to hazards when removing stuck vehicle (winch cables, jacks, slipping).	

OUTLINE	AIDS & CUES
B. Tractor Plow and Dozer	FHB (Firefighting Safety Unit)
1. Be alert when machine is moving.	
2. The dozer/tractor always has the right of way. Maintain a 50 foot minimum distance.	
3. Work a safe distance away, depending on fuels and terrain. *In timber - minimum two tree lengths away. Low fuel type - minimum 50' behind and 100' ahead.*	
4. Be careful and maintain stable footing when working around winch cables.	
5. Be alert and on the lookout for rolling materials when working uphill or downhill of equipment.	
6. Take extra precautions when visibility is poor.	
7. Be alert to soft spots or bogs.	
8. Do not assume the operator knows where you are.	
9. Be alert to the hazards of night operations.	
10. Leave headlamps on.	
11. Do not sleep on the fireline.	

OUTLINE	AIDS & CUES
DISCUSS SAFETY PROCEDURES FOR OTHER EQUIPMENT USED LOCALLY.	
XII. APPLICATION/EVALUATION	
DEMONSTRATE THE FOLLOWING TECHNIQUES AND HAVE STUDENTS PAIR UP TO PRACTICE AND CRITIQUE THESE PROCEDURES UNTIL EACH STUDENT CAN SUCCESSFULLY COMPLETE EACH PERFORMANCE (SEE INSTRUCTOR CHECKLIST FOR CRITERIA).	
A. Demonstrate the proper use of appropriate hand tools during suppression activities (line construction, hot spotting, mop up).	
B. Construct a control line using at least two coordinated crew techniques.	
C. Demonstrate the construction of a control line with a cup trench on a steep slope.	
D. Demonstrate the proper procedures to follow when caught in a retardant/water drop.	
PERFORMANCE EVALUATION (GROUP OR INDIVIDUAL EXERCISE).	10-01-G130-IR SW p. 10.11 thru 10.12
BASED ON THE INSTRUCTOR CHECKLISTS PROVIDED ABOVE, INSTRUCTOR WILL EVALUATE STUDENTS' PERFORMANCE.	
ANY ITEM NOT CHECKED AS SUCCESSFULLY COMPLETED, CONSTITUTES FAILURE. ADDITIONAL TRAINING AND TESTING IS NEEDED UNTIL PROPER PERFORMANCE IS ACHIEVED.	

OUTLINE	AIDS & CUES
THERE MAY BE AN OPPORTUNITY TO COMBINE THE MOP UP EXERCISE FROM UNIT 12 WITH THIS EXERCISE. SEE PAGE 12.17 - 12.18 FOR FURTHER REFERENCE.	IG pp. 12.18 thru 12.21
OPTIONAL: **ADMINISTER UNIT QUIZ. AFTER COMPLETION, GRADE QUIZZES AND THEN REVIEW ANSWERS WITH STUDENTS.**	10-02-G130-IR SW p. 10.13 thru 10.14
REVIEW UNIT OBJECTIVES.	10-23-G130-PPT thru 10-25-G130-PPT

WILDLAND TRAINING (FFT2) FOR STRUCTURAL FIREFIGHTERS, G-130

UNIT 10 - SUPPRESSION PERFORMANCE EVALUATION

Performance evaluation:

INSTRUCTOR CHECKLISTS:

Score by placing a checkmark in the box. Failure on any step or procedure constitutes failure of the exam.

1. Demonstrate the proper use of appropriate hand tools during suppression activities (line construction, hot spotting, mop up).

   ☐ a. Inspect tool.

   ☐ b. Safe use of hand tool.

2. Construct a control line using at least two coordinated crew techniques.

   ☐ a. Proper spacing when walking and working (10 - 15 feet apart).

   ☐ b. Line extending to mineral soil, water level, or permafrost.

   ☐ c. Proper intra-crew communications.

   ☐ d. Proper use of crew for specified method.

3. Demonstrate the construction of a control line with a cup trench on a steep slope.

   ☐ a. Adequate downhill berm.

   ☐ b. Appropriate tool choice.

   ☐ c. Adherence to safety procedures.

   ☐ d. Cup trench can withstand a rolling firebrand representative of the area; e.g., rolling pine cones, pieces of wood, logs, palmetto, cacti, nuts.

4. Demonstrate the proper procedures to follow when caught in a retardant/water drop.

   In some instances, it may not be possible to complete evaluation of situation #4. However, the instructor should ensure that students have a thorough understanding of these techniques and their local variations.

   Contingency:
   Student will describe each method and local variation of each. May be done orally or in writing. Instructor evaluates students to ensure they meet the objective.

   ☐ a. Wear full PPE.

   ☐ b. Lie face down, head toward direction of incoming aircraft.

   ☐ c. Helmet on securely with chin strap, feet spread, goggles in place.

   ☐ d. Hand tool held firmly at side.

   ☐ e. Grab something solid such as a rock, tree or shrub.

   ☐ f. Move out of area.

WILDLAND TRAINING (FFT2) FOR STRUCTURAL FIREFIGHTERS, G-130

UNIT 10 - SUPPRESSION

UNIT QUIZ WITH ANSWERS
(50 Total Points)

A minimum score of 35 points is required for a passing grade.

1. Identify the three elements of the fire triangle. (3 points)

   Heat, oxygen, fuel.

2. Name and describe two primary methods of attack on a fire. (6 points)

   Direct—next to fire perimeter.
   Indirect—some distance from fire.

3. Explain when the following five suppression practices are used. (10 points)

   a. Hotspotting
      Used during fireline construction to cool down the fire edge so personnel can get close enough to directly attack the fire; used when certain areas of the control line are hotter than others; used to control the rate of spread.

   b. Cold trailing
      A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hands to detect any fire, digging out and extinguishing every live spot, and lining any live edge.

   c. Cup trench
      Used in steep terrain where the fire is uphill from the control line. A cup trench is used to keep rolling debris from going across the control line.

d. Scratch line
Used as an expedient method for causing a fuel break in light fuels until a wider line can be constructed.

e. Fireproofing
Used to reduce the chance of igniting fuels outside the control line by spraying them with water or covering with dirt.

4. Describe the blacklining concept. (2 points)
Fire is allowed to burn to the control line or is burned out from the control line.

5. Identify four kinds of control line, natural or constructed. (4 points)
Hand line, machine line, wet line, retardant line, detonated cord line, cold fire edge, fuel breaks, previously constructed barriers

6. Name four threats or hazards to an existing control line when fire is burning inside the line. (4 points)
Spotting, rolling debris, creeping, radiant heat

7. Identify the proper procedures for follow up of a dozer or tractor plow control line. (5 points)
Clean up after the equipment. Break up machine piles and berms.
Fireproof needed areas.
Prepare and burn out control lines. Patrol the control line.
Limb up any trees that threaten control line. Mop up the interior.

8. Name two kinds of coordinated crew techniques used for fireline construction. (2 points)
One-lick or Progressive
Bump-up or Leap frog

9. Describe safety procedures to follow when in an area where retardant/water drops are being made. (4 points)

   Indicate your presence. Move out of target area.
   Remain clear of large old trees, snags, etc. Determine when drops are completed.
   Move back into area quickly to take advantage of retardant effects.
   Remember that the area may be slick.

10. Identify five safety procedures to consider when working around each of the following: (10 points)

    a. Engine
       Be alert when an engine is moving.
       Be alert to hazards of charged hoselines. Wear eye protection near charged nozzles.
       Be alert and on the lookout for rolling materials. Be alert during night operations.
       Take extra precautions when visibility is poor.
       Be alert to hazards (such as winch cables) when removing stuck vehicle.

    b. Dozer/Tractor Plows
       Be alert when machine is moving. Dozer/tractor always has the right of way.
       Maintain stable footing and watch for winch cables.
       Work a safe distance away, depending on fuels and terrain. Be alert for rolling materials.
       Take extra precautions when visibility is poor. Be alert to soft spots or bogs.
       Do not assume the operator knows where you are. Be alert to hazards of night operations.
       Leave headlamps on.
       Do not sleep on the fireline.

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 11 – Risk Management: Firing Devices

Time 1 Hour

Objectives

1. Describe two hazards to operators when using a fusee.
2. Demonstrate or simulate how to ignite, use, and extinguish a fusee.
3. Describe four hazards to operators when using a drip torch.
4. State the proper fuel mixture for a drip torch.
5. Prepare a drip torch for use and ignite.
6. Demonstrate the safe use of the drip torch.
7. Extinguish a drip torch and prepare it for storage.
8. Describe two field expedient methods for igniting wildland fuels.

Strategy

This unit addresses the need for structural firefighters to be able to prepare and use firing devices. This is a skills gap identified in the *Skills Crosswalk*.

This unit will give the students background information followed by hands-on demonstration in the field. The instructor is encouraged to develop hands-on practice sessions and performance evaluation that fit the needs and logistical demands of the training site. For additional information on firing devices, instructor can utilize the NWCG course on Ignition Operations, S-234.

Instructional Method(s)

- Informative lecture (Note: There are no PowerPoint slides for this unit.)
- Field demonstration

Instructional Aids

- ☐ Fusees, drip torch, rags, adjustable wrench, matches
- ☐ Vehicle with torch mounted
- ☐ Stopwatch or wristwatch
- ☐ Shovel or other tools

- ☐ Materials for a field exercise

Exercise(s)

- Field exercise

Evaluation Method(s)

- Student's performance in the field exercise will be evaluated.

Outline

I. Fusee

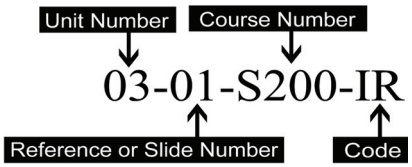
II. Drip Torch

III. Field Expedient Methods of Igniting Wildland Fuels

Aids and Cues Codes

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	IR – Instructor Reference
SW – Student Workbook	SR – Student Reference
HO – Handout	PPT– PowerPoint



UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 11 – Risk Management: Firing Devices

OUTLINE	AIDS & CUES
PRESENT UNIT OBJECTIVES. **DUE TO THE FIELD DESIGN OF THIS UNIT THERE ARE NO POWERPOINT SLIDES.** **THIS UNIT CONSISTS OF THREE SECTIONS. EACH SECTION CONCLUDES WITH AN EVALUATION INCLUDING ORAL RESPONSES AND A PERFORMANCE EVALUATION. THESE EVALUATIONS ARE DESIGNED FOR THE FIELD OR A SIMULATED AREA.** **INSTRUCTOR MAY CHOOSE TO ADMINISTER ALL EVALUATIONS AT THE CONCLUSION OF THE UNIT OR INDIVIDUALLY AT THE END OF EACH PRESENTATION.** **ADVISE STUDENTS THAT THEY WILL BE REQUIRED TO PASS EACH EVALUATION WITH 100 PERCENT CORRECT PERFORMANCE.** **A STUDENT FAILING A PERFORMANCE EVALUATION WILL NEED ADDITIONAL TRAINING AND TESTING UNTIL PROPER PERFORMANCE IS ACHIEVED.**	

OUTLINE	AIDS & CUES
I. FUSEE The fusee is an effective device used for burning out control lines and backfiring on wildland fires. It provides a method of firing grass, pine needles, leaves, brush, and similar types of dry fuel that will ignite freely and radiate sufficient heat to sustain combustion. Often the fusee is used for traffic control as a warning device. The compound that makes up the fusee, when ignited, is subject to splattering and can cause severe burns if not handled properly. Proper personal protective equipment (PPE) must be worn when using fusees. **HAVE FUSEES AVAILABLE FOR PRESENTATION AND DEMONSTRATION. DEMONSTRATE USE, CARE AND EXTINGUISHING OF A FUSEE. IF POSSIBLE, GIVE ONE FUSEE TO EACH STUDENT TO PROVIDE ACTUAL HANDS-ON EXPERIENCE IGNITING AND EXTINGUISHING A FUSEE. REINFORCE SAFETY CONSIDERATIONS WITH USE.** A. Fusee Terminology 1. Safety cap 2. Fusee 3. Wrapper (waxed) 4. Handle (ferrule) 5. Contents (phosphorous) 6. Striker (igniter)	

OUTLINE	AIDS & CUES
B. Fusee Features	
1. Fusee has protected ignition surface.	
2. Fusee is approximately 10 to 18 inches long.	
3. Fusee burns for 15 to 30 minutes.	
4. Temperature of flame is approximately 1,400 degrees Fahrenheit.	
C. Fusee Use	
1. Grip fusee by the handle.	
2. Remove striker cap by taped end.	
3. Scratch striker against ignition surface by striking down and away from body. Turn your head to side while striking. Stand upwind of the fusee if possible, to avoid inhaling fumes.	
4. Hold away from body.	
5. When using, carry fusee in downward position.	
6. Devise wooden extension for handle (improvise) or place several fusees together end-to-end.	
7. Keep on the burn side of the fireline.	

OUTLINE	AIDS & CUES
8. To extinguish, strike burning end sharply on ground or extinguish the fusee in mineral soil. Watch for splattering of hot slag.	
9. Do not leave fusee where livestock might eat.	
D. Fusee Care and Maintenance	
1. If it is punctured, dispose of fusee.	
2. If fusee is damaged or wrapper is worn, properly dispose of fusee.	
3. Keep cap in place, do not lose or allow to become loose.	
4. Keep fusee clean, dry, and away from water and oil.	
5. Keep fusee away from heat.	
E. Fusee Safety	
1. Wear eye protection and gloves.	
2. Ensure that sleeves are rolled down.	
3. Do not remove cap until ready to use.	
4. Turn your head to the side when striking.	
5. When lit, keep fusee away from body and clothing.	
6. Be careful, phosphorous can cause severe burns.	

OUTLINE	AIDS & CUES
7. Keep lighted fusee away from anything you do not want to burn.	
8. Avoid breathing fusee smoke and vapors.	
9. Do not stare at bright flame.	
10. Do not point fusee at anyone; point it downward.	
FUSEES ARE CONSIDERED HAZARDOUS MATERIALS. DISPOSE OF FUSEES IN ACCORDANCE WITH AGENCY POLICY.	
F. Fusee Storage	
1. Tape or rubber band together for storage.	
2. Do not store where fusees will rub together or be damaged.	
3. Store in a cool, dry place if possible.	
PERFORMANCE EVALUATION: **USING THE CHECKLIST, HAVE EACH STUDENT GIVE AN ORAL RESPONSE TO THE QUESTION, THEN SIMULATE OR DEMONSTRATE LIGHTING, EXTINGUISHING, AND MAINTAINING FUSEE.**	11-01-G130-IR SW p.11.5
DISCUSS SAFETY CONSIDERATIONS WITH STUDENTS WHILE THE ABOVE IS TAKING PLACE.	
ANY ITEM NOT CHECKED AS SUCCESSFULLY COMPLETED, CONSTITUTES FAILURE. ADDITIONAL TRAINING AND TESTING IS NEEDED UNTIL PROPER PERFORMANCE IS ACHIEVED.	

OUTLINE	AIDS & CUES
II. DRIP TORCH The drip torch is used for burning out fuels. It is also known as a burning out torch and it contains a mixture of liquid fuels that will flame when ignited. The fuel flows through a spout to the wick, which becomes saturated with fuel and burns continuously, permitting the person using the torch to cast burning liquid to ignite the fuel. Proper personal protective equipment (PPE) must be worn when using the drip torch. **THE DRIP TORCH SHOULD BE VISIBLE AND USED FOR PRESENTATION AND DEMONSTRATION.** **REMIND STUDENTS THAT PROPER PRECAUTIONS NEED TO BE USED WHEN HANDLING DRIP TORCH FUEL. FUEL IS CONSIDERED A HAZARDOUS MATERIAL. ENSURE THAT FUEL IS SAFEGUARDED ANY TIME IT IS USED, ESPECIALLY IN SENSITIVE AREAS SUCH AS WATERSHEDS, STREAMS, ETC. CLEAN UP ALL FUEL SPILLS.** A. Drip Torch Terminology 1. Drip torch (orchard torch) 2. Fuel tank with handle 3. Tank vent or breather valve 4. Spout and nozzle 5. Wick and wick holder 6. Tank cover and gasket	

OUTLINE	AIDS & CUES
7. Tank lock ring (o-ring)	
8. Fuel	
9. Torch holder and hold-down spring	
10. Personal protective equipment (PPE)	
B. Drip Torch Use	
1. Prepare the following fuel mix (1-1/4 gallon capacity).	
Mix 4 parts diesel fuel to 1 part gasoline (4-1 gas). Fill to one-fourth inch from top to allow for expansion.	
2. Prepare for use.	
a. Put on safety clothing.	
b. Remove torch from vehicle.	
c. Shake torch to mix fuel after removing torch from vehicle, and set torch down in cleared area.	
d. Unscrew lock ring.	
e. Remove and secure flow plug.	
f. Remove spout from fuel tank. Inspect rubber gasket and fuel supply.	
g. Set spout upright on torch in space provided, with wick facing opposite and away from handle.	

OUTLINE	AIDS & CUES
h. Screw lock ring on fuel tank tightly.	
i. Open air vent three-fourths of the way.	
j. Wipe off spilled fuel.	
3. Lighting the drip torch.	
a. Spread fuel on a small amount of ground litter or paper in a cleared area where torch will be used, then ignite.	
b. Light torch from ground fire.	
c. Carry torch upright until ready for use.	
d. Tilt torch downward when using (may be used in a swinging motion parallel to the direction of travel).	
e. Be careful of where you spread the fire.	
f. Each droplet of fuel should ignite if fuel is mixed properly.	
4. Preparing the drip torch for storage after use.	
a. Extinguish or let wick burn dry, set upright and let cool.	
b. Remove lock ring.	

OUTLINE	AIDS & CUES
c. Reverse spout and put inside tank.	
d. Replace lock ring securely.	
e. Replace flow plug.	
f. Close air breather valve.	
g. Clean and store empty after fire season.	
h. Fill to proper level when storing during fire season.	
C. Drip Torch Care and Maintenance	
1. Check tank for dents, leaks, and damaged threads.	
2. Check spout, wick, wick holder, and flow plug.	
3. Check gaskets.	
4. Open air vent.	
5. Ensure that holder and spring clamp are bolted to vehicle.	
D. Safety	
1. Do not exceed the gasoline mix ratio. Too much gasoline may cause the torch to explode upon ignition.	
2. Keep torch away from your body, clothing, and boots.	

OUTLINE	AIDS & CUES
3. When using torch, burn from top of hill downward.	
4. Keep fuel flowing so wick does not burn out.	
5. Extinguish torch when not in use.	
6. Do not insert the spout and wick into fuel can until they are cool.	
7. Carry the torch by the handle only.	
8. Maintain torch.	
9. Do not open or fill the drip torch near open flame, hot embers, sparks, or while smoking (because of dangerous vapors). Do not breathe vapors.	
10. Fuel mixtures are considered hazardous materials and should be treated as such. Wash as soon as possible following exposure.	
11. Carry on downhill side.	
12. Have escape route planned when using torch.	
13. Wear gloves and keep sleeves rolled down. (Always wear personal protective equipment.)	
14. Change contaminated clothes.	

OUTLINE	AIDS & CUES
PERFORMANCE EVALUATION: **USING THE CHECKLIST, HAVE EACH STUDENT GIVE AN ORAL RESPONSE TO THE QUESTIONS, THEN SIMULATE OR DEMONSTRATE ASSEMBLY, USE, AND STORAGE OF THE DRIP TORCH.** **DISCUSS SAFETY CONSIDERATIONS WITH STUDENTS WHILE THE ABOVE IS TAKING PLACE. ANY ITEM NOT CHECKED AS SUCCESSFULLY COMPLETED, CONSTITUTES FAILURE. ADDITIONAL TRAINING AND TESTING IS NEEDED UNTIL PROPER PERFORMANCE IS ACHIEVED.**	11-02-G130-IR SW pp. 11.7 thru 11.8
III. FIELD EXPEDIENT METHODS OF IGNITING WILDLAND FUELS	
A. Methods of Ignition	
Several methods of ignition can be used to accomplish burnout. Some suggestions are:	
• With a tool, drag burning needles or leaves (natural fuels) along the ground.	
• Fusee	
• Drip torch	
• Use matches	
• Other methods (at discretion of instructor)	
DEMONSTRATE OR SIMULATE USE OF EACH METHOD.	

OUTLINE	AIDS & CUES
B. Safety	
MANY OF THE METHODS ARE SIMILAR TO THOSE PRESENTED IN THE PREVIOUS SECTIONS OF THIS UNIT. INVOLVE THE STUDENTS IN DISCUSSIONS AND/OR USE THE PREVIOUS SECTIONS TO COMPARE AND CONTRAST.	
Be alert for:	
1. Rolling materials.	
2. Spreading of burning embers outside fireline.	
3. What is going on around you; stay in contact with the person above and below you.	
PERFORMANCE EVALUATION:	11-03-G130-IR SW p. 11.9
USING THE CHECKLIST, HAVE EACH STUDENT GIVE AN ORAL RESPONSE TO THE QUESTION, THEN SIMULATE OR DEMONSTRATE EACH METHOD, EXPLAINING BENEFITS AND HAZARDS.	
DISCUSS SAFETY CONSIDERATIONS WITH STUDENTS WHILE THE ABOVE IS TAKING PLACE.	
ANY ITEM NOT CHECKED AS SUCCESSFULLY COMPLETED, CONSTITUTES FAILURE. ADDITIONAL TRAINING AND TESTING IS NEEDED UNTIL PROPER PERFORMANCE IS ACHIEVED.	
REVIEW UNIT OBJECTIVES.	

WILDLAND TRAINING (FFT2) FOR STRUCTURAL FIREFIGHTERS, G-130

UNIT 11 - FUSEE PERFORMANCE EVALUATION

The instructor will ask the following question for an oral response. The question and performance evaluation are pass/fail.

List two hazards to operators when using a fusee.

Fusee particles and fumes.

Performance evaluation:

Given a fusee and a cleared area, demonstrate (1) igniting a fusee, (2) igniting wildland fuel, and (3) extinguishing the fusee.

INSTRUCTOR CHECKLIST:

Score by placing a check mark in the box. Failure on any step or procedure constitutes failure of the exam.

- ☐ 1. Sleeves down, gloves on and eye protection in place.
- ☐ 2. Remove striker protector.
- ☐ 3. Expose igniter.
- ☐ 4. Place striker on igniter.
- ☐ 5. Turn face away from fusee.
- ☐ 6. Light fusee by sharply scratching the igniter across the striker.
- ☐ 7. Strike fusee (away from body).
- ☐ 8. Apply flame to simulated fuel.
- ☐ 9. Extinguish fusee by striking sharply on ground or by placing lighted end in mineral soil.

WILDLAND TRAINING (FFT2) FOR STRUCTURAL FIREFIGHTERS, G-130

UNIT 11 – DRIP TORCH PERFORMANCE EVALUATION

The instructor will ask the following two questions for an oral response. All questions and the performance evaluation are pass/fail.

1. Describe four hazards to operators when using a drip torch.

   Flaming fuel, improper fuel mix, flash back or explosion, carrying burning torch on uphill side, personal burns.

2. Describe the fuel mixture for a drip torch.

   4 parts diesel fuel, 1 part gasoline.

Performance evaluation:

Given a drip torch in proper working order, rags, matches, a cleared area and PPE, correctly demonstrate the proper procedures for (a) assembly, (b) lighting, carrying and spreading burning fuel, extinguishing, and (c) storing the drip torch.

INSTRUCTOR CHECKLIST:

Score by placing a check mark in the box:

If a. and b. of the performance examination take more than five minutes or if there is a failure on any step or procedure, this constitutes failure of the exam.

a. Assemble the drip torch.

- ☐ Shake fuel.
- ☐ Unscrew locking ring.
- ☐ Unscrew and secure fuel flow plug.
- ☐ Remove spout and inspect gasket, fuel, and wick.
- ☐ Set spout with wick in correct position and secure lock ring.
- ☐ Open air vent.
- ☐ Wipe off spilled fuel.

b. Demonstrate proper procedure for lighting, carrying and spreading burning fuel, and extinguishing of the drip torch.

- ☐ Spread fuel on ground litter or paper.
- ☐ Ignite fuel.
- ☐ Ignite drip torch from ground fire.
- ☐ Demonstrate proper procedure for carrying and spreading burning fuel.
- ☐ Extinguish wick by setting upright and letting wick burn dry.

c. Storage procedures

- ☐ Let wick cool before storage.
- ☐ Return drip torch to condition of readiness.

WILDLAND TRAINING (FFT2) FOR STRUCTURAL FIREFIGHTERS, G-130

UNIT 11 – FIELD EXPEDIENT IGNITION PERFORMANCE EVALUATION

The instructor will ask the following question for an oral response. The question and performance evaluation are pass/fail.

Describe two field expedient methods for igniting wildland fuels.

> **Drag burning natural fuels with a tool, oil-soaked rag on a stick, matches.**

Performance evaluation:

Given a cleared area, PPE, and materials necessary for a field expedient method of igniting wildland fuels, correctly demonstrate or simulate the proper procedures for igniting a field expedient device and ensure that all safety considerations are met.

- Ignite field expedient device.
- Demonstrate proper procedure for spreading burning fuel.
- Extinguish properly.
- Ensure all safety considerations are met.

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 12 – Risk Management: Mop up and Securing the Fireline

Time 1½ to 2 Hours

Objectives

1. Describe and demonstrate how to extinguish burning materials by chopping, scraping, and mixing them with soil and water.
2. Describe precautions to take when applying water to hot materials and demonstrate proper techniques for doing so.
3. Describe a systematic method of mop up and give two reasons for using this method.
4. Describe how four of the senses aid in detecting burning materials.
5. Discuss the importance of breaking up and dispersing machine piles and berms adjacent to the control line.
6. Demonstrate the technique of cold trailing on a simulated fire perimeter.
7. State three factors that determine the amount of additional work required for a water or retardant line.
8. Given a constructed control line, strengthen the line to facilitate holding by rearranging and fireproofing fuels adjacent to the line.

Strategy

This unit addresses the need for structural firefighters to know systematic procedures for locating and suppressing fire. This is a skills gap identified by the *Skills Crosswalk*.

Instructional Method(s)

- Informative lecture/discussion
- Instructional video

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software

- ☐ Fireline Handbook (FHB)
- ☐ "Minimum Impact Suppression Tactics" video
- ☐ Commonly used hand tools and equipment, water source, flagging tape

Exercise(s)

- Practice mop up techniques and cold trailing

Evaluation Method(s)

- Performance evaluation and optional written quiz.

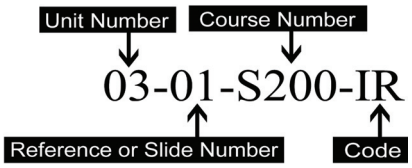
Outline

I. Introduction
II. Minimum Impact Suppression Tactics
III. Methods of Mop Up
IV. Systematic Mop Up
V. Using Four of the Senses to Detect Hot Materials
VI. Covered Fuels
VII. Other Aids to Assist the Mop Up Procedure
VIII. Strengthening the Control Line
IX. Follow Up of a Wet Line, Retardant Line, or Treated Area
X. Application/Evaluation

Aids and Cues Codes

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	IR – Instructor Reference
SW – Student Workbook	SR – Student Reference
HO – Handout	PPT – PowerPoint



UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 12 – Risk Management: Mop up and Securing the Fireline

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	12-01-G130-PPT
PRESENT UNIT OBJECTIVES.	12-02-G130-PPT thru 12-04-G130-PPT
ADVISE STUDENTS THEY WILL BE REQUIRED TO PASS A PERFORMANCE EVALUATION. THERE IS ALSO A WRITTEN QUIZ (OPTIONAL) THAT CAN BE ADMINISTERED IN THIS UNIT. SUCCESSFUL COMPLETION OF THIS UNIT REQUIRES 100 PERCENT CORRECT PERFORMANCE AND A SCORE OF AT LEAST 45 OF 65 POINTS (70 PERCENT) ON THE UNIT QUIZ (IF INSTRUCTOR CHOOSES TO GRADE THE QUIZ).	
A STUDENT FAILING THE PERFORMANCE EVALUATION AND WRITTEN QUIZ (OPTIONAL) WILL NEED ADDITIONAL TRAINING AND TESTING UNTIL PROPER PERFORMANCE IS ACHIEVED.	
I. INTRODUCTION	
Once a control line has been established around the fire perimeter, the line must be made safe. This action is called securing the control line. Mop up methods must be used to secure the control line. To some extent, mop up should already have begun as the control line was being constructed to provide a more effective control line.	

OUTLINE	AIDS & CUES
Mop up is one of the most important phases of fire suppression because any remaining burning debris may rekindle the fire making previous action ineffective.	
Mop up is difficult, dirty, and tiresome. It lacks the excitement of initial control action, and it usually starts after a long shift of initial control activity and in the dark. However, this important task may be filled with the safety hazards that exist in initial control action and require use of all personal protective equipment, especially eye protection.	FHB (inside front cover)
<u>Note:</u> One of the four common denominators present on the majority of the tragedy or near miss fires is: most of the fires appeared to be out before the "flare-ups" or problem fire behavior occurred. In some cases, tragedies have occurred in the mop up stage.	
II. MINIMUM IMPACT SUPPRESSION TACTICS	Minimum Impact Suppression Tactics Video
SHOW MIST VIDEO. FOLLOW UP VIDEO WITH A BRIEF DISCUSSION ON HOW MIST AFFECTS THE JOB OF THE BASIC FIREFIGHTER.	
III. METHODS OF MOP UP	
There are two types of mop up: dry and wet. Both involve separating burning and unburned materials, extinguishing the fire, and/or removing burning material along or near the control line according to agency specifications.	

OUTLINE	AIDS & CUES
Hand tools are used for mop up in the following ways:	
• Scraping	
• Digging	
• Stirring	
• Mixing	
• Separating	
• Turning logs and other heavy materials	
A. Dry Mop up	
Dry mop up is performed using tools with no water, retardant, or other wetting agent. The burning materials are extinguished by using soil and hand tools, or by moving the burning material into the burn area and piling to allow material to burn itself out (follow agency procedures and guidelines).	
1. Boneyarding or bone piling	12-05-G130-PPT
a. In an area that has many small limbs and logs not burning, the material can be checked by hand, and then placed in an area inside the burned area that has been checked and is cool.	
b. Safety concerns: picking up hot materials, missing hot areas, and getting a rekindle in a bone pile.	

OUTLINE	AIDS & CUES
2. Chunking and piling	12-06-G130-PPT
a. In certain cases it is best to allow the material to completely burn itself out, i.e., when in areas where escape is unlikely, in minimum impact areas, or areas where visual impact is a concern.	
b. Safety concerns: open fire for an extended time, spotting potential, and handling of burning material.	
3. Spreading of heavy concentrations of materials near control line or inside burned area to aid in mop up.	
a. A change in fuel arrangement can lower fire intensity and aid in mop up.	
b. Safety concerns: handling of burning fuels, rolling material, potential for flying embers.	
4. Banked fuels - fuels temporarily covered to cool or to protect them from becoming ignited:	
a. Must be uncovered, checked, and hot spots scraped out.	
b. Must be marked and included in a briefing for the next operational period.	
c. Safety concerns: smoldering fuels overlooked might cause an ash pit.	

OUTLINE	AIDS & CUES
5. Turn logs and material that might roll perpendicular to slope, and place a cup trench below it.	12-07-G130-PPT
B. Wet Mop up	12-08-G130-PPT
Separating and exposing burning materials using hand tools. The burning materials are then extinguished with water or a combination of water and soil.	
1. Apply water in a fine spray (conserves water and is most effective).	12-09-G130-PPT
2. Apply from control line inwards, toward the inside of the burned area.	
3. Apply from the outside of a hot area inward to the center.	
4. Use a straight stream to penetrate or reach a target (i.e., begin at base of tree and work up to the top).	
5. Spray, stir, and spray. Repeat as necessary.	
6. Consider the use of foam or other wetting agent (some environmental concerns).	12-10-G130-PPT 12-01-G130-IR SW p. 12.9
7. The use of hand tools is a must for effective mop up.	
8. Hay bales or other concentrations of fuel must be torn apart, sprayed, and spread out for complete mop up.	

OUTLINE	AIDS & CUES
C. Safety	
HAVE STUDENTS RECALL INFORMATION PRESENTED IN PREVIOUS UNITS ON SAFETY.	
1. Hazards in the general area include:	12-11-G130-PPT
a. Overhanging/leaning trees	12-12-G130-PPT
b. Snags	
c. Broken branches, tree tops, and large loose pieces of bark attached to snags or on the ground	
d. Trees with roots burned away	
e. Trees caught in other trees	
f. Rolling material on steep slopes	
g. Weather	
h. Bees, hornets	
2. Hazards associated with water use include:	
a. Rock and dirt particles, ash, charcoal, and mud being blown back when spraying hot rocks, white ash or fire pits, steam from putting water on a hot stump hole.	
b. Slippery footing	
c. Extensive hose lays	

OUTLINE	AIDS & CUES
d. Potentially spraying others. Adjust nozzle from stream to a spray before applying in the direction of other workers	
3. Always wear personal protective equipment with emphasis on eye protection and fire shelter.	
INVOLVE THE STUDENTS IN A DISCUSSION ON THE HAZARDS OF APPLYING WATER TO HOT MATERIALS. EMPHASIZE APPROPRIATE WATER USE INCLUDING FINE SPRAY WHEN WATER IS SCARCE.	
IV. SYSTEMATIC MOP UP	
On small fires where adequate resources are available, all burning materials should be extinguished. Fire size or quantity of burning materials may be so large that this is impractical. In this case, systematic/partial or systematic/total mop up must be used. Mop up specifications are found in the Incident Action Plan.	
Process for applying systematic mop up:	12-13-G130-PPT
• Start with the hottest area and progress to the coolest.	
• Plan a beginning and an ending point. Keep to the plan and work methodically.	
• Work inward from the control line.	
• Examine the entire assigned area.	

OUTLINE	AIDS & CUES
• Make sure instructions are clear. Ask questions.	
• For large burns and/or complicated situations some type of grid (block) system should be implemented. Set priorities and number each block.	
USE LOCAL EXAMPLES TO MAKE THIS POINT, IF APPLICABLE.	
Example: Frequently, bog fires cover large areas and require complicated mop up with a systematic plan of action. Such a plan should identify priorities and specific assignments. The plan might call for installing a sprinkler system to temporarily contain a hot section, while at the same time flooding another area for 100 percent mop up. This flooding would probably be done on a block by block basis.	
V. USING FOUR OF THE SENSES TO DETECT HOT MATERIALS	
Hot materials must be found before they can be extinguished.	
A. Sight - look for:	12-14-G130-PPT
1. Smoke. Look up as well as down. A treetop may be on fire.	
2. Heat waves.	
3. White ash. White ash indicates great heat; the ash may be covering hot embers.	

OUTLINE	AIDS & CUES
4. Stump holes. Care should be exercised around stump holes so that you do not collapse the edge and step into a very hot hole and steam scalds your foot.	
5. Steam.	
6. Gnats. They often hover over hot spots.	
B. Touch	12-15-G130-PPT
1. Do not wear gloves. Take care, do not burn yourself.	
2. At first, feel with the back of your hand about 1 inch away, then carefully with direct contact.	
C. Smell	12-16-G130-PPT
1. Smoke. Learn the difference between live and old smoke.	
2. Burning materials and the gases that these materials give off.	
D. Hearing - listen for the:	12-17-G130-PPT
1. Crack and pop of burning material.	
2. Hiss of water as it hits hot materials.	

OUTLINE	AIDS & CUES
VI. COVERED FUELS	
A. Machine Piles	12-18-G130-PPT
Dozer piles, pushups, or berms may result when equipment is used to build control line.	
These must be broken up, dispersed, and all burning materials extinguished. If not, any burning materials within the piles can smolder and later rekindle the fire.	
This can also be the result of large cup trenches on steep slopes constructed by hand crews.	
1. Break up and disperse.	
a. Separate fuels and dirt by hand or by machine.	
b. Remove all unburned fuels and throw outside the control line. Scatter fuels - do not make piles near the line.	
c. Remove all burning fuels and throw inside the control line. Either make piles to burn up or scatter fuels to dissipate heat.	
d. Cool all hot material in the pile.	
e. Extinguish any burning fuels.	

OUTLINE	AIDS & CUES
2. Hazards in the machine piles include:	
a. Spring poles. Branches or trees under tension as a result of piling.	
b. Unstable footing.	
c. Stepping into hidden hot pockets of coals.	
d. Reduced recognition of hazards and reduced visibility during night operations.	
e. Falling berm and logs.	
f. Crew fatigue.	
B. Ground Fuels, including:	12-19-G130-PPT
1. Coal seams	
• Dig out all burning material, spread out, and extinguish all hot spots. • Heavy equipment may be necessary to mop up. • Care must be exercised as not to fall into ash pits.	
2. Peat	
• Bogs	
3. Heavy duff layers in timber	

OUTLINE	AIDS & CUES
4. Natural fuel accumulations	
• Wind, insect or disease damaged down timber.	
VII. OTHER AIDS TO ASSIST THE MOP UP PROCEDURE	
A. Infrared Imagery – Aircraft	
• FLIR - Forward looking infrared	
• FLAME	
• Phoenix	
B. Infrared Devices (heat detectors) – Handheld	
• Probeye	
• Thermal scanner	
• Xedar	
• Palm IR	
VIII. STRENGTHENING THE CONTROL LINE	
A. Rearranging Fuel	12-20-G130-PPT
1. Limb up trees or eliminate ladder fuels.	
2. Fell snags inside and outside the control line that may pose a danger to the security of the control line or to the safety of fire suppression personnel.	

OUTLINE	AIDS & CUES
3. Fell brush and trees that pose a threat to the security of the fireline (inside and outside the control line).	
4. Break open stumps, remove burning materials and extinguish them.	
5. Dig out and remove burning materials from underground roots and extinguish.	
6. Scatter all cut fuels.	
7. Throw all burned and/or charred materials well back into the burn, and/or extinguish the materials.	
8. Scrape duff and other materials into the burn and scatter them.	
B. Trenches	12-21-G130-PPT
Be sure that trenches and/or under slung lines are deep and high and composed solely of mineral soil to insure that no burning material can cross.	
C. Water bars	12-22-G130-PPT
During mop up, construct or improve existing water bars according to the specifications in the Incident Action Plan, to reduce erosion.	

OUTLINE	AIDS & CUES
IX. FOLLOW UP OF A WET LINE, RETARDANT LINE, OR TREATED AREA	
A. Deficiencies that may occur	
1. Not all fuels in a treated area may be coated.	
2. Skips in application of water or retardant occur.	
3. Evaporation has dried out fuels since application.	
B. Action	
1. Assess the nature of the fuels inside and outside the treated area for:	
• Arrangement	
• Continuity	
• Compactness	
• Loading	
2. Assess the fire activity threatening the treated area for:	
• Smoldering	
• Creeping	
• Running	

OUTLINE	AIDS & CUES
• Spotting • Crowning 3. Assess the chances for later burn through the treated area. Look for: a. Parched and/or scorched but unburned fuels near the area. b. Fuels not fully burned out near the treated area. 4. Reinforce the treated area by: a. Constructing a fireline. b. Limbing up nearby trees and brush. c. Fireproofing fuels on the outside of the control line. d. Dropping snags. 5. If safe and practical, burn out areas of unburned fuel near the treated area to prevent a possible slopover or reburn later.	

OUTLINE	AIDS & CUES
X. APPLICATION/EVALUATION	
DEMONSTRATE THE FOLLOWING TECHNIQUES AND HAVE THE STUDENTS PRACTICE THEM. PRACTICE AND CRITIQUE THESE PROCEDURES UNTIL EACH STUDENT CAN SUCCESSFULLY PERFORM EACH TECHNIQUE.	
1. HAVE EACH STUDENT DEMONSTRATE THE FOLLOWING MOP UP TECHNIQUES.	
A. Dry Mop up	
• Utilization of hand tools for chopping, scraping, separating burning materials.	
• Mixing burning materials with soil.	
• Use of senses to detect burning materials.	
• Rearranging of fuels adjacent to the control line to facilitate holding the fire.	
B. Wet Mop up	
• Utilization of hand tools for chopping, scraping, separating burning materials.	
• Safe application of water to burning materials.	
• Use of the senses to detect burning materials.	
• Rearranging of fuels adjacent to the control line to facilitate holding of the fire.	

OUTLINE	AIDS & CUES
2. HAVE THE STUDENT DEMONSTRATE THE TECHNIQUES FOR COLD TRAILING A FIRE.	
3. IF POSSIBLE, SET UP A SIMULATION ALLOWING THE STUDENTS TO DEMONSTRATE THE FOLLOW UP PROCEDURES FOR WETLINE, RETARDANT LINE, OR TREATED AREA.	
THERE MAY BE AN OPPORTUNITY TO COMBINE THIS EXERCISE/SIMULATION WITH THE APPLICATION EXERCISE/SIMULATION IN UNIT 9 - SUPPRESSION.	
OPTIONAL: **ADMINISTER UNIT QUIZ. AFTER COMPLETION, GRADE QUIZZES AND THEN REVIEW ANSWERS WITH STUDENTS.**	12-02-G130-IR SW p. 12.11 thru 12.12
REVIEW UNIT OBJECTIVES.	12-23-G130-PPT thru 12-25-G130-PPT

Types of Class A Foam

Expansion
1:1

20:1

Foam Solution
- A clear to milky fluid
- lacks bubble structure
- mostly water

Wet Foam
- Watery
- Large to small bubbles
- Lacks body
- Fast drain times

Fluid Foam
- Similar to watery shaving cream
- Medium to small bubbles
- Flows easily
- Moderate drain times

Dry Foam
- Similar to shaving cream
- Medium to small bubbles
- Mostly air
- Clings to vertical surfaces
- Slow drain times

Drainage
Rapid

Slow

WILDLAND TRAINING (FFT2) FOR STRUCTURAL FIREFIGHTERS, G-130

UNIT 12 - MOP UP AND SECURING THE FIRELINE

UNIT QUIZ WITH ANSWERS
(65 Total Points)

A minimum score of 45 is required for a passing grade.

1. Which four senses aid in the detection of burning materials? How? (12 points)

   - **Sight - See smoke, heat waves, white ash, stump holes, steam, gnats.**
   - **Touch - Feel heat with back of hand first.**
   - **Smell - Detect smoke or gases from fire.**
   - **Hearing - Listen for crackling and popping sounds in smoldering fire, and hissing when water hits hot materials.**

2. Describe five precautions or techniques used to safely apply water to hot materials. (10 points)

   - **Wear eye protection to prevent ashes, embers, mud, steam and debris from injuring eyes.**
   - **Direct and apply water from the control line to the inside of the burn.**
   - **Apply water from the outside to the center of a hot area.**
   - **Apply water from the base to the top of burning fuel.**
   - **Choose nozzle setting appropriate to the situation.**
   - **Use hand tools in conjunction with applying water.**

3. Why is it important to break up and disperse machine piles adjacent to the fireline? (3 points)

   Fire may smolder in fuels covered with soil and rekindle later.

4. Describe a systematic method of mop up. (10 points)

- **Start along the control line.**
- **Progress inward from the control line.**
- **Examine entire assigned area.**
- **Use a grid method for extensive mop up.**
- **Identify flood method of mop up: Sprinkler pipes–irrigation system or volume flooding.**

5. Describe the technique of cold trailing on a simulated fire perimeter. (4 points)

Uses sense of touch to detect any burning materials. If burning materials exist, extinguish.

6. Describe what to do when using the following two methods to strengthen the control line. (8 points)

a. Rearrange fuels adjacent to a control line to facilitate holding the fire.

- **Turn logs and secure to prevent them from rolling across fireline.**
- **Scatter fuel accumulations.**
- **Fell trees and brush near control line.**
- **Identify snags that need felling.**

b. Fireproof fuels adjacent to a control line to facilitate holding the line.

- **Cover logs and stumps with soil, rocks, water, or retardant.**
- **Limb up standing trees and brush.**

7. Describe the proper follow up procedures for a wet line, retardant line, or treated area. (10 points)

- **Assess the nature of the fuels inside and outside the treated area.**
- **Assess the fire activity threatening the treated area.**
- **Assess the chances of a later fire in the treated area.**
- **Reinforce the treated area.**
- **Cold trail the treated area.**
- **If safe and practical, burnout where necessary.**

8. Describe the method to extinguish burning materials without the use of water.
(4 points)

By chopping and scraping, separate burning materials from non-burning materials and then extinguish by mixing with soil.

9. Describe the method for wet mop up. (4 points)

Burning materials are separated and exposed using hand tools. Burning materials are then extinguished with water or a combination of water and soil.

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 13 – Risk Management: Wildland Hose and Hose Lays

Time 1 ¾ - 2 Hours

Objectives

1. Identify various pieces of equipment used in the wildland water delivery system.
2. List and describe the various pieces of equipment needed to implement the delivery system.
3. Describe and identify the various types of hose lays used in initial attack and mop up of fires.

Strategy

This unit addresses the need for structural firefighters to understand and use wildland hoses including: hose pack construction, fittings, progressive hose lay, and deployments. These are gaps in skill identified by the *Skills Crosswalk*.

Instructional Method(s)

- Informative lecture/discussion
- Demonstration

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software
- ☐ A portable pump and a portable pump kit
- ☐ Examples of local hose packs
- ☐ Water Handling Equipment Guide

Exercise(s)

- No exercises

Evaluation Method(s)

- Written quiz.

Outline

I. Selecting the Right Fittings and Hose

II. Common Fittings Used in Wildland Fire Suppression

III. Hose Deployment

IV. Hose Lays

V. Hose Retrieval

VI. Teamwork

Aids and Cues Codes

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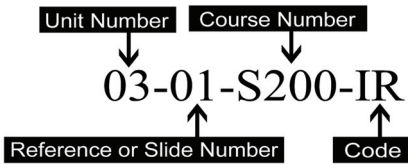

UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 13 – Risk Management: Wildland Hose and Hose Lays

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	13-01-G130-PPT
PRESENT UNIT OBJECTIVES.	13-02-G130-PPT
I. SELECTING THE RIGHT FITTINGS AND HOSE	13-03-G130-PPT
In the wildland, just as in structural firefighting, hoses and fittings are a common tool. There are several configurations of fittings available as well as nozzles and hose. In this lesson we will discuss all of the common types so that you will become familiar with them and know which ones will make your hose lay more efficient. You will learn how to make your job easier using the correct fittings in different situations.	
Fittings can be divided into four major categories.	
A. ADAPTERS: Adapters are used to connect two dissimilar hose fitting threads. They can either be brass, bronze, or aluminum alloy.	
B. HOSE COUPLINGS: Hose couplings, when installed, become a permanent part of the hose. Each hose has a swivel or female end and a male end. All female ends will have lugs. Male ends may or may not have lugs.	
C. INTAKES: Intakes include gravity socks, suction strainers, foot valves, and ejectors.	

OUTLINE	AIDS & CUES
D. SERVICE FITTINGS: This is a catchall phrase for in-line parts not included in the first categories. These include double female, double male, increasers, reducers, hoseline tees, hoseline tee valves, bleeder valves, check valves, check and bleeder valves, pressure relief valves, and gated valves.	
1. These fittings are constructed of brass or aluminum alloy, with the aluminum alloy being the most common for forestry applications. They have lugs that facilitate the tightening or loosening of the fitting.	
2. To assist with the alignment of the fittings the threads have a blunt end called a "Higbee Cut." When the ends of the hose or fittings are put together the blunt ends allow the threads to line up and prevent cross threading.	
3. Threads on fittings and hose are said to be straight or parallel. A water seal is formed as the external thread lip seats against a recessed gasket in the internal thread section.	
4. NH is an abbreviation of American National firehose coupling thread for chemical and fire protection hose. NPSH is the abbreviation for American National hose- coupling threads; i.e., straight pipe threads for hose couplings and nipples. Table 1 shows the threads used in current wildland fire suppression operations.	

OUTLINE	AIDS & CUES

Table 1 - Thread Types

Nominal Size (inch)	Threads per inch	Thread Type
2 ½	7 ½	NH
1 ½	9	NH
1	11 ½	NPSH
¾	11 ½	NH

5. The large 2½" diameter threads are used primarily for suction hose couplings and municipal fire applications. Some local variations on 2½" threads. The 1½" size is by far the most common in fire operations and is used for primary hose lays. The 1" connection is used on most nozzle bases, on 1" soft hose, and on 3/4" hard rubber hose on reels.

"NH" THREAD TYPE – MAY FIND FITTINGS MARKED "GHT" FOR THE 3/4 INCH.

Fittings, hose, and water handling tools are expensive. Gather up all the items when you are finished using them and make sure they are returned. Protect the threads on all fittings and hose as much as possible. With proper care these items can be reused numerous times.

PROVIDE EXAMPLES OF CURRENT PRICES.

OUTLINE	AIDS & CUES
II. COMMON FITTINGS USED IN WILDLAND FIRE SUPPRESSION	
PROVIDE EXAMPLES TO SHOW VARIATIONS IN FITTINGS.	
A. The pressure relief valve is used on 1½" hose lines from positive displacement pumps and is recommended for use with centrifugal pumps. It relieves line surges and excessive pressure on the pump due to kinked hose and rapid discharge water shut-off. The device bypasses water and cushions sudden line surges automatically to permit the use of a shutoff nozzle. The pressure may be hand adjusted from 50 to 200 pounds.	13-04-G130-PPT
B. A check and bleeder valve is a combination valve used in 1½" hose lines when pumping water with portable pumps. A clapper valve holds the head of water back when the pump is stopped. Before starting the engine, the bleeder valve is opened until the pump gains normal operations. A pump protection hose can be coupled to the 1" bleeder valve outlet if required.	13-05-G130-PPT
C. Wyes are also called wye valves, gated wyes, wye connections, wye control valves, etc. Wye connections are often confused with Siamese connections. They are not the same. A wye divides one line into two, as the Siamese unites two lines into one.	13-06-G130-PPT 13-07-G130-PPT

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D. Siamese connections can be used to unite two lines into one. Wye valves can be used as Siamese by turning them around backwards to normal flow and by adding two double female and one double male fitting.	13-08-G130-PPT
E. The hose line tee valve is placed on a 1½" main line to branch or "T" off into a smaller 1" lateral line. It may have a shut-off feature to control flow in a 1" lateral.	13-09-G130-PPT
F. Threaded caps are used to protect threads and close ports.	13-10-G130-PPT
G. Double female couplings connect two male ends having the same diameter and threads.	13-11-G130-PPT
H. The double male coupling connects two female ends having the same diameter and threads.	13-12-G130-PPT
I. Reducers connect the outlet end of any fitting to the inlet side of a smaller fitting with the same or different hose threads.	13-13-G130-PPT
J. Increasers are used to go from one size to a larger size connection.	13-14-G130-PPT
K. Thread adapters have different threads on opposite ends. They are used to connect different types of threads together, or to adapt threads to the pump discharge.	13-15-G130-PPT
L. The twin tip combination nozzle, commonly called the "forester" nozzle, is a combination spray, straight stream nozzle with a sequence shut-off from spray (fog) to straight stream.	13-16-G130-PPT

OUTLINE	AIDS & CUES
M. Adjustable combination barrel nozzles provide a sequence of spray from straight stream to wide angle in multiple GPM settings for both fog and straight stream patterns.	13-17-G130-PPT
N. Hose clamps stop the flow of water through the hose so that hose can be added or replaced.	13-18-G130-PPT
O. A spanner wrench is used to tighten connections. They are supplied in various sizes.	13-19-G130-PPT
P. The gravity sock is used to take advantage of flowing water that is above the fire. The large opening is placed up stream and anchored securely. The tail is hooked to the fire hose and by gravity feed water is supplied to the fire.	13-20-G130-PPT
Q. Ejectors are used where the lift required from the water source is greater than a pump's ability to lift water. Ejectors operate using the venturi effect. Water is pumped through a small opening at high velocity into a larger opening or chamber, which in turn creates a vacuum. This vacuum is used to draft water up through the suction. The amount of water picked up will depend on the velocity of the pumped water and size of the opening the water is forced through.	13-21-G130-PPT
R. Most foot valves are a foot valve and strainer assembly. It is spring loaded to prevent water from running out of the suction hose as it is being primed or if the pump is shut off. A strainer is used to strain out foreign material. Always use a foot valve with a strainer to prevent damage to the pump.	13-22-G130-PPT

OUTLINE	AIDS & CUES
S. Hose is used on the pump suction and discharge. Suction hose should withstand at least 25-in Hg vacuum. Working pressures vary depending upon the type of discharge hose needed. Hose is manufactured in numerous ways with various materials resulting in a variety of strengths, friction losses, and other factors that suit the needs of the user. The most common sizes of hose used in wildland firefighting are ¾", 1", and 1½" in 50 and 100 foot lengths. 1. Fire hose provides the essential means of transporting water from a water source to the fire. The hose selected must be able to withstand the necessary pressures involved, yet be flexible and lightweight enough to handle. 2. The care and maintenance of fire hose is described in detail in the NFPA Standard No. 1962, dated 1987. Further information on hose is found in the NWCG Water Handling Equipment Guide NFES number 1275.	
T. <u>Cotton-synthetic Jacket Rubber Lined hose</u> (CJRL) consists of a cotton-synthetic fiber outer layer and a smooth rubber lining. All-cotton is less liable to heat and flame damage than synthetic fibers, but is no longer procured under Forest Service Specification.	13-23-G130-PPT

OUTLINE	AIDS & CUES
U. Synthetic jacket lined hose consists of a synthetic fiber jacket and a synthetic or rubber lining. The synthetic fiber is susceptible to abrasion and heat damage but is lighter in weight.	13-24-G130-PPT
V. Unlined weeping hose is made of synthetic or linen fibers. Its design provides protection to the hose from fire by maintaining a wet surface on the hose.	13-25-G130-PPT
W. Hard suction hose is used on the suction side of the pump. The hose consists of synthetic or hard rubber outer covering with cotton fibers around a spring steel wire coil lined with rubber. The hose is designed for a pressure test of 100 psi and a vacuum of 25-in Hg.	13-26-G130-PPT
III. HOSE DEPLOYMENT	13-27-G130-PPT
The efficient deployment of hose is important to the wildland firefighter. Hose is generally laid in two manners: using rolled hose or pre-packed hose packs. There are numerous styles of hose packs and different methods to construct them.	
Rolled hose is the most common method of deploying hose. When deploying hose ensure personnel are aware of potential impact hazards. Fire caches normally store and ship rolled hose, so there is no handling necessary prior to deployment. It is easier to store and ship, and it can be easily inspected and tested.	
Hose packs take time to construct. Hose packs should be dismantled during the off-season to reduce damage to the hose. They are heavy, cumbersome, and make travel in rough terrain difficult.	

OUTLINE	AIDS & CUES
BRIEFLY DISCUSS ADVANTAGES AND DISADVANTAGES.	
SHOW A HOSE PACK APPLICABLE TO YOUR AREA.	
IV. HOSE LAYS	Water Handling Equipment Guide p. 98-101
Once the firefighter is familiar with how to set up, operate, and maintain a portable pump, they then must get the water to the incident in an efficient and safe manner. This is accomplished by flowing water through the hose, fittings, and nozzles you have previously learned about.	
There are numerous ingenious methods for dispensing hose and fittings to accomplish this. Here we will discuss the types of hose lays, not the methods used to lay the hose out.	
The two types of hose lays are:	
• <u>Simple</u> - one that comes straight off the pump and goes directly to the nozzle with no junctions in between.	13-28-G130-PPT
• <u>Progressive</u> - is a hose lay that comes from a pump source to the fire with a series of lateral junctions put in place as the hose lay is extended.	13-29-G130-PPT
Both types of hose lay may use either 1" or 1½" hose of whatever type construction that is preferred.	

OUTLINE	AIDS & CUES
A. A simple hose lay is one that runs directly from the pump to the nozzle. This hose lay is easily installed and can vary in length as needed. This type of hose lay does not have a lot of friction loss due to additional fittings, which is an advantage. The key disadvantage of the simple hose lay is that the water flow must be stopped before it can be extended by adding a length of hose. **There also are no provisions for safety should the fire flare up behind the nozzle operator.** A simple hose lay is more difficult to use in mop up as you must either reverse the installation process or pull large amounts of hose.	13-30-G130-PPT
WHEN YOU HAVE NO PROTECTION BEHIND YOU, YOU MAY GET INTO TROUBLE VERY QUICKLY.	
B. A progressive hose lay is one that incorporates a series of lateral lines off of a main trunk line. The progressive hose lay has several advantages over the simple hose lay in that it provides for a continuous attack on a fire without risking shutting down the hose lay to extend its reach. The progressive hose lay provides a safety margin for the lead nozzle operator in that there is a charged or easily charged lateral line behind them should there be a flare up. It also can provide for multiple attack lines on spot fires across the control line.	13-31-G130-PPT

OUTLINE	AIDS & CUES
A progressive hose lay does create a higher friction loss in your hose lay due to the increased numbers of fittings (approximately 5 psi each). A progressive hose lay may be slower to install, but is inherently safer for direct attack and much more efficient in mop up.	
1. To install a progressive hose lay, a crew first extends a trunk line of 1½" hose from the pump to the fire as a simple hose lay. Once they reach the fire, they install a gated wye and proceed 100 feet with the trunk line to install another gated wye, which has a 1½" to 1" reducer on one side (toward the fire) and attach 100 feet of 1" hose with the preferred nozzle. One person can then operate this nozzle to attack the fire as another person extends the next section of the trunk line, which is attached to the remaining side of the gated wye. Once the trunk line is extended and the second lateral gated wye is in place, the first nozzle operator then charges the trunk line and returns for more hose once the second lateral attack line is flowing water. This process is repeated until the fire is contained or the pump has reached capacity.	

OUTLINE	AIDS & CUES
A progressive hose lay is very efficient when mop up time arrives. A progressive hose lay off of a Mark 3 pump can easily supply three to five nozzles depending on friction loss and required head pressure. This can efficiently keep a 20-person crew busy. A progressive hose lay provides numerous opportunities for lateral lines to speed up mop up and prevent having to move 1½" trunk lines.	
V. HOSE RETRIEVAL	
Once the hose lay operation is finished and it is time to retrieve the hose, it is important to follow the proper method, to avoid damage to the hose.	
Drain the water from the hose by opening a valve or disconnecting the hose at the lowest point on the line. Stretch the hose out to drain all the water. Any hose that is damaged should be marked by tying a knot in the ends of the hose.	
There are various ways to field roll hose such as the watermelon roll, figure eight, and single or double rolling, etc.	
When handling hose, care should be taken not to damage the hose or fittings. Hose can be damaged by dragging it over rough surfaces such as rock or pavement or pulling long lengths of hose by the fitting with vehicles, winches and ATV's. The fitting can be damaged by dragging on a rough surface or by being dropped.	

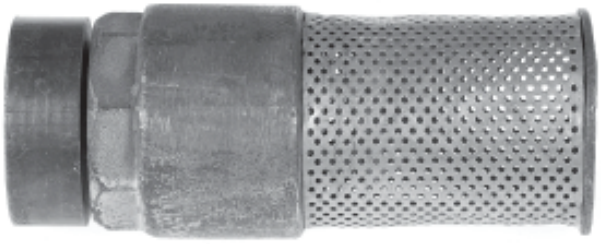
OUTLINE	AIDS & CUES
EMPHASIZE PROTECTING THE MALE END OF THE HOSE. Hose should be cleaned, inspected, and tested after use. These procedures are given in the NFPA standard 1962, Care, Use, and Maintenance of Fire Hose, and the NWCG Water Handling Equipment Guide, NFES 1275.	
REFER STUDENTS TO PAGE 13.16 IN THE STUDENT WORKBOOK FOR THE UNIT QUIZ. ALLOW 20 MINUTES FOR COMPLETION.	13-32-G130-PPT thru 13-38-G130-PPT
HAND OUT SOLUTIONS AND DISCUSS ANSWERS WITH STUDENTS.	13-01-G130-IR 13-02-G130-IR
REVIEW UNIT OBJECTIVES.	13-34-G130-PPT

WILDLAND TRAINING (FFT2) FOR
STRUCTURAL FIREFIGHTERS, G-130
UNIT 13 -WILDLAND HOSE AND HOSE LAYS

QUIZ

Correctly identify the pictures below:

1._____ 2._____



3._____ 4._____

5._____

6._____

7._____

8._____

9._____

10._____

11._____

12._____

13._____

14._____

15._____

Are the following statements true or false?

16. Linen, cotton, wool, and rubber are all materials used in making hose.

___True

___False

17. Pressure relief valves are recommended on centrifugal pumps.

___True

___False

18. Adapters connect two ends of different thread types together.

___True

___False

19. Increasers are used to go from one size to a smaller size connection.

___True

___False

20. Washers or gaskets are not needed in the female ends of all connections.

___True

___False

21. What are the two types of hose lays?

a.

b.

22. How many attack lines are operated with a simple hose lay?

23. List five benefits of a progressive hose lay.

a.

b.

c.

d.

e.

24. What are some advantages of a simple hose lay?

25. On which hose lay must you stop the flow of water before extending?

26. What size hose is normally used on a progressive hose lay trunkline?

27. What size hose is normally used on a progressive hose lay lateral line?

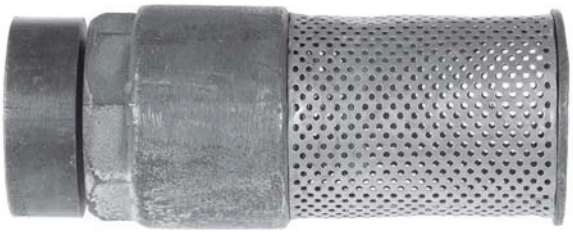
WILDLAND TRAINING (FFT2) FOR STRUCTURAL FIREFIGHTERS, G-130

UNIT 13 -WILDLAND HOSE AND HOSE LAYS

QUIZ ANSWERS

Correctly identify the pictures below:

1. Double Male Coupling **2. Hose Line Tee Valve**



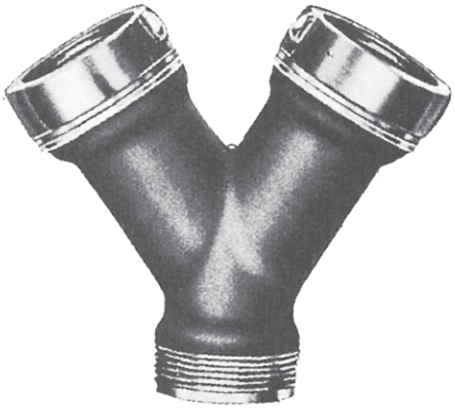
3. Foot Valve Strainer **4. Check and Bleeder Valve**

5. Ejector

6. Reducer

7. Double Female Coupling

8. Thread Adapter



9. Siamese Connection

10. Cap

11. Pressure Relief Valve

12. Wye Valve

13. Gravity Sock

14. Hose Clamp

15. Spanner Wrench

Are the following statements true or false?

16. Linen, cotton, wool, and rubber are all materials used in making hose.

_____True

__X__False

17. Pressure relief valves are recommended on centrifugal pumps.

__X__True

_____False

18. Adapters connect two ends of different thread types together.

__X__True

_____False

19. Increasers are used to go from one size to a smaller size connection.

_____True

__X__False

20. Washers or gaskets are not needed in the female ends of all connections.

_____True

__X__False

21. What are the two types of hose lays?

a. Simple

b. Progressive

22. How many attack lines are operated with a simple hose lay?

One

23. List five benefits of a progressive hose lay.

a. Safety for the nozzle person

b. Multiple attack lines

c. Easier mop up

d. Provides for picking up spots behind the lead nozzle person

e. Trunk line is always charged

24. What are some advantages of a simple hose lay?

a. Easy to install

b. Less friction loss

c. Length easily varied

25. On which hose lay must you stop the flow of water before extending?

Simple

26. What size hose is normally used on a progressive hose lay trunk line?

1½ inch

27. What size hose is normally used on a progressive hose lay lateral line?

1 inch

UNIT OVERVIEW

Course Wildland Training (FFT2) for Structural Firefighters, G-130

Unit 14 – Risk Management: Transportation Safety Procedures

Time 30 Minutes

Objectives

1. Develop a list of three safety procedures to follow when traveling by each of the following:
   - Vehicle
   - Boat
   - Helicopter
   - Fixed-wing aircraft
   - On foot

Strategy

This unit addresses the need for structural firefighters to know how to be safe, and safely transport personnel and equipment in wildland situations. This is a gap in skill identified by the *Skills Crosswalk*.

Instructional Method(s)

- Informative lecture/discussion

Instructional Aids

- ☐ Whiteboard or flipchart, and writing utensils
- ☐ Computer with projector and appropriate software
- ☐ As many types of vehicles available as possible

Exercise(s)

- Field Exercise

Evaluation Method(s)

- Performance evaluation

Outline

I. Introduction

II. Vehicle Travel

III. Boat Travel

IV. Helicopter Travel

V. Fixed-wing Aircraft Travel

VI. Emergency Landing Procedures for Aircraft

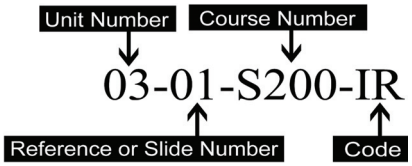
VII. Foot Travel

VIII. Application/Evaluation

Aids and Cues Codes

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	IR – Instructor Reference
SW – Student Workbook	SR – Student Reference
HO – Handout	PPT – PowerPoint



UNIT PRESENTATION

COURSE: Wildland Training (FFT2) for Structural Firefighters, G-130

UNIT: 14 – Risk Management: Transportation Safety Procedures

OUTLINE	AIDS & CUES
UNIT TITLE SLIDE.	14-01-G130-PPT
PRESENT UNIT OBJECTIVES.	14-02-G130-PPT
ADVISE STUDENTS THEY WILL BE REQUIRED TO PASS A PERFORMANCE EVALUATION AND A QUIZ ADMINISTERED DURING THE FIELD EXERCISE. SUCCESSFUL COMPLETION OF THIS UNIT REQUIRES 100 PERCENT CORRECT PERFORMANCE AND A SCORE OF AT LEAST 21 OF 30 POINTS (70 PERCENT) ON THE UNIT QUIZ.	
A STUDENT FAILING THE PERFORMANCE EVALUATION OR WRITTEN QUIZ WILL NEED ADDITIONAL TRAINING AND TESTING UNTIL PROPER PERFORMANCE IS ACHIEVED.	
I. INTRODUCTION	
Fire suppression is hazardous, as is travel to the fire and along the fireline. The roads and terrain can be extremely rough. Helicopter flights expose the firefighters to the hazards of flying in mountainous terrain.	
At times it may also be necessary to be transported by boats. Although these many forms of transportation save time and energy, they also expose the firefighter to the many hazards that are inherent with each type of transportation.	

OUTLINE	AIDS & CUES
INCLUDE DEMONSTRATIONS AS MUCH AS POSSIBLE IN LESSON PRESENTATION. USE TRAVEL TO AND FROM TRAINING SITES AND SIMULATED DEMONSTRATIONS TO ACHIEVE TRAINING OBJECTIVES.	
II. VEHICLE TRAVEL	14-03-G130-PPT
A. Loading	
1. Provide one person to control loading.	
2. Use steps or safety devices.	
3. Provide lights at night.	
4. When traveling, stay off running boards, bumpers, and steps.	
5. Keep tools boxed.	
6. Do not overload.	
B. Riding	
1. Avoid horseplay.	
2. Keep arms and legs inside.	
3. Do not throw anything off vehicle.	
4. Do not smoke.	
5. Wear seat belts.	

OUTLINE	AIDS & CUES
C. Unloading	
1. Provide one person to control unloading.	
2. Stay seated until vehicle stops.	
3. Wait for steps or tailgate to be lowered, if appropriate.	
4. Move away from vehicle.	
III. BOAT TRAVEL	14-04-G130-PPT
A. Loading	
1. Wear life preservers.	
2. Stay seated.	
3. Follow boat crew directions.	
4. Do not overload.	
B. Riding	
1. Keep arms and legs inside.	
2. Remain seated.	
3. Remain still, do not rock the boat.	
C. Unloading	
1. Wait for boat to be secured.	
2. Be careful on wet rocks and painted surfaces, they may be slippery.	

OUTLINE	AIDS & CUES
IV. HELICOPTER TRAVEL	
CONSIDER USING LOCAL QUALIFIED HELITACK PERSONNEL FOR PRESENTATION ON HELICOPTER TRAVEL.	14-05-G130-PPT
Generally, all helicopter operations will be managed by qualified helitack personnel. Helitack is responsible for the loading and unloading of personnel and gear.	
Even if the operation is managed by helitack, each firefighter should be aware of what is happening on the helispot or helibase.	
Major hazards are rotors and air turbulence from the rotors.	
A. Loading	
1. Follow instructions of personnel responsible for loading.	
2. Approach helicopter when directed by pilot or person responsible for loading, keeping eye contact with pilot.	
3. Never approach a helicopter from the rear.	
4. Never approach from ground that is higher than the helicopter.	
5. Fasten hard hat chin strap or hold hard hat firmly in your hand close to your body.	

OUTLINE	AIDS & CUES
6. Walk in crouched position when underneath main rotor. Do not run.	
7. Tools will be loaded by qualified helitack personnel.	
8. Never throw anything from or near the helicopter.	
9. Pack all gear securely and hold it firmly or tie it down.	
10. Wear eye and ear protection when around helicopters. Face away from helicopters when they are taking off and landing to avoid blowing dust or debris.	
11. Follow directions of helitack personnel.	
12. Fasten seat belt.	
13. Have person responsible for loading or unloading open and close door.	
14. Know the emergency egress procedure.	
B. Riding	
1. Do not smoke or chew tobacco.	
2. Keep hands off controls, door, and window knobs.	
3. Hold gear firmly.	
4. Never throw anything out of a helicopter.	
5. Fasten hard hat chin strap.	

OUTLINE	AIDS & CUES
6. Do not distract the pilot, particularly during landing or take off.	
7. Stay seated. Do not unfasten seat belt until directed by helitack personnel.	
C. Unloading	
1. Wait for signal from pilot or helitack.	
2. Crouch and exit to the front or side, as directed. Never go uphill away from the helicopter.	
3. Use red handles only for emergencies; these handles jettison the doors.	
4. Re-fasten seatbelts prior to exiting helicopter.	
V. FIXED-WING AIRCRAFT TRAVEL	14-06-G130-PPT
If in a large transport aircraft, follow the directions of pilot and attendants.	
For smaller aircraft:	
• Remember the pilot is in command. Follow the pilot's instructions.	
• Never open a door while in flight.	
• Do not distract the pilot during take-off or landing.	
• No smoking.	

OUTLINE	AIDS & CUES
• Do not slam door shut; assure nothing is hanging outside the door that could cause damage.	
• Fasten seat belt/shoulder harness.	
• Know emergency egress procedure.	
VI. EMERGENCY LANDING PROCEDURES FOR AIRCRAFT	
Position yourself in the correct crash position as dictated by the pilot or helitack crew.	
VII. FOOT TRAVEL	14-07-G130-PPT
A. Your supervisor will set the pace and select the route for your crew.	
B. Crew members <u>must</u> stay together. If you are separated, stay on the fireline and try to make contact with your crew. You are safe in the burned area and you will eventually be found.	
C. Maintain proper distance between crew members (10-feet).	
D. Hazards you will encounter while walking to or from the fire are:	
1. Darkness (hampers your ability to recognize many objects in time to avoid them).	
2. Your hand tools.	
3. Another person's hand tools.	

OUTLINE	AIDS & CUES
4. Falling trees, tree-tops, hanging loose debris from saws or tractors, fire or disease weakened trees.	
5. Leaning trees.	
6. Snags.	
7. Whipping branches.	
8. Rolling rocks or logs.	
9. Vehicles, heavy equipment, ATVs, aircraft working overhead.	
10. Unstable footing.	
11. Stream or canal crossings.	
a. Avoid high log crossings.	
b. Watch the log (not the water).	
c. In swift current; face across stream; use a stick for balance; remove boots; loosen pack.	
12. Stump holes.	
a. Avoid root holes from upended trees.	
b. Watch for burned stumps that may be hidden under ash layer. Beware of white ash that may indicate stump hole (test with stick or hand tool).	

OUTLINE	AIDS & CUES
13. Local hazards (poisonous insects, snakes, or plants; polluted water; etc.).	
14. Fire location (know where the fire is; follow your crew leader's directions in an emergency).	
VIII. APPLICATION/EVALUATION	
INSTRUCTOR MAY USE STUDENT TRAVEL DURING THE TRAINING TO PRACTICE TRAVEL AND TRANSPORTATION OF PERSONNEL AND TOOLS.	
PERFORMANCE EVALUATION (GROUP OR INDIVIDUAL EXERCISE):	
USING THE CHECKLIST, OBSERVE STUDENTS TRAVELING DURING THE TRAINING. INSTRUCTOR MAY HAVE STUDENTS LOAD AND UNLOAD FROM VEHICLES AND AIRCRAFT.	14-01-G130-IR SW p. 14.7
ANY ITEM NOT CHECKED AS SUCCESSFULLY COMPLETED, CONSTITUTES FAILURE. ADDITIONAL TRAINING AND TESTING IS NEEDED UNTIL PROPER PERFORMANCE IS ACHIEVED.	
ADMINISTER UNIT QUIZ. AFTER COMPLETION, GRADE QUIZZES AND THEN REVIEW ANSWERS WITH STUDENTS.	14-02-G130-IR SW p. 14.8
REVIEW UNIT OBJECTIVES.	14-08-G130-PPT
REVIEW COURSE OBJECTIVES.	14-09-G130-PPT 14-10-G130-PPT

WILDLAND TRAINING (FFT2) FOR STRUCTURAL FIREFIGHTERS, G-130

UNIT 14 - TRANSPORTATION SAFETY PERFORMANCE EVALUATION

Observe students traveling during the training. Instructor may have students load and unload from vehicles and aircraft.

INSTRUCTOR CHECKLIST:

Score by placing a checkmark in the box. Failure on any step or procedure constitutes failure of the exam.

☐ 1. PPE properly worn.

☐ 2. Safety measures taken (seat belts, life vests, etc.).

☐ 3. Tools and personnel separated.

☐ 4. Follows directions of appropriate personnel.

☐ 5. Appropriate spacing during foot travel.

☐ 6. Eye protection utilized where necessary.

WILDLAND TRAINING (FFT2) FOR STRUCTURAL FIREFIGHTERS, G-130

UNIT 14 - TRANSPORTATION SAFETY PERFORMANCE EVALUATION

UNIT QUIZ WITH ANSWERS

List three safety procedures for each of the following five modes of transportation. There are many possible answers; if unsure of the correctness of a particular answer, refer to page numbers. **(6 pt. each = 30 possible points)** Possible answers can also be found in the Incident Response Pocket Guide (IRPG)

1. Vehicle safety procedures: (6 pts.)

   - **See pages 14.4 – 14.5 for possible answers.**

2. Boat safety procedures: (6 pts.)

   - **See page 14.5 for possible answers.**

3. Helicopter safety procedures: (6 pts.)

   - **See pages 14.5 – 14.8 for possible answers.**

4. Fixed-wing aircraft safety procedures: (6 pts.)

   - **See pages 14.8 – 14.9 for possible answers.**

5. Foot travel safety procedures: (6 pts.)

   - **See pages 14.9 – 14.10 for possible answers.**