



## 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:*

Firing Operations, S-219  
Certified at Level I

This product is part of an established NWCG curriculum. It meets the requirements of the NWCG Curriculum Management Plan and has received a technical review and a professional edit.

  
\_\_\_\_\_  
NWCG Executive Board Chair

  
\_\_\_\_\_  
Training Committee Chair

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# Firing Operations

## S-219

### Student Workbook

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## **PREFACE**

Firing Operations, S-219 is a recommended training course in the National Interagency Incident Management System: Wildland Fire Qualification System Guide (PMS 310-1).

This course was developed by an interagency group of subject matter experts with direction and guidance from the National Wildfire Coordinating Group (NWCG) Training Branch. The primary participants in this development effort were:

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



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## Firing Operations, S-219

### Unit 0 – Introduction

#### OBJECTIVES:

Upon completion of this unit, instructor will:

1. Introduce the course coordinator, instructors, and students.
2. Discuss course logistics.
3. Provide a course overview.
4. Discuss course expectations.
5. Identify course reference materials.
6. Discuss position responsibilities.
7. Review online module.





## I. WELCOME AND INTRODUCTIONS

- Name and job title
- Agency and home unit
- ICS qualifications
- Experience relative to the position as either a trainee or a trainer/coach, both positive and negative.

## II. COURSE LOGISTICS

- Course agenda
- Sign-in sheet
- Breaks
- Facility locations (restrooms, vending machines, drinking fountains, smoking areas, evacuation policy, etc.)
- Message location
- Cell phone policy
- Local information (restaurants, local map, transportation)

### III. COURSE OVERVIEW

This course is designed to meet the training needs of Firing Boss (FIRB) as outlined in the Wildland Fire Qualifications System Guide (PMS 310-1) and the position task book developed for the position.

#### A. Course Objectives

At the successful completion of this course, students will be able to:

1. Identify the roles and responsibilities of the FIRB for planning, execution, safety, coordination, and evaluation of an ignition operation on a wildland or prescribed fire.
2. Describe the characteristics, applications, safety and availability of the various firing devices a FIRB has at their disposal.
3. Given a wildland or prescribed scenario, prepare a firing plan and briefing that contains desired fire behavior, firing techniques, required resources, coordination, safety and risk management factors, and communication, to meet specific objectives.

#### B. Instructional Methods

1. Facilitation and short lectures with PowerPoint presentations
2. Discussion
3. Exercises
4. Field day

### C. Evaluating Student Performance

To successfully complete the course, students must:

- Participate in all classroom discussions, exercises, and scenarios.
- Complete all quizzes.
- Students must obtain a score of 70% or higher on the final exam to receive a certificate of completion for the course.

### D. Student Training Course Evaluation Form

Students are given the opportunity to comment on the course, the units, and the quality of instruction at the end of the course.

### E. Course Reference Materials

Below is a list of materials that are referenced throughout the course:

- Wildland Fire Incident Management Field Guide (PMS 210) with Appendix B: Fire Behavior (PMS 410-2)
- Incident Response Pocket Guide (PMS 461)
- Wildland Fire Qualification System Guide (PMS 310-1)
- Interagency Standards for Fire and Fire Aviation Operations (Red Book)
- Interagency Prescribed Fire Planning Procedures and Implementation Procedures Guide (PMS 484).

#### IV. COURSE EXPECTATIONS

##### A. Student Expectations

#### **EXERCISE: Student Expectations for the Course**

Purpose: Students develop a list of their expectations for the course.

Instructions:

1. Write your response to the following question:
  - What do you expect to learn from this course?
  
2. Present your expectations to the class.

**End of Exercise.**

## B. Instructor Expectations

Students will:

- Have an interest in becoming a FIRB.
- Have completed their pre-course work/online module(s.)
- Exhibit mutual cooperation with the group.
- Participate actively in all of the training exercises presented in the course.
- Return to class at stated times.
- Have all questions answered.

## V. POSITION DESCRIPTIONS

### A. Wildland Fire Incident Management Field Guide (PMS 210)

The Wildland Fire Incident Management Field Guide contains positions in the ICS system. The Firing Boss will be covered in detail throughout the course.

A single resource boss (FIRB) is responsible for supervising and directing fire suppression module, such as a hand crew, engine, helicopter, heavy equipment, firing team, or one or more fallers.

### B. Position Task Book (PTB) Description

The PTB contains common tasks for all unit leaders and additional specific tasks for the FIRB.

The PTB is the primary tool for observing and evaluating performance.

In the current performance based system, trainees must complete the tasking in the PTB to become qualified as a FIRB.

The PTB can only be initiated by the home unit, not at this course.

## VI. ONLINE MODULE REVIEW

## Firing Operations, S-219

### Unit 1 – Introduction to Basic Firing Concepts

#### OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe or illustrate the different types of fire spread, e.g., head, flank, backing.
2. Identify environmental elements that may affect the firing operation.
3. Identify fire behavior characteristics that may affect the firing operation.





## I. TYPES OF FIRE SPREAD

Fire spread refers to the behavior and direction, in relation to the wind or slope, that the fire is moving.

There are three general types of fire spread:

- Head fire
- Backing fire
- Flanking fire

### A. Head Fire

A fire front spreading with the wind or with the slope.

#### 1. Characteristics

- Rate of spread/intensity
  - Highest fire intensity, tend to have longer flame lengths.
  - Fastest rate of spread.
  - Stronger convection column and rapid heat buildup.
  - Shorter heat residence time than a backing or flanking fire.
- Hazards
  - Extreme rates of spread.
  - Heat buildup preheats adjoining fuels.
  - Potential uncontrollable spread after ignition.

- Severe in-drafts can affect adjoining forces.
- Torching, spotting and large volume of ember production or casting.
- Fire whirls may be produced creating erratic fire behavior.

## B. Backing Fire

Fire spreading against the wind or slope.

### 1. Characteristics

- Rate of spread and intensity
  - Lowest fire intensity, tend to have smaller flame lengths.
  - Slowest rate of spread.
  - Requires more time to burn a given area.
  - Longer heat residence time than a head or flanking fire.
- Hazards
  - Unexpected wind shifts can turn it into a head fire.
  - Spotting is still a concern.
  - Rolling material below backing fire can cause a head fire.
  - Smoke dispersal is poor for the holders.

## C. Flanking Fire

Fire that spreads at right angles (perpendicular) to the wind or slope.

### 1. Characteristics

- Rate of spread and intensity
  - Lower intensity/less heat than head fire; higher intensity/more heat than a backing fire.
  - Rate of spread faster than a backing fire, slower than a head fire.
  - Heat residence time is generally intermediate to head and backing fire.
- Hazards
  - Wind shifts may convert flanking fire to a head fire.
  - Spotting
  - Fire whirls may be produced creating erratic fire behavior.
  - Subtle changes in wind and topography can have an adverse influence on fire behavior.

## II. ENVIRONMENTAL ELEMENTS

A firing operation outcome can be affected by certain changes in environmental elements. These elements are apt to change the fire environment quickly and need to be constantly monitored by the FIRB and other firing personnel.

The following is a list of the primary elements that can affect a firing operation:

### A. Weather

This is the most variable element affecting a firing operation.

#### 1. Wind

- Has the greatest impact on fire behavior.
- Directly influences direction and rate of spread (ROS).
- Can increase flame lengths/intensity.
- Can overpower the effects of slope.
- Can enhance the drying of fuels.

#### 2. Frontal passages

- Increase in wind speeds.
- Wind direction shift – typically 180°.
- Increase in ROS and flame lengths/intensity.

### 3. Thunderstorms

- Erratic wind shifts.
- Gusty winds.
- Increased spotting potential.
- Downdrafts
- Increase in ROS and flame lengths.
- Lightning

### 4. Temperature and relative humidity (RH)

- Temperature and RH have an inverse relationship; as temperatures increase RH decreases and vice versa.
- Decrease in RH
  - Fire behavior could intensify and exceed prescription parameters for prescribed burn. It could also be a precursor to spotting across holding lines in a wildfire operation.
- Increase in RH
  - Fire behavior decreases and fire may not burn intensely enough to carry across a burn area or consume all the fuels in a firing operation, leaving potential for reburn.

## 5. Local weather patterns and influences

**TIP: Check with your local unit for local weather patterns and influences.**

Some examples:

- Santa Ana and Chinook winds
- Local lake affect
- Large river corridors
- Effects of terrain
- Diurnal patterns
- Swamps
- Sea and land breezes

## 6. Atmospheric Stability

The degree to which vertical motion in the atmosphere is enhanced or suppressed.

- Stable conditions
  - Wind is relatively calm or light breezes.
  - Clouds form in layers.
  - Smoke rises then flattens out.
  - No vertical cloud development.
  - Inversion layer may form.
- Unstable conditions
  - Wind is gusty.
  - Vertical cloud development (e.g., thunderstorms).
  - Smoke rises to a high altitude.
  - Dust devils are common.
  - No inversion layer forms.

## B. Fuel Characteristics

Fuel characteristics vary over the landscape. It is important to understand how these characteristics interact and influence firing operations and fire behavior.

- Types
  - Grass
  - Brush
  - Timber
  - Slash
- Size and shape
- Horizontal continuity
  - Uniform
  - Patchy
- Vertical arrangement
  - Ground
  - Surface
  - Aerial
  - Ladder fuels (can contribute to torching)
- Moisture content
  - Live vs. Dead Fuels (Which one is carrying the fire?)

**TIP: In the Southeast most fire is carried by live fuel, in the Western U.S. most fire is carried by dead fuels.**

- Loading
  - Tons per acre
- Chemical content (e.g., manzanita, palmetto, sage, etc.)
  - Volatility

## C. Topography

Topography features vary spatially. It is important to understand how topography features interact and influence firing operations and fire behavior.

**TIP: Firing operations are generally started from high points.**

- Shape of the country
  - Saddles (fire tends to funnel through saddles).
  - Narrow/box canyons (fire tends to funnel up canyons).
  - Ridgelines
  - Drainage bottoms
- Aspect
  - North aspect generally has heavier fuels.
  - South aspect generally has lighter fuels.
  - East aspect generally is hotter in the morning.
  - West aspect heats up as the afternoon progresses. (Follows the pattern of the sun.)
  - Affects fuel temperature.
  - Influences fuel type.
- Slope
- Elevation
  - Influences weather, fuel type and fuel moisture.



### III. FIRE BEHAVIOR CHARACTERISTICS THAT MAY AFFECT THE FIRING OPERATION

The combined influences of fuels, weather, and topography determine fire behavior and its characteristics. It is important to understand how fire behavior characteristics can affect a firing operation.

#### A. Fire Behavior Characteristics

The following is a list of the fire characteristics that can affect a firing operation.

1. Intensity
  - Flame length
  - Flame height
  - ROS
  - Flame zone depth
  - Torching
2. Spotting
  - Short range
  - Long range
3. Slopovers
4. Extreme fire behavior

On a wildfire, firing operations are often conducted under extreme conditions. In these situations a firing operation can create, or be influenced, by extreme fire behavior.

Prescribed fires (RX) are not usually ignited under extreme conditions. However, personnel should be prepared if extreme conditions develop.

- Crowning
- Fire whirls
- Plume dominated
- Horizontal roll vortices

## 5. Smoke

Smoke production, direction of travel, and dispersal must be monitored closely at all stages of firing operations.

- Column
  - Firing can be shaded
  - Ember loft and transport
  - Visibility
  - Impacts personnel and public
- Column as an indicator of changes in fire behavior
  - Color
  - Well-developed vertically (indrafts)

<b>TIP: Rapid vertical growth will influence your firing operation.</b>
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- Collapsed (outflows)
- Bent or sheared
- Rotating

## IV. POINTS TO REMEMBER:

- Firing operation must be anchored and have a Tie- in point. (otherwise you are not suppressing the fire you are taking a walk with the fire)
- What is your intermediate tie-in? Contingency tie- in?
- We want to take away where the fire wants to GO! Strive to burn from a high point or into the wind! It can depend on objectives but these are the main tenants.
- What do I have in place to stop the fire where and when I want to?

## Firing Operations, S-219

### Unit 2 – Duties and Responsibilities

#### OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Identify the duties and responsibilities of a FIRB and other key personnel involved in a Firing Organization (suppression and prescribed fire).
2. Identify critical information to assess in the Incident Action Plan (IAP) and prescribed fire burn plan.
3. Identify components within the operational briefing that are specific for firing personnel.
4. Organize and deliver a briefing for varied firing personnel including Leader's intent and clearly measurable objectives.



## I. FIRB DUTIES AND RESPONSIBILITIES

This unit builds upon the knowledge and experience that students bring into the course from both prescribed (RX) and wildland fires. The general duties for an FIRB have been outlined, for suppression and prescribed fire. It is important that the personnel understand where they fit into the firing operation and who is generally responsible for certain tasks and duties.

## II. SUPPRESSION FIRE DUTIES AND RESPONSIBILITIES

The general duties and responsibilities of a FIRB involved in a *suppression* fire are as follows:

- Oversees the firing operation from the tactical level on the ground or aerial platform and is responsible for assuring the objectives are achieved.
- A FIRB mitigates friction within the system and manages operational tempo. An effective FIRB requires patience and flexibility.
- Provides leader's intent to firing teams.
- Communicates objectives.
- Responsible for the firing briefing.
- Assigns duties and responsibilities.
- Establishes chain-of-command.
- Responsible for the safety of all personnel assigned.
- Adjusts timing, sequencing, personnel, staging of materials, and transition of equipment.
- Builds the firing plan.
- Continually evaluates, monitors, and communicates the attainment of objectives.

- Redeem the five communication responsibilities:
  - Brief others as needed.
  - Debrief your actions.
  - Communicate hazards to others.
  - Acknowledge messages.
  - Ask if you don't know.
- A. Firing Team
  - Responsible for executing the overall intent of the ignition patterns as defined by the Firing Boss.
  - Is the operational component tasked with ignition and is made up of one to as many igniters as needed.
  - Understands the Firing Bosses intent to meet objectives.
  - Firing teams are often quickly assembled from available resources and experience levels may vary. The FIRB must assess and monitor capabilities of each team.

B. Firing Team Leader

The Firing Team Leader is an experienced firefighter, usually a FFT1 or above, whose job it is to provide supervision to the firing team under the direction of the Firing Boss.

A Firing Team Leader is not an NWCG official position but instead an assigned position.

### C. Holding Specialist

The Holding Specialist is an experienced firefighter whose job is to ensure their personnel can manage and hold the firing operation.

The Holding Specialist is not a NWCG official position but instead an assigned position. However, it usually ties into a corresponding NWCG qualification such as CRWB, TFLD, DIVS, etc., depending on operational complexity.

The Holding Specialist can be used on either a RX or wildfire.

The Holding Specialist will:

- Review the RX or Wildfire Firing Plan.
- Brief holding personnel.
- Conduct operations in a safe manner.
- Coordinate with the Firing Boss.
- Confine fire to a designated area.
- Maintain communication with the line supervisor on holding progress or problems.

A general rule of firing is “you can only fire as quickly as the holding personnel can effectively hold the line.”

Holding functions will be managed by personnel qualified at the appropriate ICS wildland fire operations position and as required by the RX complexity, assigned resources, and operational span of control.

## D. Igniter

Paul Gleason coined the term “student of fire.” Part of being a student of fire is to continuously learn and observe throughout your career. As a firefighter, igniter, and a holder it is your duty to become a “student of fire.”

The more firefighters pay attention to the effects of their ignition, the quicker they will become a valuable part of the operation.

As an igniter and holder, a firefighter begins to build a foundation of knowledge to become a proficient Firing Boss.

### 1. Primary Duties and Responsibilities of an Igniter

- Understand the firing objectives.
- Evaluate fuels to be ignited.
- Look behind you as you burn to ensure objectives are being achieved.
- Pick access route before lighting and always have an escape route.
- Don’t ignite fuels below yourself or others.
- Keep aware of and communicate firing device fuel levels.
- Maintain communication with adjacent igniters and supervisor.
- Stay hydrated.
- Rotate out when fatigued.
- Keep informed on the weather and changing conditions.



## 2. Primary Duties and Responsibilities of a Holder

- Keep eyes in the green.
- Monitor smoke column and wind shifts.
- Watch for falling fire brands and rolling materials.
- Grid the green as necessary.
- Patrol the line.
- Detect and suppress slopovers/spot fires.
- Keep informed on changing escape routes and safety zones.
- Bump logistical firing supplies.
- Communicate to other holders and supervisor:
  - Ember fallout
  - Slopovers/spot fires
  - Hazards
  - Wind shifts
  - Other
- Staff holding equipment as needed.
  - Hose lays
  - Pumps (backpack, Mark III, etc.)
  - Rotate fatigued personnel out if necessary.

#### D. Field Observer and Fire Effects Monitor

The Field Observer and Fire Effects Monitor reports to the line supervisor and is typically responsible for the following:

- Collecting weather data.
- Recording smoke column information.
- Observing fire behavior and fire effects.
- Monitoring the attainment of objectives.
- Serving as a lookout.
- Scouting and mapping fire perimeter.

#### E. Safety Officer

On a wildland operation a Safety Officer may be present on the incident in order to evaluate the firing and ensure all safety components are being considered.

### III. PRESCRIBED FIRE DUTIES AND RESPONSIBILITIES

The general duties and responsibilities of an FIRB involved in a *RX* fire are as follows:

#### A. Firing Boss

The Firing Boss is responsible to:

- Oversee the firing operation from the tactical level on the ground or aerial platform and is responsible for assuring the burn plan objectives are achieved.
- Report to the Prescribed Fire Burn Boss and is responsible for supervising and directing ground and/or aerial ignition operations according to established standards in the Prescribed Fire Plan.
- Review the Prescribed Fire Plan and the burn unit prior to implementation.
- Brief personnel on project objectives and ignition operations.
- Complete the test fire according to the ignition plan at the direction of the Prescribed Fire Burn Boss.
- Conduct ignition operations in a safe manner according to the ignition plan.
- Identify the impacts of ignition on the control and desired fire effects.
- Coordinate ignition operations with the Holding Specialist.
- Continually evaluate, monitor, and communicate the attainment of objectives.

- Redeem the five communication responsibilities:
  - Brief others as needed.
  - Debrief your actions.
  - Communicate hazards to others.
  - Acknowledge messages.
  - Ask if you don't know.

## B. Burn Boss

The Burn Boss responsibility is to implement the prescribed fire plan.

The Burn Boss oversees:

- The total firing operation.
- The timeliness of firing completion.
- Adjustments to the firing.

#### IV. CRITICAL INFORMATION IN THE IAP AND PRESCRIBED FIRE BURN PLAN

The IAP and RX plan both have critical information that is relevant to the firing personnel. It is essential that a FIRB be able to discern the relevant points within the IAP and RX plan and be able to effectively communicate those points to other firing personnel.

##### A. Incident Action Plan (IAP)

The IAP contains information that the FIRB will need. There may also be a separate ignition plan within the IAP which will outline the firing specifics. The ignition plan is an integral part of the firing operation and may include the following information:

- Maps
- Weather
- Information on adjoining resources
- Special instructions
- Hazards
- Leader's intent
- Objectives
- Communication
- Lookout, Communications, Escape Routes and Safety Zones (LCES)
- Firing sequence
- Firing technique

## B. Prescribed (RX) Fire Burn Plan

An RX plan is site specific and a legal document providing the Agency Administrator the information needed to approve the plan.

The plan provides the FIRB with all information needed to conduct the firing operation. Prescribed fire plans will vary by complexity and must be implemented in compliance with the written plan.

The Interagency Prescribed Fire Planning and Implementation Procedures Guide (PMS 484) identify 21 critical elements to adhere to when conducting a prescribed burn. There are several elements that a FIRB should review.

## V. BRIEFING COMPONENTS

All assigned personnel must be briefed at the beginning of each operational period to ensure personnel safety considerations and firing objectives and operations are clearly defined and understood.

### **Tip: Debriefing**

**Debriefing may be necessary if there has been a significant change in the operation.**

- **Specific Firing Briefing Components**

The following information is there to provide a guideline about what components are specific to firing personnel during the briefing.

- Firing objectives
- Regulating the heat and intensity
- Pattern/techniques
- Spacing/stagger
- Sequence
- Timing
- Amount of personnel
- Equipment
- Safety
- Communications (radio, verbal, hand signals)
- Areas of concern
- Hazards
- Resource values/Values at risk
- Trigger points/Decision point
- Weather
- Contingency plan
  - Primary, Alternate, Contingency and Emergency (PACE)

A leader ensures that the igniters are thoroughly briefed on the firing plan and desired results of the firing operation.

## VI. ORGANIZE AND DELIVER A BRIEFING

A FIRB must be able to filter, organize, and communicate relevant information from a variety of sources. The ability to give personnel an effective briefing is crucial to conducting a firing operation.

### A. Effective Briefing Principles

- Provide leader's intent.
  - Task
  - Purpose
  - End state
- Ensure the firing team understands how to achieve the objectives.
- Be aware of special considerations or hazards.
- Answer questions from the crew.
- Use visual aids (maps, whiteboards, sand table, etc.).
- Provide command presence.
- Be concise.

**Tip:**

**For additional information on briefings and intent refer to [www.fireleadership.gov](http://www.fireleadership.gov).**



# The Interagency Prescribed Fire Planning and Procedures and Implementation Procedures Guide

## 21 Critical Elements

PRESCRIBED FIRE PLAN ELEMENTS	RATING	COMMENTS
1. Signature page		
2A. Agency Administrator Ignition Authorization, PMS 485		
2B. Prescribed Fire GO/NO-GO Checklist, PMS 486		
3. Complexity Analysis Summary		
4. Description of Prescribed Fire Area		
5. Objectives		
6. Funding		
7. Prescription: Prescription Narrative and Prescription Parameters		
8. Scheduling		
9. Pre-Burn Considerations and Weather		
10. Briefing		
11. Organization and Equipment		
12. Communication		
13. Public and Personnel Safety, Medical		
14. Test Fire		
15. Ignition Plan		
16. Holding Plan		
17. Contingency Plan		
18. Wildfire Declaration		
19. Smoke Management and Air Quality		
20. Monitoring		
21. Post-Burn Activities		



## Firing Operations, S-219

### Unit 3 – Firing Operations and Techniques

#### OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Identify critical factors to assess during the reconnaissance for a firing operation.
2. Identify the importance of a test fire and what the process is for conducting a test fire.
3. Identify what issues could affect a firing operation and the Go/No-Go decision.
4. Describe the difference between types of firing operations (burning out, backfiring, and prescribed fire).
5. Describe the basic elements of a firing plan.
6. Describe the difference between the types of firing techniques (strip, dot, flanking, ring, chevron, concentric).
7. Identify and mitigate complex firing situations safely and effectively.



## I. INTRODUCTION

There are a myriad of options a Firing Boss may utilize in order to achieve firing objectives. This unit outlines the basic steps for initiating a firing operation including: reconnaissance, anchor points, test fire, Go/No-Go decision, elements to monitor, tying-in of firing operation, types of fire spread and mitigation techniques.

## II. RECONNAISSANCE

Reconnaissance of the burn area is crucial to firing. The Firing Boss and other overhead personnel should, if possible, walk the entire burn area and look for factors which may affect production and the meeting of firing objectives.

When doing reconnaissance of an area to be burned the FIRB should be constantly looking and noting critical factors.

The following factors should be taken into consideration:

- Fuel type and characteristics inside and outside of burn area (moisture content, loading, jackpots, horizontal and vertical continuity, size and shape, etc.)
- Topography (aspect, saddles, canyons, slope, natural or man-made barriers, ridges, etc.)
- Weather (current and predicted)
- Risk Management/LCES
- Anchor points and/or test burn area
- Areas of Concern (threatened and endangered species habitats, doglegs, cultural concerns, values at risk, watersheds, riparian areas, important resources [e.g., timber, agricultural fields etc.])
- Ingress/egress
- Resource needs

- Control features (hand line, natural barriers, etc.)
- Contingency Plan (primary, alternate, contingency, emergency[PACE])

### III. ANCHOR POINTS

All firing operations must be initiated from an anchor point. This is a barrier to fire spread from which to begin firing, similar to when constructing fire line.

After reconnaissance, identify or establish an anchor point(s) prior to firing.

The anchor point is used to minimize the chance of being out flanked by the fire during ignition. The control line is progressively strengthened by burning until the adequate depth is reached for the operation to commence.

In some cases a clear anchor point may not exist. In this instance two firing teams could work in opposite directions in order to create a solid anchor point.

### IV. TEST FIRE DEFINED

- A test fire is a prescribed fire set to evaluate such things as fire behavior, smoke dispersion, or controllability.
- The purpose of the test fire is to verify fire behavior will meet objectives.
- A test fire helps to validate expected fire behavior. Test fires are required on prescribed burns and are often used on wildfires.
- The test fire is a legal requirement of a prescribed burn. The provisions for and results from a prescribed burn test fire must be recorded.
- The test fire should be ignited in a representative location and in an area that can be easily controlled.

## V. TEST FIRE PROCESS

- Choose a location for the test fire which has fuel representative of the burn area. This location is typically downwind or at a high point to allow for a controllable test fire.
- On a wildfire the location options may be more limited when time is critical; however, test fires should be initiated from an anchor point.
- Fire an area of adequate size and observe fire behavior.
- Assess whether the results are compatible with the firing objectives.
- When burning an area with multiple fuel types, it may be necessary to light multiple test fires if possible.
- Document onsite weather conditions and test fire results.
- Make determination whether to continue lighting in conjunction with line supervisor.
- Communicate results to all relevant firing and holding personnel.

Things to consider when lighting a test fire to evaluate fire behavior.

- Consider potential diurnal effects when making fire behavior predictions based on test fire observations.
- If you light a test fire in the morning you need to account for changes in fire behavior in the afternoon.
- A single spot ignition may produce much lower rates of spread and fire intensity than a strip head fire.
- A test fire should simulate the actual firing pattern which will be used.

## VI. GO/NO-GO CHECKLIST AND DECISION TO PROCEED

The Go/No-Go Checklist is completed prior to the test fire.

The decision to proceed is made after a test fire has been set and evaluated. The Go/No-Go Checklist is a mandatory step in the Prescribed Burning process. The Go/No-Go concept can be used on a wildfire but the checklist is not mandatory. On a wildfire, the Go/No-Go concept is a component of the decision making cycle within the risk management process as a final evaluation before committing to action.

There are many factors that must be considered when making the decision to Go/No-Go during a firing operation. The following checklist provides a general idea of factors to monitor while preparing to make the Go/No-Go decision. However, not all the elements apply directly to the Firing Boss.

### A. Prescribed Fire Go/No-Go Decision Checklist

#### 1. Preliminary Questions

- Have conditions in or adjacent to the ignition unit changed, (for example: drought conditions or fuel loadings), which were not considered in the prescription development?
- Has the prescribed fire plan been reviewed and an amendment been approved; or has it been determined that no amendment is necessary?



## 2. Go/No-Go Checklist

- Have ALL permits and clearances been obtained?
- Have ALL the required notifications been made?
- Have ALL the pre-burn considerations and preparation work identified in the prescribed fire plan been completed or addressed and checked?
- Have ALL required current and projected fire weather forecast been obtained and are they favorable?
- Are ALL prescription parameters met?
- Are ALL smoke management specifications met?
- Are ALL planned operations personnel and equipment on-site, available and operational?
- Has the availability of contingency resources applicable to today's implementation been checked and are they available?
- Have ALL personnel been briefed on the project objectives, their assignment, safety hazards, escape routes, and safety zones?

## B. Other Elements to Consider

The following additional elements are worth considering on a wildfire and a prescribed fire.

- Is firing the best option?
- Are there adequate resources for the firing operation?
- What are the potential threats to control lines/anchor points?

- Can the line be held?
- Are there special areas of concern (riparian areas, endangered species, watersheds, cultural, etc.)?
- What is the firing operation tying into?
- Will other resources be impacted by this operation?

**TIP: Monitoring:**

**Continue to monitor, evaluate and adjust your firing patterns.**

C. Decision to Proceed

After all pre-firing information has been received and reviewed by the firing personnel, the Line Supervisor/Burn Boss will make the decision to proceed or halt the firing operation

## VII. TYING-IN THE FIRING OPERATION

All firing operations must be tied into a predetermined firebreak such as existing black, natural or man-made barriers. Sometimes this could be tying into firing teams from other crews or divisions.

Adjust firing patterns prior to reaching the tie-in point thus giving the igniters time and pace to withdraw from the firing operation until only the number one igniter remains firing on the line.

Depth can be built after the line is tied-in through the use of flare launchers and/or allowing igniters to return to firing.

## VIII. FIRING OPERATIONS

Backfiring and burning out are the two types of suppression operations; they are often misunderstood and interchanged. The other common firing operation is prescribed fire.

### A. Backfiring

A fire set along the inner edge of a fireline to consume the fuel in the path of a fire or change the direction of force of the fire's convection column. Generally, backfiring is a large scale strategic operation that is considered a method of indirect attack.

The decision to backfire is made at the division supervisor level or above.

#### 1. Backfiring advantages

- Allows firefighters to bring the safety zone with them.
- Allows firefighters to choose the terrain to hold the fire.
- Use of natural barriers/fuel breaks combined with backfire can reduce preparation time.
- Eliminates fuel in advance of the progressing fire front.
- Can potentially reduce fire intensity and spread rate near control lines.
- Gives firefighters more flexibility in choosing the timing of the firing operation.
- A backfire can alter direction of main fire spread if there is enough heat intensity.

#### **TIP: Heat Residence**

**When using the black as a safety zone consider heat residence time.**

## B. Backfiring Disadvantages

- Unburned fuel between the main fire and firefighters.
- Requires additional preparation, organization, and coordination over line construction.
- Increases acreage burned.
- A backfiring operation may influence fire activity on other divisions in a negative way.
- Holding forces could be placed ahead of the firing operation in unburned fuels.

## C. Burning Out

Setting fire inside a control line to consume fuel between the edge of the fire and the control line. Generally a small scale tactical operation to strengthen and straighten control lines by eliminating fuel between the fire edge and the control line. Burning out is considered direct attack.

The decision to burnout is typically made at the single resource boss level.

### 1. Burning Out Advantages

- Strengthens and secures line.
- Supports the black line concept.
- Reduces required holding forces.

- Can help to minimize the amount of line construction required.
  - Cutting across fingers.
  - Incorporating spot fires.
  - Can allow line to be relocated to areas of lighter fuels.
  - Can take advantage of natural barriers.
- Burning out can be an ongoing part of line construction.
- Allows firefighters to bring their safety zone with them.

## 2. Burning Out Disadvantages

- Increased risk of spotting across control lines.
- Can increase holding and patrol time.

## D. Prescribed Fire (Firing Operations)

Prescribed (RX) fire– Any fire ignited by management to meet specific objectives. A written, approved prescribed fire plan must exist, and National Environmental Protection Act (NEPA) requirements (where applicable) must be met, prior to ignition.

A burn plan is required for each fire application ignited by management. Plans are documents prepared by qualified personnel, approved by the Agency Administrator, and include criteria for the conditions under which the fire will be conducted (a prescription). Plan content varies among the agencies.

A prescription is measurable criteria that define conditions under which a prescribed fire may be ignited. A firing boss is typically part of the RX fire organization.

The Interagency Prescribed Fire Planning and Implementation Procedures Guide is located at:

<http://www.nwcg.gov/pms/pubs/pubs.htm>.

## E. Basic Elements of a Firing Plan

Every firing operation requires a firing plan. On a RX fire this will be part of the written burn plan.

On a wildfire this may be dynamic and informal plan generated within a short time frame.

- Methods: Hand, ground (equipment mounted) and/or aerial ignition.
- Devices: Equipment used is determined by availability, fuel type, terrain, objectives, resources, etc.
- Techniques: Techniques are a group of firing methods used in a pattern to produce desired fire behavior to attain specific objectives.
- Pattern: The measureable combination of spacing and stagger that can be manipulated to create desired fire intensity.
- Stagger (1-2-3/3-2-1 concept): How igniters of a firing team will be positioned so they do not lay fire underneath or upwind from one another. Proper stagger will always allow igniters to have an escape route. Each igniter is assigned a number with the number one igniter always closest to the line.
- Spacing: Distance between igniters (not be confused with stagger).
- Sequencing: The order and timing which igniters/firing teams will start and/or complete their assignments.
- Trigger Points/Contingency: Primary, Alternate, Contingency, Emergency (PACE).

## F. Firing Techniques

There are six primary techniques used for firing: strip, dot, flanking, ring, chevron, and concentric.

## G. Strip Firing

Setting fire to one or more strips of fuel to create in-drafts and reduce intensity at the control line.

- Most commonly used technique.
- More than one strip is often fired in a parallel alignment allowing strips to burn together.
- Spacing between strips and igniters can be adjusted to regulate fire intensity and should be established prior to beginning firing operations.
- Can either be a strip-head or strip-backing fire.
- Can be applied to other techniques.
- Requires two or more firing personnel. Each igniter is assigned a number (1, 2, or 3 etc.).
- Depending on the wind or slope, the number one lighter may not always be the lead lighter.

## H. Dot Firing

Lighting individual dots of fire to regulate intensity.

- Can be performed by hand or aerial firing.
- Often used in conjunction with strip-firing.
- Fire intensity can be increased or decreased depending on placement and spacing of dot ignition points.
- Allows for igniters to move at a faster pace.
- Conserves burn fuel.

## I. Flank Firing

Lighting into the wind or perpendicular to the slope direction allowing fire to spread at right angles.

- Another option to modify fire intensity.
- Intensity will be intermediate between strip-head and strip-backing techniques.

### **Caution: Flanking Fire**

**Igniters must be wary of wind shifts which can turn a flanking fire into head fire.**



J. Ring Firing

1. Lighting fire in a circular pattern around specific objects to exclude or minimize impacts (resource, power pole).
  - Allows fire to spread away from an object in all directions.
  - Can be used to burn around piles, structures, cultural sites, knobs and other valued resources.

OR

2. Lighting fire in a circular pattern so that the fire-fronts converge towards the center.
  - A rapid technique to generate high intensity fire.
  - Can be used for lifting and dispersing smoke.

K. Chevron Firing

Variations of strip-head or flank firing where the strips or fire spread resemble a V-shape.

- Used for widening a control line quickly.
- Used to burn down ridgelines in order to modify heat intensity and provide for firefighter safety.
- Requires a higher skill level to moderate fire activity; this is done by adjusting the depth and angles of the chevron.

L. Concentric Firing

Lighting fire in a circular fashion from the inside or high point of an area in an outward progression.

- A rapid technique to generate high intensity fire.
- Can be used for lifting and dispersing smoke.
- Can be used to burn clear cuts or timber sale blocks.

## IX. COMPLEX FIRING SITUATIONS

There are complex firing situations which will require a FIRB to develop a more specific plan. The following situations should be given due consideration when building a firing plan.

### A. Saddle Firing

Firing a saddle requires careful timing and coordination. The firing should be done by the same crew if possible to assist in eliminating confusion. Every situation is unique, the diagram and steps provided will assist the FIRB to understand this concept.

- Scout the line, identify saddles and establish a plan of action.
- When approaching a saddle ignition operations should be slowed or halted.
- Before introducing fire into a saddle a group of igniters and holders (group B) should travel to the opposite side of the saddle, while the other group of igniters and holders (group A) stays on the initial side to “check” any fire activity and prepare to recommence firing.
- Group B then constructs an anchor point (frequently a check line) on the opposite side of the saddle from Group A in order to safely begin ignition.
- Upon completion of this anchor point, both A and B groups will begin ignition. The groups should be evenly paced as to reach the bottom of the saddle at the same location and time.

## B. Firing under Adverse Conditions

- Adverse conditions are generally defined as either unfavorable wind or topography. However, unusual fuel conditions (e.g. – numerous snags) may also contribute to this situation.
- A FIRB must have the patience to allow their firing to mature under adverse conditions.
- Look for opportunities to fire during windows of lower fire behavior or times when adverse conditions are not as severe.
- If times allows, wait for favorable weather conditions to return.
- Some cases may require relocating line to more favorable terrain or in more favorable fuels.
- Utilize patterns that minimize high intensity fire.
- Begin ignition by slowly backing fire off the control line to achieve depth.
- Take little bites of firing at one time. Ensure close coordination is occurring between firing and holding resources.
- Under adverse conditions, the pace of the operation is normally driven by what can safely and successfully held.
- If possible try to generate some interior heat using flare launchers to help pull the fire off the line.

## C. Night Firing

- Night firing presents unique challenges to the FIRB. For this reason it is very important for the FIRB to try and scout the assignment while there is still daylight.
- This includes identifying anchor points, tie in points, hazards, terrain, fuels, problem areas, potential check lines or hang up areas, etc.

- Implementing LCES at night presents specific situational challenges of which the FIRB must plan for in conjunction with other overhead resources.
- The FIRB must become familiar with how weather conditions will change after dark. This includes normal diurnal wind shifts, relative humidity recovery, temperature drops, and the presence of thermal belts.
- Of equal importance is for the FIRB to recognize when weather conditions have changed to the point where firing objectives are no longer being met. Firing under poor or marginal conditions at night can affect the following dayshift and cause unnecessary problems. An example would be leaving day resources with a partially burned area that is no longer receptive to meeting firing objectives.
- Achieving the desired firing depth at night can be difficult. Access problems due to heavy fuels or rugged terrain may compromise burners from safely igniting the interior. In this case, consider the use of flare launchers to add the necessary depth.
- Many times it will be much more advantageous to fire at night if conditions are extreme in the day. Firing at night has the advantage of reduced spotting potential and more favorable holding conditions.

**TIP: Night Firing**

**It is the responsibility of the FIRB to understand the advantages and disadvantages of night firing, and to be able to mitigate the specific hazards associated with nighttime operations.**

#### D. Aerial Ignition

- Aerial ignition is a good tool for burning large areas interior of firelines.
- Aerial ignition supports indirect attack and can also be used on large prescribed burns.
- Plastic Sphere Dispenser (PSD) operations have less logistical and overhead support needs, but may fail to generate enough heat to meet the operational objectives in heavier fuels.

Per the Interagency Helicopter Operations Guide (IHOG), a qualified FIRB must be on board the helicopter and in control of the pilot and PSD operator. This FIRB may or may not be working in conjunction with a ground FIRB.

- Helitorch operations require specific logistical support and overhead needs. Per the Interagency Aerial Ignition Guide (IAIG), only the pilot can be on board when using a helitorch. A FIRB would need an additional helicopter to be airborne. A helitorch operation must also have a helicopter crew with specific qualified personnel including a helitorch manager, mixmaster, and parking tender.
- It is harder to regulate the amount of heat with a helitorch compared to a PSD. A helitorch can put down a lot of fire in a short time period. For this reason it is an effective tool in brush types which sometimes need a lot of heat to sustain fire spread.

Patience is the key to all aerial ignition operations. Because there typically is a delay between dropping PSD balls or fire gel and seeing the resultant fire behavior, many problems associated with aerial ignition occur when a FIRB becomes impatient.

- A good technique is to make a pass and then set the helicopter down for a period of time to evaluate the subsequent change in fire behavior.

- Remember, there is usually a delayed reaction, particularly with PSD balls which need time to coalesce. With a helitorch it is easy to reach a tipping point where there is suddenly more fire on the ground than can be controlled.
- Aerial ignition puts a lot of heat on the ground. One way to mitigate this potential problem is to burn later in the day to minimize control issues or negative fire effects. This allows the fuels to continue burning in more moderate evening conditions.
- Firing sequence is critical when using aerial ignition. Safety problems have occurred when aerial ignition has gotten ahead of ground forces preparing or firing control lines. This can force ground resources to fire prematurely, causing unnecessary risk to firefighters and/or undesirable fire effects. In some extreme cases, ground resources have had to abandon firelines which were overrun by the aerial ignition.
- For this reason aerial ignition must be well coordinated with ground personnel. A designated radio frequency should be assigned for ground personnel to communicate with the aerial platform.
- It can be very difficult for a FIRB in the air to supervise ground operations simultaneously. In these situations, consider modifying the firing overhead organization.
- Per the IAIG, there must be an Aerial Ignition Safety Plan in place before an aerial operation. This applies to both wildfire and prescribed fire.
- There must also be a firing plan in place before the use of aerial ignition. This applies to both wildfire and RX fire.

## X. MODIFYING THE PLAN

It is the FIRB's responsibility to develop a firing plan and monitor fire behavior to ensure both firing and safety objectives are being met.

Sometimes fire behavior must be regulated by modifying elements of the firing plan.

### A. Regulating Fire

Heat production and flame lengths are managed via firing pattern and timing.

Firing operations can be manipulated to push or pull heat, depending on the desired end product.

The FIRB needs to find a balance between building the heat necessary for the operation vs. losing control.

The possibilities to modify a firing plan are numerous. The following are some examples of ways to modify the firing plan.

The following is a partial list of situations that might require modification of techniques and devices to regulate fire intensity.

## B Situations

- Wind shift (smoke across the line)
- Changes in weather (frontal passages, thunderstorms, local patterns, etc.)
- Steep terrain
- Narrow canyons
- Increase in fire intensity
- Changes in fuel (type, continuity, loading, moisture content, etc.)
- Creating a re-burn potential
- Access issues
- Saddles
- Conditions become favorable (window of opportunity)
- Doglegs
- Areas of concern
- Spot fires
- Others?



### C. Mitigations

- Change stagger
- Slow down
- Speed up
- Create interior heat (draw fire in off the line)
- Reduce or increase spacing
- Utilize air resources
- Change devices (e.g., switch from drip torch to Very pistol)
- Change techniques (e.g., switch from strip to dot firing technique)
- Reevaluate firing plan (tactical pause)
- Stop firing
- Others?

<b>TIP: The key to being a FIRB is regulating intensity.</b>
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## **EXERCISE: Formulate a Firing Plan**

### Purpose:

The exercise consists of a scenario (SR 3-1) to create a firing plan. Students should be prepared to explain their choices. The firing plan will be delivered via briefing format outlined in the IRPG.

### **End of Exercise.**

## **Formulate a Firing Plan Scenario**

It is August 26<sup>th</sup>; you are a crew boss assigned to a twenty-person hand crew on Division C of the Banner Fire on the Boise National Forest. Your assignment is to complete firing operations from the existing fire edge on Highway 21 to Forest Road 083; establishing adequate depth to halt the main fire as well as steering the fire into the Wilderness and away from the values at risk to the east.

The crew is fully prepared with standard firing equipment. Drip torches and fuel have been staged. With the threat to the values at risk to the east, protecting Bradley Boy Scout camp is priority. The DIVS wants a low intensity backfire to avoid spotting problems over Highway 21 and Forest Service Road 083.

The fire's current situation is 500 acres and 0% contained. It is mid-day, the temperature is (85- 90 °F) and the relative humidity is (10-12%). The winds are light out of the west and terrain dominated. The slope is extremely steep and rocky. Fuels are lodge pole pine transitioning to subalpine fir on the upper slope. Current fire behavior consists of crowning and large runs comprised of 200 ft. flame lengths.



## Firing Operations, S-219

### Unit 4 – Risk Management

#### OBJECTIVE:

Upon completion of this unit, students will be able to:

- Apply effective risk management during a firing operation.



## I. RISK MANAGEMENT

Risk Management (RM) – A continuous process that provides a systematic method for identifying and managing the risks associated with any operation.

There is inherent danger to some degree in virtually everything we do, such as driving, operating a chain saw, operating a drip torch, etc.

Most firefighters are familiar with the Risk Management Process (RMP) found on page one of the IRPG. How we think and talk about risk will shape our decision, actions, and our behaviors. To better understand risk, let's look at the risk environment.

### A. Risk Defined

Risk is the probability and severity of loss linked to the hazards found in the wildland environment.

- In order to have risk, there must be something of value. If there is nothing to be harmed, there is nothing at risk. Examples of values can range from people, structures, archeological sites, etc. Risk to firefighters is without question one of the most common encountered and is present in every operation.
- When an event or incident in our world occurs this event generates hazards. We must attempt to determine “what is the probability of our value being impacted.” Is it low, moderate or high?
- If a hazard(s) does impact the value, then what is the severity or consequences? Is it negligible, can we live with the impact? Or is it catastrophic or perhaps something in between?
- Managing risk is often based more on perception than analysis. How you frame the problem will greatly alter the perception and analysis and vice versa. This is a continuing cycle as we update our situational awareness, analyze our data, make decisions and evaluate our decisions.

## B. Levels of Risk

The amount of time available for a decision, the amount of data available, and analysis that can or needs to be conducted, defines the levels of risk.

- Risk at the Programmatic level occurs in the political arena with long and far reaching consequences.
- Risk at the Strategic level is more constrained but more time may be available for the decision.
- Risk at the Operational or Tactical level is the day to day decision cycle.
- Immediate risk in real-time is “in your face risk” related decisions.

A Firing Boss primarily deals with operational and real-time level decisions, and their actions can easily cross through these two levels. The actions of a Firing Boss are also often driven by and affect the two higher risk levels.

A Firing Boss must recognize the significance of their role in determining the outcome of a firing operation. Just the decision to begin firing or to not begin can be extremely complex.

Risk management as a written process is merely a tool to assist a Firing Boss in making sound decisions. Risk Management should not be reduced to a Go/No-Go Checklist.

As a Firing Boss, you will have to weigh a myriad of options and filter through a large volume of information and numerous external influences prior to making a decision.

Operational inertia, human factors, management expectations and other external pressures have the potential to influence a Firing Boss' judgment and perception of nearly any situation. A Firing Boss needs to be aware of this and develop the cognitive discipline to sort through this fog of war and focus on safety principles and sound risk management.



Just as it's difficult to know every hazard, we can never fully mitigate risk to zero. Therefore, the risk management process is designed to ensure decisions are being made with the proper analysis of hazards, probabilities, consequences, and mitigations.

Risk levels vary between the three types of firing operations (burning out, backfiring, and prescribed fire). While the risk some operations may be obvious, sometimes the risk is unclear until after ignition has begun.

**Tip:**

**One thing a Firing Boss should always remember is, once firing is initiated it can be very difficult to “put the genie back in the bottle.”**

## II. BASIC EXAMPLE OF THE RISK MANAGEMENT PROCESS

Identify the Risk(s):

Igniters are too close and impacting each other during the firing operation.

Mitigate the Risk(s):

Stagger the igniters in a more efficient fashion; continue to fire while evaluating the new arrangement.

When engaged in any type of firing operation ask yourself these Risk Management questions (refer to page one of the IRPG):

What information was gathered to build situational awareness when the firing plan was constructed?

- From your perception, what hazards exist?
- How could the identified hazards be mitigated?

In light of the decision to ignite, what trigger points will you establish to continuously evaluate your firing plan?

What is your contingency plan? (P.A.C.E.)

- Primary
- Alternate
- Contingency
- Emergency

Most firefighters in this class have been introduced to or are applying risk management in an intuitive manner. Previous units provided information, tools, and knowledge to implement firing operations.

Boiling it down to the basics, the Firing Boss manages:

- People
- Logistics
- Risk
- Fire

Firing is an art. To be an effective Firing Boss, one must be a student of fire and have a depth of experience that permits them to understand the relationship of how the fire environment affects the firing operation.

The Firing Boss is a leader. To be an effective Firing Boss, one must be able to develop and communicate leader's intent such that igniters have the ability to comprehend the end state of a firing operation. The Firing Boss must have the people skills to foster and create a positive climate that promotes a learning culture and a unity of effort.

A Firing Boss mitigates friction within the system and manages operational tempo. An effective Firing Boss requires patience, flexibility, and above all, experience.

## **Exercise: Final Rim Fire**

### **Purpose:**

This exercise (SR 4-1) will be the final scenario for the course. It is a multifaceted exercise and will combine many of the concepts taught thus far.

The S-219 cadre will review decisions made by the group. Students should be prepared to discuss and explain their firing plan and decision-making cycle to the class.

Given the following scenario, students will develop a comprehensive firing plan and identify and mitigate risk factors during a firing operation on a wildfire. This scenario is based on an actual event.

### **Exercise Ends.**



## Final Rim Fire Exercise

You are assigned as a Firing Boss on Division Q on the Rim Fire in California. The fire, which has been burning for 11 days, started on the Stanislaus National Forest and has burned into Yosemite National Park. The fire has made significant daily crown fire runs predominantly to the northeast and is over 150,000 acres. Spot fires have been observed over a mile ahead of the main fire.

Date: August 30

Location: Division Q, Yosemite National Park

Elevation Range: 5700' – 7400' across the division

Fuels: Mixed conifer, fuels are extremely dry

Weather: Typically in the mid to high 70s in the day; RH into the low 20s; eye-level winds terrain driven 5-7, gusts to 10-12; upper level winds SW at 15-20 mph; some cumulus development to the east; good humidity recovery at night.

Fire Behavior: Extreme crown fire runs several miles long with long range spotting are a daily occurrence; probability of ignition approaches 100% in the peak burning period with spot fires exhibiting rapid growth which generally cannot be contained except when very small (and with water).

Values at Risk:

- Crane Flat Helibase/Lookout (approximately 10 structures)
- Crane Flat Ranger Station (approximately 5 structures)
- Nature Bridge (outdoor education center with approximately 12 structures)
- Tuolumne Grove (giant sequoias with a national historic register site)
- Rockefeller Grove (historic old growth sugar pine stand donated by the Rockefeller family)

Fire History: Numerous past prescribed burns in the vicinity of the Crane Flat Helibase and along Highway 120 which have reduced fuels but have also created numerous snags; the Rockefeller Grove and most of the Tuolumne Grove have no recorded fire history, as does the area downhill and north towards the main fire.

Division Q Resources (see attached ICS-204 from the IAP)

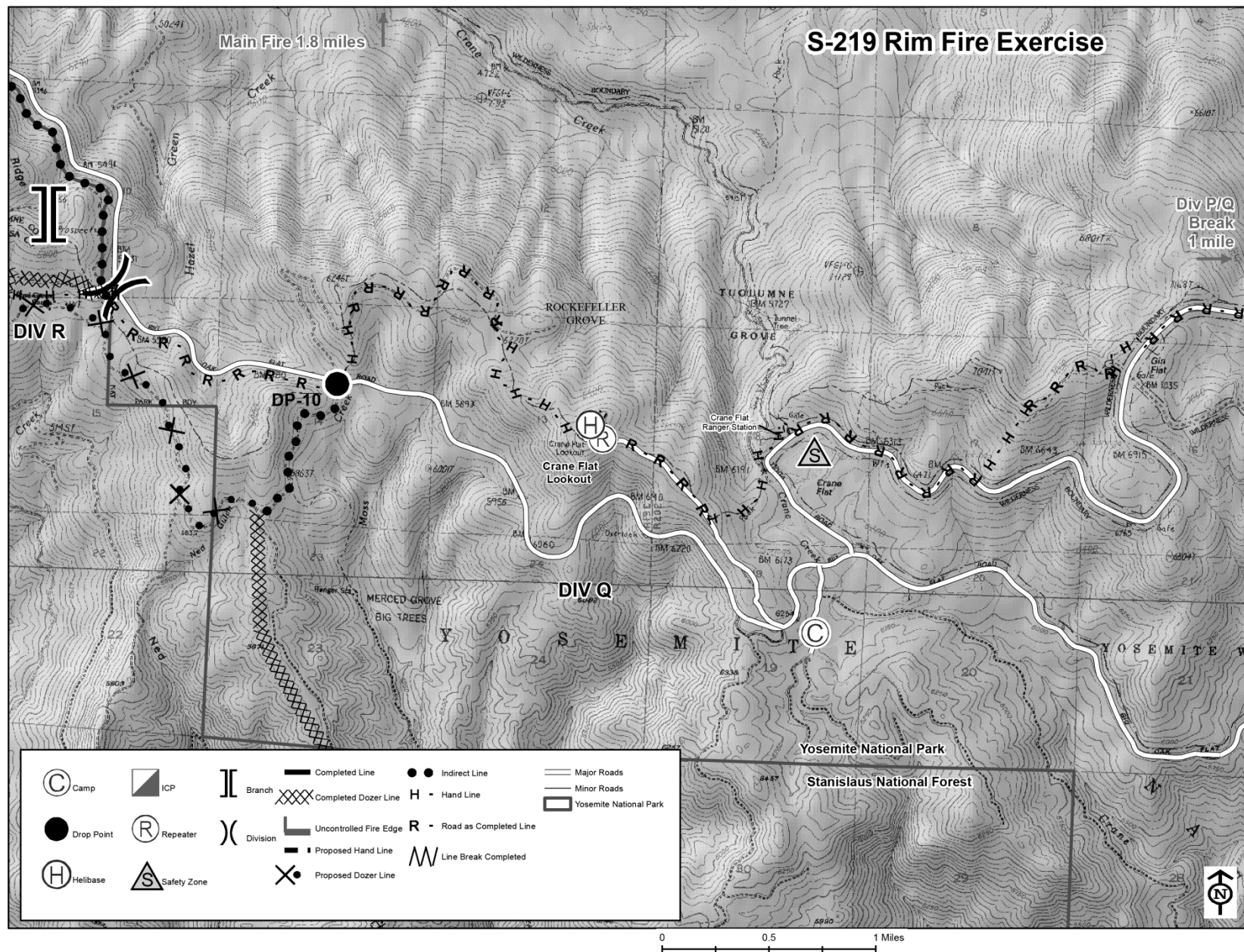
Division Q is over six miles long and consists of various roads and cut-off handlines. The Q/R break is on the Oak Flat Road (just east of the Hazel Green Ranch), the Q/P break is a couple miles east of Gin Flat on Highway 120. The main fire is located approximately five miles to the north. While the predominant fire spread has been to the northwest, the fire has shown the potential to make rapid runs up side drainages to the south/southeast. Radio communication is a problem. A repeater was installed at the Crane Flat Helibase, even so resources cannot talk to each other from one side of the division to the other. There are dead zones throughout. Crane Flat Helibase can be considered a safety zone as can Crane Flat Meadow. Crane Flat Helibase is a good lookout point but only for part of the division. Additional eyes will be necessary.

The main fire is currently threatening Division R to the west. They will begin firing towards Division Q on August 30. The first priority is to secure the perimeter to the Q/R break. This firing operation has been planned and approved in conjunction with the Type 1 Incident Commander, Operations Sections Chief, Branch Director, Division Q, R, P Supervisors, and park officials. Once the fire burned into Yosemite, media interest soared and is both national and international. Of particular interest are the Tuolumne and Rockefeller Groves. Excessive damage to the groves would have major political fall out to the park, the overhead team, and probably to the Firing Boss.

All prep work across the entire division has finally been completed, including snagging and hose lay installation. Division R is ready to fire. Division P is still being prepped and is a lower priority at this time. Park roads have been closed to public traffic. You are assigned to the day shift and have access to a wide range of firing equipment including a Plastic Sphere Dispenser and a Type 2 helicopter. (Note: there are several competing priorities for the helicopter.)

### Points to Remember:

- Develop a firing plan for Division Q only.
- Focus on firing, not running the division.
- The date is August 30<sup>th</sup>, the prep work has been done, and it's time to burn.
- The dirt roads are drivable
- There is a drivable road to Tuolumne Grove but not a drivable road to Roosevelt Grove.
- The highest priority on the fire is to get fire to the Q/R division break; the next highest priorities are the structures/groves.
- High points: Crane Flat Helibase and Gin Flat.





## Resources

<b>DIVISION ASSIGNMENT LIST</b>		1. Branch <b>V</b>		2. Division/Group <b>DIVS Q</b>	
3. Incident Name <b>RIM</b>		4. Operational Period Date: 08/30/13 Friday Time: 0600-1800			
5. Operations Personnel					
Operations Chief	<b>OSC1</b>	Division/Group Supervisor	<b>DIVS Q DIVS Q SUP</b>		
Branch Director	<b>BRANCH V</b>	Air Attack Supervisor No.			
6. Resources Assigned this Period					
Strike Team/Task Force/ Resource Designator	Leader	Number Persons	Trans. Needed	Drop Off PT./Time	Pick Up PT./Time
<b>T1 Crew 1 IHC</b>		<b>19</b>			
<b>T1 Crew 2 IHC</b>		<b>20</b>			
<b>T1 Crew 3 IHC</b>		<b>21</b>			
<b>T2IA Crew 4</b>		<b>21</b>			
<b>T2IA Crew 5</b>		<b>21</b>			
<b>T2IA Crew 6</b>		<b>21</b>			
<b>ENG-S/T T3 1000C</b>		<b>19</b>			
<b>ENG-S/T T3 2000C</b>		<b>17</b>			
<b>ENG - T3 E-1</b>		<b>5</b>			
<b>ENG - T3 E-2</b>		<b>5</b>			
<b>ENG - T6 E-3</b>		<b>3</b>			
<b>ENG - T6 E-4</b>		<b>3</b>			
<b>ENG - T6 E-5</b>		<b>3</b>			
<b>ENG - T6 E-6</b>		<b>3</b>			
<b>ENG - T6 E-7</b>		<b>1</b>			
<b>WT-T2 - WT-1</b>		<b>2</b>			
<b>WT-T2 - WT-2</b>		<b>1</b>			
<b>WT-T2 - WT-3</b>		<b>1</b>			
<b>WT-T2 - WT-4</b>		<b>1</b>			
<b>FELB</b>		<b>1</b>			
<b>FALC 1</b>		<b>2</b>			
<b>FALC 2</b>		<b>2</b>			
<b>FALC 3</b>		<b>1</b>			
<b>FALC 4</b>		<b>1</b>			
<b>FALC 5</b>		<b>1</b>			
<b>TFLD</b>		<b>1</b>			
<b>SOFR</b>		<b>2</b>			
<b>FEMT</b>		<b>1</b>			
<b>FEMP</b>		<b>1</b>			
<b>FOBS</b>		<b>4</b>			
<b>READ</b>		<b>6</b>			
<b>FIRB</b>	<b>YOU!!!</b>	<b>1</b>			

7. Control Operations

**Implement back fire operations as necessary. Hold fire north of Highway 120 from Hazel Green Ranch to division break.**

8. Special Instructions

**Coordinate efforts between neighboring divisions, sharing resources as necessary.**

**Utilize M.I.S.T. in Yosemite National Park.**

**Take weather observations and call them into Communications. READs to check in and out with Division Supervisors.**

**FOOD AND TOILETRIES MUST BE SECURED AT ALL TIMES. PARTICULARLY AT NIGHT.**

**DO NOT FEED THE BEARS OR ANY OTHER WILDLIFE.**

9. Division/Group Communication Summary

Function	Frequency	System	Channel	Function	Frequency	System	Channel
Command		King NIFC		Logistics		King NIFC	
Tactical Div/Group		King NIFC		Air to Ground		King NIFC	
Prepared by (Resource Unit Ldr.)		Approved by (Planning Sect. Ch.)			Date		Time

**Questions to ask as you are developing a firing plan:**

1. What are the primary risk factors that need to be identified, mitigated, and managed throughout the operation?
2. What are your primary safety concerns?
3. How many firing teams will you use?
4. What resources will you pull from the division to complete the firing team(s) for the operation?
5. Where and how will the firing team(s) be placed?
6. What type of equipment and what quantities will you order for the operation?
7. Where will you position the equipment?
8. Where will you begin your operation at?
9. What time of day will you start?
10. How much depth will you try to achieve on your blackline?
11. What are the holding concerns with your firing?
12. What is your general firing sequence, in particular with regards to the Tuolumne and Rockefeller Groves?
13. How will you obtain adequate depth to ensure the division is not threatened by spotting and to protect the Rockefeller and Tuolumne Groves from head fire?
14. How will your operation be coordinated with the adjacent divisions?
15. This is a large division with over six miles of perimeter. Where will you position yourself to maintain situation awareness of the big picture?
16. What will you do about the communication issues?

17. How will you deal with lack of good lookout spots? (Aircraft are in too great demand to be used as lookout platforms.)
18. This will be a multi-day operation. What items will you include in your transition briefing to the night Firing Boss?

**NOTE: There is no right or wrong answer to the above questions.**

## **Risk Management Factors**

- Firefighter fatigue (this is the 12<sup>th</sup> day of the fire); shift length must be kept under 16 hours.
- Firefighter safety – long access to safety zones, poor radio communication, need for multiple lookouts, snags, steep terrain, nighttime operations, etc.
- Fire behavior has been explosive – both a problem for control and safety.
- Three sets of structures – Crane Flat Helibase, Crane Flat Ranger Station, and Nature Bridge.
- The importance of protecting the Rockefeller and Tuolumne Groves should not be underestimated; they are probably as valuable as the structures in the eyes of many.
- Timing and coordination with the other divisions, including the risk of delay.
- Risk/benefit of using an aerial ignition platform.
- Transition briefings and seamless firing hand offs between day and night shifts.



## **Additional Complex Examples**

Use these examples or consider using locally relevant or personal examples that involve similar decision points for a Firing Boss.

Attempt to get students to recognize that there will be times when the decision not to burn will as important as a decision to begin firing.

Try to illustrate the significance of mindfully applying risk management in the context of potential outside influences such as significant stress or other human factors.

### **Example 1**

You are an out-of-town resource and have been asked to act as a Firing Boss on a moderate complexity prescribed fire. The hosting unit has a strong desire to reintroduce prescribed fire into a state park and they have spent many years planning for this burn with heavy involvement from the nearby local community.

Numerous additional resources had to be brought in at great expense to allow the burn to proceed due to weather parameters at the high end of the prescription and a narrow weather window for implementation. Limited funding and costs associated with mobilizing extra resources make it unlikely the hosting unit will get a second chance to attempt this burn for some time.

As the local agency administrator and much of the local community watch, your gut feeling has you debating even lighting a test fire. How will you approach this with the Burn Boss? What will your risk management approach be and what human factors should be on your radar?

## **Example 2**

You are an Engine Boss whose crew is has been ordered to work a night shift on a growing wildfire that has rapidly increased in complexity. A type 2 incident management team is scheduled to take the incident over the next morning, but the fire is already threatening a community tonight.

You are the only person qualified as a Firing Boss and your Division Supervisor (DIVS) has asked you to lead a night firing operation. There is barely enough time to scout the proposed two-track road that will serve as your control line above town and the DIVS is scrambling to coordinate local resources for holding, evacuations, and a possible second firing operation at the other end of the division.

It is critical the ridge above town be held if there is any hope of keeping the fire out of town. As you scramble to get prepared to start firing you realize you haven't been able to reach the DIVS on the radio and the fire is approaching your trigger point for starting your firing operation. What thoughts do you have about this operation? What will your risk management approach be and what human factors should be on your radar?

## **Example 3**

If time allows, review the highlights of the 2010 Davis 5 Prescribed Fire escape fire review (Helena NF) which can be found at the following website: [Davis 5 Escaped Prescribed Fire \(2010\) - Wildland Fire Lessons Learned Center](#)

Walk the students through the Davis pre-burn process to identify the various risks and potential mitigations. Ensure the students remain nonjudgmental with the benefit of hindsight.