INDUSTRIAL OPERATIONS FIRE PREVENTION FIELD GUIDE

CALIFORNIA DEPARTMENT of FORESTRY and FIRE PROTECTION

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

INDUSTRIAL OPERATIONS FIRE PREVENTION FIELD GUIDE

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TABLE OF CONTENTS

FOREWARD 1

INTRODUCTION 2

1. OBJECTIVES AND RESPONSIBILITIES 3
    1.1 Cooperation 3
    1.2 Fire Danger 3
    1.3 Responsibilities for Compliance 3
    1.4 Operating Company 3
    1.5 Protection Agency 4
    1.6 Correction of Violations 4
    1.7 Law Enforcement 4
    1.8 Legal Actions 4
    1.9 Public-Private Meetings 5

2. OPERATING AREAS 6
    2.1 Cleanliness 6
    2.2 Smoking 6
    2.3 Lunch and Warming Fires 7

3. FIRE PLANS 9
    3.1 Agency Input at Environmental Impact Report 9
    3.2 Outline of a Typical Fire Plan 9

4. INSPECTION AND SAFETY 19
    4.1 Inspection Responsibilities 19
    4.2 Company Inspections 19
    4.3 Fire Protection Agency Inspections 19
    4.4 Joint Inspection 23
    4.5 Mechanical Inspections 23
    4.6 Exhaust Systems 24
    4.7 Miscellaneous 32
    4.8 Operating Area Inspections 33
    4.9 Identification of Item Inspected 33
    4.9a Location 33
    4.9b Equipment 35

5. MAINTENANCE, REPAIR AND SERVICING 36
    5.1 Welding, Cutting and Grinding 36
    5.2 Refueling and Lubrication 38
    5.3 Servicing Equipment 39
    5.4 Spark Arrester Servicing 41

6. EXPLOSIVES 43
6.1 Disposal of Explosive Containers 44

7. MOTOR VEHICLES OPERATION AND MAINTENANCE 45
7.1 Fuel Systems 45
7.2 Exhaust Systems 45
7.3 Tool Requirements 49

8. USE OF FIRE 51
8.1 Slash Burning 51
8.2 Land Management Burning 54
8.3 Debris Burning 55
8.2 Lunch and Warming Fires 56
8.3 Infrared Scanning 57

9. TIMBER HARVESTING 58
9.1 Chain Saws 58
9.2 Choker Setting 60
9.3 Tractors, Skidders, Loaders, etc. 61
9.3a Feller/Hydro Bunchers 66
9.3b Manual/Automatic Fire Suppression Systems 67
9.4 Cable Systems 69
9.5 Helicopter Logging 75
9.6 Landings 76
9.7 Timber Cooperators 77
9.8 Firefighting Equipment 78

10. CONSTRUCTION AND SURFACE MINING 79
10.1 Earth Moving Equipment 79
10.2 Stationary and Portable Equipment 81
10.3 Trenching Equipment 82
10.4 Small Multi-Position Engines 83
10.5 Crushers and Pavement Plants 85
10.6 Servicing and Maintenance of Equipment 85
10.7 Training 85

11. WELL DRILLING AND OPERATING 86

12. COMMERCIAL TRANSPORTATION AND STORAGE 88

13. PRODUCT PROCESSING AND HANDLING 92
13.1 Sawmills 92
13.2 Portable Processing Equipment 94
13.3 Log Decks 95
13.4 Outside Storage of Wood Chips and Hog Material 97
13.5 Ore and Aggregate Plants 98
13.6 Oil and Gas 98
13.7 Electrical Power Use 99

14. FILM INDUSTRY 100
14.1 Special Use 101

APPENDICES
A. Bibliography 102
B. Statutes and Regulations 103
C. Northern California Fire Association – Minimum Standards for Hotsaw Shearing Operations (Cooperative Agreement to Shutdown) 134
D. Catalytic Converter Caused Fires 135
E. Oregon Department of Forestry Interim Guidance on Operation of Feller-Buncher Machines during Industrial Fire Precaution Levels II and III 142
F. Spontaneous Combustion in Delimber Residue Piles 143
G. Glossary of Terms 146

FOREWORD

This Guide contains standards and practices which have been found effective in preventing forest fires caused by various types of industrial operations when conducted on forest, grass or watershed lands. These standards and practices are based upon studies and the experience of fire agency and operating company personnel. The standards are to be considered as minimums and the various practices are offered as suggestions and examples of what has been tried and found successful in various situations. As industrial equipment and techniques change, the standards may need to change too. On-the-ground conditions may indicate the need for practices beyond the minimum legal requirements and will indicate which practices are most applicable in a given situation.

It is expected that all personnel, who supervise or inspect industrial operations in forest, grass and watershed areas, or who prescribe hazard reduction work or other fire prevention measures, will be thoroughly familiar with the contents of this Guide. It is intended that it be given wide distribution at the field level in both the fire agencies and the operating companies. Their personnel should use it, refer to it regularly and observe the principles and practices included herein.

This Guide was developed as a cooperative undertaking by the United States Forest Service, United States Bureau of Land Management, California Department of Forestry and Fire Protection, and many operating and equipment supply companies in California.

This Guide could not have been possible without the assistance of the following individuals or companies:

- All of the personnel from the public fire agencies and those from the industry and supply companies who spent so much time initially developing the Industrial Operations Fire Prevention Field Guide of 1980
- Dan Nichols, California Department of Forestry and Fire Protection
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Respectfully submitted by:

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INTRODUCTION

Industrial operations on the wildlands have been an integral part of the economic growth of this country since its inception. Over the years, many new methods of mechanical operations have evolved that require technology to devise more modern equipment. Timber harvesting, dam and highway construction, housing development, and agricultural land development have benefited from these advances with sometimes larger and more efficient systems.

Historically, these activities have not resulted in an unusual number of wildfires compared to other causes. However, several large fires were caused by sparks from grader blades, tractor grozers on rocks, and faulty exhaust systems on internal combustion engines. This has led to aggressive fire prevention programs by fire protection agencies and industry in order to reduce fire losses and save money. The beneficial results from this effort can be easily and quickly negated by a careless act of negligence. Knowledge and conscience practice of fire safe activities are necessary to avoid future disasters.

Many aspects of machine use may start vegetation fires which include: exhaust sparks, hot exhaust manifolds and pipes, fuel leaks, overheating, track and blade sparks, short circuits, brakes, belts and pulleys, accumulated debris, and broken hydraulic lines spilling on hot engine parts.

Burning of vegetation for land management practices is commonly used for fire hazard reduction, planting site preparation, and land clearing in regards to construction. Unless conducted under properly prescribed and controlled conditions, such burning can escape and become a wildfire. An escape is more likely to occur in the spring when windy weather quickly dries wildland fuels and causes fire escapes on unattended projects. If well done, prescribed fire can produce the desired land management purpose and greatly reduce the likelihood of severe wildfires.

Controlled fire and the use of internal combustion engines are two of our most useful tools. However, uncontrolled fires are always dangerous. This guide is an attempt to make the available tools as safe as possible while guarding against wildfire.

1. OBJECTIVES AND RESPONSIBILITIES

The basic objective of the agencies and companies involved in the publication and distribution of this Guide is to prevent loss of life, property and natural resources and the disruption of operations as a result of wildfires.

1.1 Cooperation

It is generally agreed that the most effective means of attaining the above objective is a cooperative approach. The ways in which cooperation can be implemented can include, but certainly are not limited to, joint training sessions, joint inspections, notification of critical fire weather, supplemental fire detection, coordinated communications, and the sharing of research and other information.

No fire protection agency can afford, at taxpayer expense, to maintain the large force of personnel and equipment required to prevent or suppress all fires all the time before they can do serious damage. It is, therefore, necessary for operating companies to assume the impact created by their activities. In addition, operating companies are liable for damages resulting from fires caused by them.

Joint inspections can be difficult to arrange and are not always feasible. However, they provide excellent on-the-job training while promoting mutual trust and understanding. Typically, information and discovery are made available through the filing of reports and other forms of written communications. It is easier to discuss and explain a situation or condition on site.

1.2 Fire Danger

The wildland fire agencies, in cooperation with the National Weather Service, have a system for keeping themselves informed of fire weather conditions, which includes critical or “Red Flag” conditions. This information is computed over a wide area and available upon request. Operators who manage and operate their own stations often require more specific and localized information. These stations can profit from their combined information. Managers of other types of industrial operations can make arrangements to obtain useful weather information from either or both of these sources, in addition to the World Wide Web.

1.3 Responsibilities for Compliance

Operating companies have both legal and management responsibilities for fire safety inspections of their operating areas and mechanical equipment. Fire protection agencies are responsible for assuring that the companies are in compliance with the law. The reasons for and purposes of their inspections differ. Although joint inspections are desirable and helpful, often they are not practical. Agency personnel are also responsible for other types of fire prevention activities. This precludes their spending as much time on industrial compliance inspections as might be desired.

1.4 Operating Company

The operating companies are responsible for the fire safety of their operations and for compliance with the forest and fire laws. They must determine what work needs to be done in order to comply with laws, regulations and contract requirements, to prevent fires and to ensure safe and efficient progress of their operation. They also need to know whether or not the work has been accomplished and to what standards. They cannot rely on fire agency inspectors for this information.

1.5 Protection Agency

The protection agencies' inspection responsibilities are primarily regulatory. They are expected to make fire prevention inspections of operating areas as often as their other duties reasonably allow to ensure that operating companies are complying with laws, regulations and contract provisions. The protection agency should always notify the company in writing of its findings. This also applies when the inspection has been conducted jointly with a company representative. The protection agency should take appropriate enforcement action when warranted by the findings.

However, the company should not treat these notifications as work lists. The company should not assume that remarks of "no violations observed" contained in agency reports nor the lack of inspection of some areas or equipment mean that there are, in fact, no violations. Agency inspections or investigations will also be made to determine the causes of fires that do occur.

1.6 Correction of Violations

Correction of violations and the maintenance of effective risk and hazard reduction measures are the responsibilities of the operating companies. They should not wait for agency inspectors to point them out. Ignorance of the law or commonly accepted fire-safe practices is not a valid excuse. The companies have an obligation to make their employees and contractors aware of requirements and then to police themselves. Company employees of any level or specialty should never pass over an obvious violation or any other problem merely because it is not on their assigned work list. Fire agency personnel must never ignore observed violations. They should report broken or damaged equipment and ineffective or unsafe fire prevention practices to the company so they may be corrected promptly.

1.7 Law Enforcement

Fire protection agencies are charged with the responsibility of enforcing certain fire prevention laws. Wildland protection agencies may initiate administrative, civil, criminal or injunctive actions to secure compliance with laws and ordinances. It is the policy of all these agencies not to take indiscriminate and arbitrary law enforcement action. However, when violations are present, and can be supported by evidence, failure to take action represents a dereliction of duty. Under such circumstances some form of legal action is probable.

1.8 Legal Actions

Inspections or fire-cause investigations may lead to any one, or a combination of, four basic types of legal action. Since these actions are sometimes misunderstood and confused with each other by both agency and company personnel, each will be briefly described as follows:

Administrative

Administrative action is not a legal action in the sense that a court is involved. It is, however, a formal notification of violation of a law or regulation and a notice to correct the violation, usually within a specified time. It becomes a matter of record and may serve as the basis for more stringent action later. The administrative action, in addition to being a legal notice, becomes a documented history.

Administrative action is initiated by the protection agency and addressed to the operating company. It may take any number of forms. The red tag for internal combustion engines is affixed to

the machine itself and is both a notice of violation and an order to shut down the engine. The engine is not to be placed back into service until the violation is corrected. It is important for all involved to understand that the Inspection Report (LE-38 or R5-5100-209) is not a citation. It is a notification requiring immediate attention/correction.

Administrative action may also come in the form of a letter, memo, telegram, etc., from the inspector or supervisor. Letters of demand for damages or costs of suppression fall in this category, as do actions to suspend or revoke licenses and permits.

Civil

This is a filing, with a court of appropriate jurisdiction, of a suit for damages or costs of fire suppression or both. It is seldom filed unless a letter of demand has been ignored or denied.

Criminal

A citation or a complaint usually initiates criminal action. Most criminal actions coming from violations of fire laws or regulations are misdemeanor actions. Such actions may name as the defendant either the company or the employee who was found committing the act, or both. If the company is named, the only penalty possible is a fine. If an employee is named, the penalty may be a fine and/or a jail term.

Equity

An equity action is one seeking a court order requiring the defendant to refrain from doing some specific act that is harmful to the plaintiff or to the public at large, or to do something to avoid such damage. This is commonly known as an injunction.

1.9 Public-Private Meetings

Although public agencies and industrial operators are often in adversary roles in regard to regulatory taxation and other matters, there is one field in which they have, or should have, a community of interest and a common purpose. This is the field of fire protection. Though the goal may be the same, the means of reaching said goal may not appear compatible. It has been found in the railroad and timber industries that coordination and understanding can be gained by meeting once or twice a year to discuss mutual problems, plans and results. This principle applies to all wildland industries.

The most productive meetings are those including middle and upper level management personnel. It should also include fire protection specialists from both public agencies and industrial operators in a regional area. Since very large groups of people are seldom productive, the area involved should be kept small enough to keep the meeting manageable.

A meeting involving only one company and one agency is often unable to resolve problems that may be caused by an adjoining or nearby company or agency. As with attendance, the agenda should not be too broad and unstructured. Specific problems should be addressed. Solutions need to be agreeable to all involved. The best meetings seem to be relatively short ones (e.g., two or three hours).

Spring meetings are particularly appropriate for planning fire prevention activities and fire control operations. Fall meetings are good for reporting results, planning fire prevention activities and meeting budgeting deadlines.

2. OPERATING AREAS

- ***USFS Timber Sale Contract Standard B Provision B7.3 Fire Control (Suppression action required for fires in timber sale and/or adjacent to the timber sale)***

Every industrial operation has an area on which its activities are conducted. Some of these areas, such as mines, are in fixed locations for long periods of time. Others, such as logging and construction, are mobile and transitory, remaining in one location for only a few weeks or months. For some, such as petroleum and steam wells, the nature of the activity and of the fire problem changes over time (drilling vs. pumping and servicing). In all cases, for fire prevention purposes, the access routes between the scene of actual industrial operations and public roads are considered part of the operating area.

Although operators may be adversely affected by fires starting outside their operating area, and thus have considerable interest in preventing and suppressing such fires, they are legally liable only for those starting in their operating area. Therefore, if they own, lease, or otherwise control a large acreage but only operating on a portion thereof, it is to their advantage to make such fact a matter of record. For private timber harvesting operations in California and on federal land, the map required as part of the timber harvesting plan or the timber sale contract does this. For other types of industrial operations it can be accomplished by filing a map and declaratory letter with the appropriate fire protection agency. Some fires, such as “Act-of-God” (lightning), can be expected to start either on or in the vicinity of any operating area. The operator has a responsibility, both legal and moral, to anticipate and plan for these and to take necessary action when they occur.

Some general fire precautions apply equally to all types of industrial operating areas. These have been thoroughly set forth in federal and state laws, regulations and contract requirements for the timber harvesting industry. They are equally valid for mining, construction, or drilling operations.

2.1 Cleanliness

This is primarily a matter of recognizing and eliminating, or reducing to an acceptable level, fire hazards. The easiest of these to ignite are partially decomposed (punky) wood, duff, dry grass and loose or crumpled paper. Fire acceleration hazards which contribute most to the increased intensity and spread of fires are: slash, snags, spilled petroleum products, and piles of any kind of flammables.

It is not feasible, nor usually necessary, to clean up all the easily ignitable hazards on the entire operating area. They should, however, be removed from all high-risk areas. These areas include, but are not restricted to: refueling areas; locations of stationary or portable engines; welding, cutting or grinding operations; and personnel assembly areas where smoking and/or lunch or warming fires are allowed. The width or radius of the clearing, in order to be effective, will vary with the nature and size of the risk from 10 to 25 feet. Under certain special high-risk situations, 50 feet may be required. Where such clearances beyond 25 feet are needed, they must not only be initially made, but also subsequently maintained.

2.2 Smoking

- ***36CFR §261.52d (USFS fire restrictions pertaining to smoking on National Forests in California)***
- ***H&SC §13001 (Discarding lighted smoking material)***

- ***Title 14CCR §918.4 (Smoking and matches requirements)***
- ***Local Ordinances (Local restrictions pertaining to smoking)***

Every industrial operator must adopt and enforce rules relating to smoking for his/her operating area. Most effective, of course, are the complete prohibitions already in effect in some companies. Other measures include: prohibition at certain times, usually based on fire danger rating; prohibition except in certain designated areas; requirement of the smoker to find or make an area cleared of all flammable material; etc. Prohibition of smoking, except in designated areas which can be made and maintained safe for this purpose, is the course recommended for those companies which do not desire totally prohibiting smoking. Minimum smoking should not be allowed except in an area cleared to mineral soil, or other nonflammable base, with a minimum diameter of three feet.

It is illegal to discard any tobacco products or matches from a moving vehicle. On public roads, state and federal fire and police officers enforce this law. On private roads and operating areas, company rules and supervisors should enforce compliance. During critical fire periods smoking can be confined to an enclosed vehicle or designated area.

Photograph 2-1.
Smoker in a Properly Cleared Area

2.3 Lunch and Warming Fires

- ***PRC §4432 (Neglecting a campfire)***
- ***PRC §4425 (Violation of a campfire permit)***
- ***PRC §4433 (Campfire permit required)***
- ***PRC §4434 (Escape of a campfire)***
- ***Title 14CCR §918.5 (Lunch and warming fire requirements)***
- ***36CFR §261.5f (Campfire clearances required on National Forest land)***
- ***36CFR §261.52 (Campfire permits required and fire restrictions on National Forest land)***

Clearance requirements for lunch and warming fires (campfires) in an industrial operation are more restrictive than they are in a recreational setting. Unless built, maintained, and extinguished properly, they are as dangerous in one location as another. Some might assume that workers on industrial operations would be better trained, more careful, and more closely supervised in their use of fire than campers and other wildland visitors. The most common reason for escapes is the violation of one or more of the well-known and long-recognized safety rules for such fires. Rarely is the unpredictable, such as a gust of wind, responsible for an escape.

Lunch or warming fires should never be built without first providing a clearing to bare mineral soil, or other nonflammable base, for a minimum distance of 10 feet in all directions from the expected perimeter of the fire. The fire should not be permitted to become any larger than actually needed to cook or provide warmth. The fire should never be left unattended. Firefighting tools, especially a long-handled, round-point shovel, should be readily available in the immediate vicinity at all times while the fire is burning or glowing. Extinguishing of the fire must be thorough and complete. Preferably this is accomplished with water, and checked by ungloved hand. One person, ideally a foreman or other supervisor, should be made responsible and held accountable for the safety of the fire. A fire patrol person, or other specifically assigned individual, should check all such fire sites not less than one hour nor more than two hours after the fire is terminated.

Photograph 2-2.
Proper Clearance for a Lunch or Warming Fire

3. FIRE PLANS

- ***Title 14CCR §918 (Fire protection plan is required on logging operations)***
- ***Title 14CCR §918.1 (Fire protection plan filing procedures)***
- ***Title 14CCR §918.2 (Fire plan contents)***

A fire plan is a document prepared by an industrial operator, a copy of which is filed with the responsible fire protection agency. The plan sets forth the manpower and equipment that can be used for fighting fire, the person to be contacted and means of contact, the location and extent of the operating area, and other pertinent data. Timber operators in California, on both federal and private land, and contractors to the California Department of Transportation and the U.S. Forest Service are required to file fire plans. All other industrial operators should file them for reasons of safety and liability.

Each operating company should prepare its own fire plan after consultation with the local fire protection agency. In this way, the resulting plan becomes a useful tool for the operator and the agency. A fire plan is most useful in achieving its purpose when it includes the personal commitment to fire safety of the owner or general manager of the operation.

3.1 Agency Input at Enviornmental Impact Report

Most large construction projects, such as gas pipeline, power line, or telephone line construction require an Environmental Impact Report (EIR) prior to the project inception. The fire agencies can set broad guidelines which may be needed to mitigate fires. These guidelines may go beyond what the law requires. Items which may be included in an EIR are:

1. Requirement of a water tender during extensive welding/cutting operations.
2. Requirement of a fire watch during hazardous operations and after the work has ceased for the day.
3. Requirement of the construction company to provide the funding for an inspector from the fire agency.
4. Equipment which provides company employees and fire agencies the ability to communicate with one another.
5. Restriction of work during “Red Flag” conditions.

After the EIR, meetings may occur with the construction company and fire agency to further discuss issues. Ultimately the construction company must include the precautions necessary in the final Fire Plan.

3.2 Outline of a Typical Fire Plan

The various items which should be included in a fire plan are discussed in this chapter. In addition, certain matters related to fire protection, but not usually specifically set forth in the fire plan, are covered at the end of the chapter.

I. Scope or Purpose

II. Responsibilities

A. Operator

This should include requirements of the operator that will be taken in the event of a fire on the operation site.

Also included here are the persons who are responsible for the operation and key contact

individuals who may act as Incident Commanders until the fire agency personnel arrive.

B. Protection Agency

This should include who the representative fire agency is and what type of fire response can be expected to any given fire or emergency incident.

III. Tools and Equipment

A. Tools

- ***PRC §4427 (Tools required for welding/cutting/grinding)***
- ***PRC §4428 (Fire tools required on industrial operation)***
- ***PRC §4429 (Fireboxes required at camp or local headquarters for industrial operations)***
- ***PRC §4431 (Gasoline powersaw and powertool, tool requirements)***
- ***Title 14CCR §918.10 (Cable block requirements)***

California State law requires certain tools, reserved for firefighting purposes only, at certain locations. These should be considered as legal **minimums**. Many logging and construction contracts require more. Some operators, for their own self-protection, may provide additional tools. Special requirements are contained in various rules and regulations. Below is a composite listing of locations and tools recommended or required at those locations. Local laws and rules should be noted and observed.

Location	Required Tool(s)
Motor, torch, grinder, etc.	Shovel and 5-gallon backpack pump.
Log landing, construction field office or service area, mine headquarters, etc.	Fire toolbox with enough tools to equip each employee, plus chain saw and tractor headlights.
Motor vehicle, tractor, skidder, scraper, etc.	Shovel, axe, 4BC fire extinguisher or larger.
Portable power tools (including chain saw, tamper etc.)	Shovel and approved fire extinguisher.
Cable block	Shovel and 5-gallon backpack pump or 4A fire extinguisher.
Yarder, loader, crane, service truck, etc.	4 ABC fire extinguisher or larger
Helicopter refueling area.	20 ABC fire extinguisher or larger
Choker setter.	Shovel.
USFS ONLY - Mechanized-harvesting equipment with hydraulic systems powered by internal combustion engines (chipper, feller/buncher, harvester, forwarder, etc.), except tractors and skidders.	**USFS ONLY** - At least two 10 lb. 4A/60 B:C fire extinguishers or equivalent. Concentrations of wood dust shall be removed daily from equipment.

Photograph 3-1.
Backpack Pump and Toolbox

Photograph 3-2.
4ABC Fire Extinguisher

The fire plan should set forth the number and types of firefighting tools provided, their locations, and the person designated as responsible for ensuring their presence and operating condition.

B. Equipment

All equipment under the operator's control, which is either specifically designed for or capable of being adapted to fighting wildland fires, should be listed in the fire plan. The specifically designed equipment (e.g., fire trucks, water trailers with pumps and hose) is obvious.

The adaptable equipment may not be obvious. Bulldozers and chain saws can be used on most wildland fire. Road-watering tank trucks are not as useful unless equipped with pumps and hose. In areas where trees, heavy slash and surface rocks are not too prevalent, and where the terrain is not too steep, motor graders are excellent firefighting machines. These are but a few examples. In preparing this section of the fire plan, an operator should exercise resourcefulness and seek the advice of fire protection agency personnel.

Photograph 3-3.
Company Fuel Truck

In addition to firefighting equipment, the fire plan should list support equipment. This category would include, but not be restricted to: fueling and lubricating vehicles, transport vehicles (e.g., low beds, buses, flat beds), communications links (e.g., radio-equipped vehicles, portable radios, radio-telephones), portable electric generators, etc.

Photograph 3-4.
Fire Trailer

All equipment listed should be designated as “with operator” or “without operator.” The location and means of contacting as well as other pertinent and useful information should also be listed.

IV. General

A. Laws and Local Ordinances.
B. Permits for Burning, Welding, and Blasting.
C. Smoking and Fire Rules.
D. Storage and Parking Areas.

V. Emergency Measures

A. Curtailment of Activities.

Because of dispersion and loss of available staffing, it is seldom wise to completely shut down industrial operations in the wildland during fire season.

On the other hand, it is foolhardy to continue normal operations when fuel and weather conditions reach “very high” and “extreme” ranges. Therefore, the fire plan should set forth those high-risk activities that will be curtailed or stopped entirely at various levels of fire danger. This is common practice with large timber operators and public utilities. It should be incorporated into all industrial operation fire plans. (See Appendix C)

Specific activities which should be considered for curtailment include: smoking, open fires, welding and cutting, blasting, operating chain saws, use of feller/bunchers with saws, (or any powered equipment) on or near any dead wood, and voluntary shutdowns, etc. Those that are normally safe to continue are servicing of equipment, watering roads, loading trucks, etc.

There are several systems of determining when and where such curtailments should take place. Some are based on adjective ratings (e.g., high, very high, or extreme), some on codes indicated by numbers (e.g., activity level, burning index, fire load index, and drought index), and some on special conditions (e.g., “Red Flag” conditions). Others are based on predicted conditions, existing observed conditions, or both. In most cases, the information is obtained from the protection agency. In others, the operator establishes the weather monitoring system.

The most technically correct system is the National Fire Danger Rating System—1978 (NFDRS—1978). It provides both current and predicted indexes of lightning-caused fire occurrence, human-caused fire occurrence, burning (spread and energy release components) and total fire suppression workload. It is based on weather, fuel and topography factors at the site in question (or a nearby representative station), and observations and predictions of the Fire Weather Forecasters of the National Weather Service. The system was developed through computer correlation and analysis of the factors affecting the ignition and burning of actual fires. Most wildland fire protection agencies have computer terminal access to this system. Private operators can get the information from the agencies.

Regardless of which fire danger rating system is used, it should be specified in the fire plan along with the types of operations to be regulated by it and the levels at which the regulations will become effective.

B. Patrol Person.
C. Weather Station.
D. Company Action upon Report of Fire.

VI. Detection and Alarm Systems

- ***Title 14CCR §918.6 (Posting fire rules)***
- ***Title 14CCR §918.8 (Inspection for fire)***

The fire plan should also set forth the method the operator and his/her employees will use to detect and report wildfires originating on or near the operating area to the protection agency. A system to be used for contacting the operator's employees in case of emergency must also be detailed in the plan.

Fire detection can be accomplished in any of several ways; therefore, the plan should incorporate two or more methods. The same can be said for alarm or communication systems.

Certain laws, regulations and contract provisions require a person to watch for fires at designated times and places (e.g., after daily logging operations or after blasting). Some of the larger operations may require full-time employees for this purpose. Smaller operators are often able to meet their legal and contract responsibilities by assigning employees hired basically for other duties to this activity at the times and places required. This usually requires either an offset work shift or the payment of overtime. In any event, during the time any person is performing as a fire watch, he/she must not have any other assigned duties nor be allowed to engage in any activity which may divert his/her attention.

People watching for fires are often alone at an operating area. For this reason it is important that they are provided with effective and reliable means of communication. This is necessary for fire reporting purposes as well as for personal safety. A person assigned to watch for fire must be mobile. The best and most common way is to provide them with radio-equipped vehicles reporting to a manned base station.

The fire-watcher should be made responsible not only for detecting and reporting fires but also for taking initial suppression action on any fires they discover. Therefore, they should be physically fit, equipped with firefighting tools and equipment, and fully trained in the effective use of such tools and equipment.

It is good insurance to assign other personnel additional duties as auxiliary fire-watchers. These people, who might be on the operating area outside of normal working hours (e.g., equipment service personnel, security guards), however, will not be accepted as substitutes for, or in lieu of, the fire-watchers required by law or contract.

Detection of fires can also be accomplished by fixed lookouts and aerial patrols. Both systems are used by the protection agencies and by some large timber operators and timber landowners. Both are adapted to broad area coverage, are rather expensive, and have blind spots as well as certain times when they are not effective. Their best use, therefore, is as supplemental or backup systems to on-the-ground fire-watchers. In most cases, their costs are borne cooperatively by multiple adjoining or intermingled owners and operators.

Infrared scanners are used increase the effectiveness of aerial patrols. Originally developed for military purposes, this equipment was adapted by public agencies for wildfire control and detection purposes. Several timber operators and agency fire management officers are using portable hand-held infrared detection equipment for slash burning surveillance to reduce the cost of maintaining holding crews, mop up crews, and equipment. Such equipment is also useful for detecting the presence of any other ignition source when smoke or darkness makes

other means of detection difficult or ineffective. However, it will not work through atmospheric moisture (i.e., fog or clouds). Several hand-held models are also now commercially available.

The fire plan should set forth not only the communications system(s) that will be employed to report fires but also will be used to alert or call in their employees in case of fire. This is particularly important on logging and construction projects where many employees are operating noisy equipment in isolated locations. It is seldom practical to equip all of them with portable or mobile radios. Often they could not hear a radio unless wearing earphones. Yet both personal safety and fire control effectiveness may dictate quick notification. Beepers with very high or very low frequency sound or with distinctive light emissions might be effective. Radio-controlled horns on cable log yarders are excellent for this purpose.

VII. Manpower

Wildland fire suppression is an extremely labor-intensive undertaking. A fire larger than a few acres in size, particularly in heavily timbered areas, may require hundreds of men and women, working for days, to suppress and mop up. Fire protection agencies cannot afford to keep the large numbers of personnel needed to fight major fires on their payrolls. Firefighting crews are often transported from across several states to suppress large fires. Therefore, the fire plan needs to list the number of people locally available by various skills, day or night, weekends, etc. This allows for quick response by the operator's personnel to assist the fire protection agency until sufficient help arrives to completely suppress and mop up the wildfire.

Photograph 3-5.
Firefighting Bulldozer

Except for persons who, by virtue of fire control training and experience, are designated as crew leaders, it is usually unnecessary to list employees and subcontractors by name in the fire plan. However, particularly in timber country, certain skills (e.g., timber fallers, bulldozer operators,

pump operators) are more critical than laborers. The special skills involved are those related to firefighting and not to the primary activity of the operation. For instance, operating a bulldozer to fight fire is not the same as operating one to yard logs, build a road or excavate ore. With this in mind, the number of personnel available should be listed by various skills.

Availability does not remain constant over time. A maximum number will normally be available during regular working hours. Somewhat less can be expected to respond at night. Even fewer will be available on weekends and holidays. Therefore, the fire plan should indicate expected availability in, at least, the above categories. Several large timber operators maintain rotating standby schedules, particularly for supervisory personnel, for weekends and holidays.

Also, because of the extended duration of many wildland fires, the need for and availability of relief personnel should be provided for in the fire plan. Bulldozer operators, for instance, have been known to work on fire lines for 36 or more hours without relief. This endurance displays a remarkable dedication but is, in fact, counterproductive. They not only lose much of their effectiveness but also become high safety risks after approximately 12 hours. Thus, the fire plan should provide at least two people for each position: one for immediate response and one for relief on the next shift. This may not be necessary for laborers as their relief may be transported in from a considerable distance. However, for the operators of machinery it is quite important.

VIII. Map

The map is an integral part of a complete fire plan. It should be of sufficiently large scale and accurate enough to be of real use. Contours are not necessary but should normally be provided. Main ridges and drainages should be indicated. U.S.G.S. quadrangle maps (7.5-minute size) are usually good base maps. Property boundaries and operating area boundaries should be shown. All roads, landings, equipment servicing areas, field offices and other structures, and other significant manmade features should be indicated. Reasonable accuracy of scale, distance, direction, etc., is important.

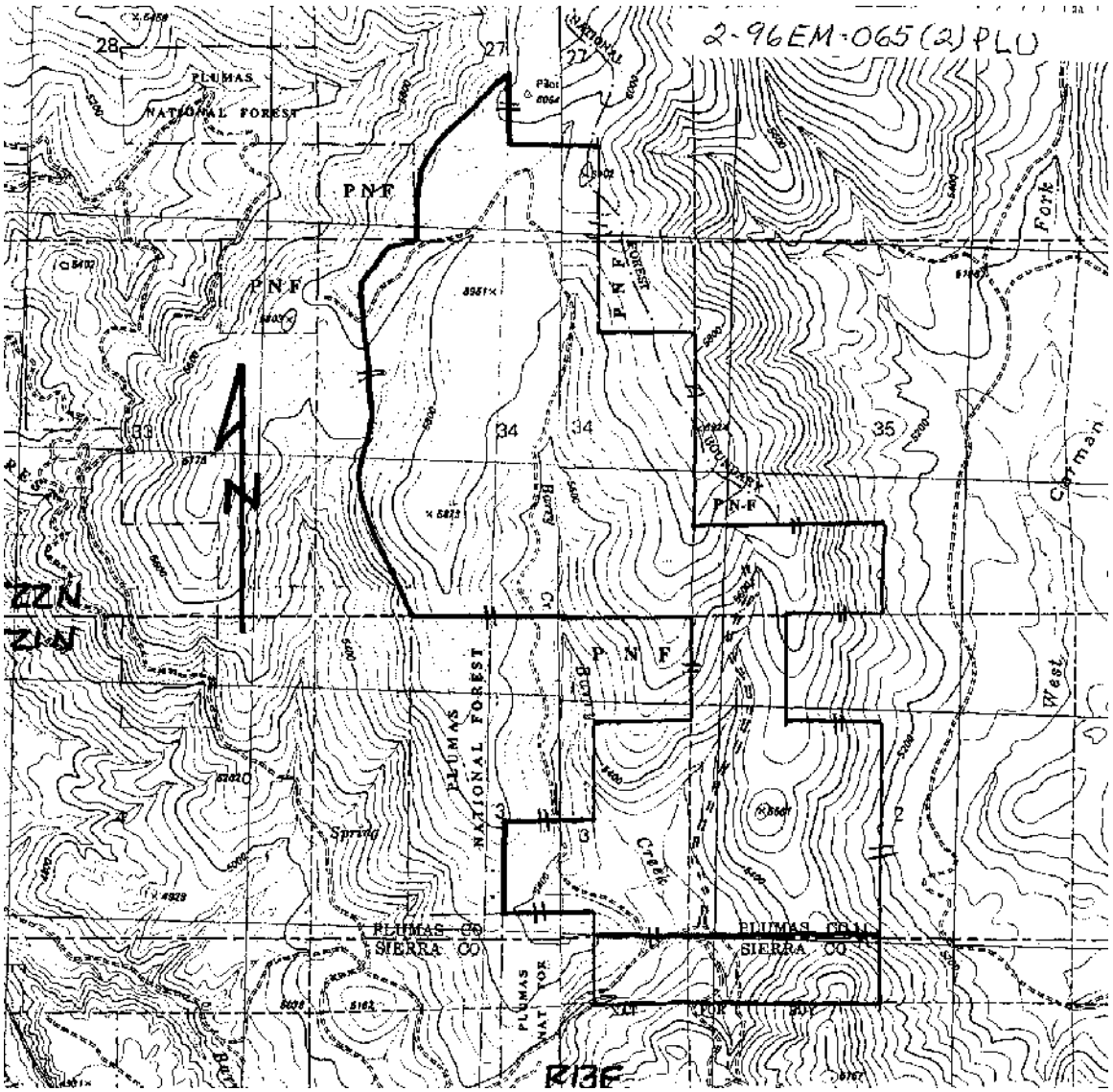


Figure 3-6.
Typical Fire Plan Map

4. INSPECTION AND SAFETY

Industrial operations of any kind in the wildland are potential sources of wildfire. As such, they require inspection to ensure protection of the operator, the public, and neighboring property owners. In addition to fire laws and regulations, such operations are governed by numerous safety rules. It is important that personnel required to make fire prevention inspections comply with the safety rules. Safety rules are designed to protect workers. It is often difficult to make inspections and at the same time comply with all safety rules.

For their own welfare inspectors must not violate safety rules. They should always wear hard hats and other appropriate personal protective equipment such as gloves, safety glasses or goggles, air filter masks, or hearing protection when required. Always avoid slick-soled boots.

This chapter will discuss various types of inspection procedures, safety rules, reporting procedures, legal actions that may result from inspections, and methods of identifying items inspected.

4.1 Inspection Responsibilities

Both the operating companies and the fire protection agencies make industrial operation fire prevention inspections. The reasons for, and the timing of, these inspections may differ. There are significant advantages for both parties when joint inspections are made.

4.2 Company Inspections

Operating companies hold exclusive responsibility for inspecting their operating areas and equipment in compliance with all laws and regulations. They are also solely responsible for the maintenance of uninterrupted production and avoidance of civil liability. When equipment owned by one company is being operated by another under a lease or rental agreement, or when work is being performed by a subcontractor, the ultimate responsibility and liability may be established in the contract. In spite of this, the operating company is the one usually held responsible for compliance with the law by the protection agency. It is the responsibility of the owner or management personnel of each company to determine how, when, and by whom its inspections will be done.

There is no criteria regarding how often inspections should be made. This is because the sizes of companies and the types of operations vary widely. Each company must determine its own appropriate inspection schedules. Some company rules establish inspection schedules and procedures either more frequent or more intensive than those required by federal or state laws and regulations. A good inspection schedule is: a) daily by operation supervisors, and b) every 10 days by fire prevention or safety specialists.

4.3 Fire Protection Agency Inspections

Law charges the fire protection agencies with the responsibility of protecting the public from the loss of life, property and resources by fire. They are also charged with enforcing the forest and fire laws. To accomplish these missions they inspect industrial operations in order to prevent wildland fires. Public fire protection agencies have a duty to make known to operating companies those violations and defects they observe during their inspections. Protection agency inspections do not, however, relieve operating companies of the responsibility of making their own inspections.

Fire agency inspections are generally of two types: a) routine, and b) fire emergency. Routine inspections will usually be general surveys of operating areas and spot checks, or sampling, of mechanical equipment. These may be original inspections or compliance checks following prior notification of violations. The inspector should make every effort not to interfere with production.

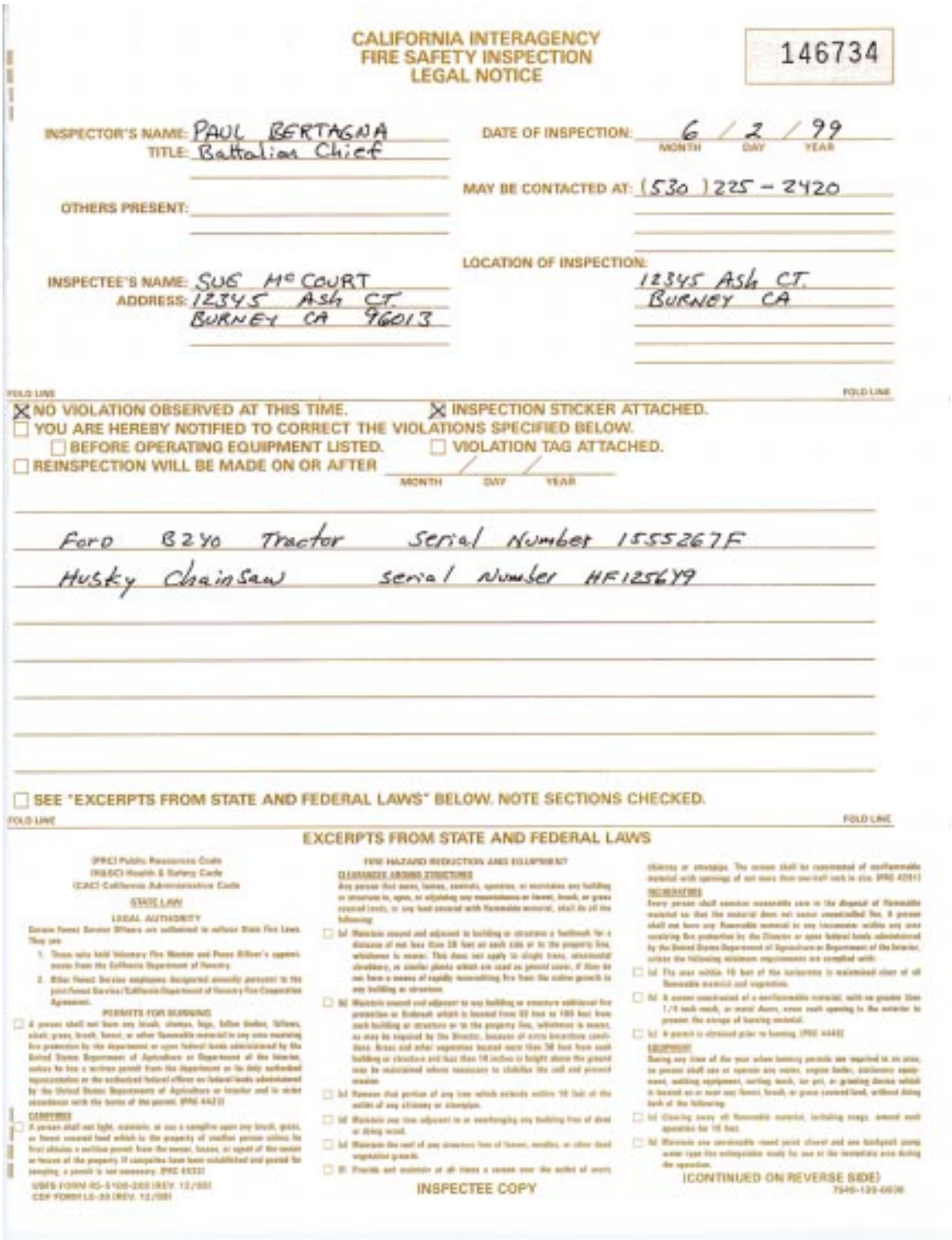
Fire emergency inspections include point of origin and ignition source determination. It also covers identification of the specific machine or person that provided the source of ignition. This is not merely for the purpose of providing data for statistical reports and fixing liability. It also releases non-offending manpower and equipment back into production as soon as possible and helps determine effective fire prevention measures, including design changes if so indicated.

Most routine inspections can be adequately performed by visual inspection. Inspectors should be equipped with such aids as Fire Prevention Field Guides, tape measures, notebooks, cameras, inspection stickers, “Red Tags” as well as copies of applicable laws, regulations, contracts, and agreements.

Photograph 4-1.
Inspection Sticker

Photograph 4-2.
Red Tag

The results of any fire agency inspection should be properly recorded. Each protection agency has its own forms and procedures for this purpose. All violations should be recorded in the field notebook and photographed. Inspections may be recorded on forms, memos, formal letters, etc. Regardless of the format of the inspection report, a copy should be sent or given to the company. Reports should be specific enough for the company to act upon them and for the courts to relate them to complaints or other legal actions in the event such actions are filed. They are not, however, to be used as work lists by the company.



CALIFORNIA INTERAGENCY
FIRE SAFETY INSPECTION
LEGAL NOTICE

146734

INSPECTOR'S NAME: PAUL BERTAGNA
TITLE: Battalion Chief

DATE OF INSPECTION: 6 / 2 / 99 (MONTH / DAY / YEAR)

MAY BE CONTACTED AT: (530) 225 - 2420

OTHERS PRESENT:

LOCATION OF INSPECTION: 12345 Ash CT. BURNEY CA

INSPECTEE'S NAME: SUE Mc COURT
ADDRESS: 12345 Ash CT. BURNEY CA 96013

FOLD LINE

☒ NO VIOLATION OBSERVED AT THIS TIME. ☒ INSPECTION STICKER ATTACHED.
☐ YOU ARE HEREBY NOTIFIED TO CORRECT THE VIOLATIONS SPECIFIED BELOW.
☐ BEFORE OPERATING EQUIPMENT LISTED. ☐ VIOLATION TAG ATTACHED.
☐ REINSPECTION WILL BE MADE ON OR AFTER ___ / ___ / ___ (MONTH / DAY / YEAR)

Ford B2410 Tractor Serial Number 1555267F
Husky Chainsaw serial Number HF125649

☐ SEE "EXCERPTS FROM STATE AND FEDERAL LAWS" BELOW. NOTE SECTIONS CHECKED.

FOLD LINE

EXCERPTS FROM STATE AND FEDERAL LAWS

(PRC) Public Resources Code
(H&SC) Health & Safety Code
(CAC) California Administrative Code

STATE LAW

LEGAL AUTHORITY

PERMITS FOR BURNING

FIRE HAZARD REDUCTION AND EQUIPMENT

CLEARANCE AROUND STRUCTURES

INCINERATORS

EQUIPMENT

INSPECTEE COPY

(CONTINUED ON REVERSE SIDE)

Figure 4-3.
Typical Inspection Form

Protection agency personnel may have occasion to observe conditions on equipment or operating areas other than violations of fire laws or regulations that may be dangerous. Also, a violation may be observed that is outside the inspector's jurisdiction. These conditions should be reported to the company as soon as possible. If they have contributed to a fire, or are likely to, the conditions should be recorded in writing and photographed.

4.4 Joint Inspection

Joint inspections are for the purpose of acquainting both fire protection agency and company personnel with violations and other problems and conditions. They often result in mutual agreement on methods of correcting problems. Joint inspections are not always possible due to time commitments or because of company or agency policy. They are, however, encouraged to whatever extent possible. The joint inspection provides an excellent opportunity for mutual understanding of the problems facing both industry and the agency as well as training opportunities for both participants.

Photograph 4-4.
Joint Inspection

Because of the safety hazards and security policies of many companies, inspections should be joint and by appointment. In some cases, such a procedure can shut down a small company. Notification of a forthcoming inspection should prevent any economic hardship to the company.

4.5 Mechanical Inspections

The source of ignition for most wildland fires caused by industrial activity is mechanical equipment, such as exhaust systems. Several laws have been passed as a result of this fact. However, other potential heat sources cause fires and should be included in a complete fire prevention

mechanical inspection.

Under normal circumstances no fire prevention inspection of machinery should be made with the engine running. Occasionally this will be impossible, in which case extreme caution must be exercised to avoid contact with exhaust systems, fans, belts, exposed gears, etc. Also, if the machine is mobile, the brakes should be set. Attachments such as blades and buckets must be lowered to the ground. Blocking of wheels or tracks is an additional safety precaution.

4.6 Exhaust Systems

- ***PRC §4442 (Using equipment without a spark arrester)***
- ***PRC §4442.5 (Spark Arrester notice to buyer or lessee or necessity of use)***
- ***36CFR §261.52 (Spark Arrester required on National Forest land)***

Exhaust systems start fires in two ways: a) an emission of carbon sparks, and b) direct contact with flammable materials. Contact with flammable materials may happen in either of two ways: a) by collection of flammables on manifolds and inside shields, or b) by parking where flammables touch, or come in close proximity to, pipes and other components. Potential problems from sparks and collection of flammables are detected by inspection of the machine itself. Problems from potential contact will be revealed by inspection of the operating area as well as inspection of company rules and regulations. These problems will be discussed later.

All internal combustion engines operating on forest, brush, or grass-covered lands are required to be equipped with an effective spark arrester. Muffler-equipped trucks, buses, and passenger vehicles (except motorcycles) are exempt, unless the system has been modified. However, if they are used regularly and primarily off-road in such areas it is good fire-safe practice to equip them with spark arresters in addition to mufflers. Turbochargers are normally accepted by fire protection agencies in lieu of spark arresters-so long as everything is in good working order and no exhaust gases (including crankcase breathers) are put into the exhaust system downstream from the turbocharger. Not all turbochargers prevent fuel sparks. Each turbo-charged exhaust system should be inspected as thoroughly as normally aspirated exhaust systems that require spark arresters.

Spark arresters are of two types. By far the most common is the retention arrester. Depending on make and model, this type of arrester will be fitted with a band covering ports or a plug through which trapped carbon particles are removed. The inspector should remove the band, or plug, to determine whether the arrester has been recently emptied and is functioning properly. Excessive amounts of carbon (i.e., enough to fall out when the band, or plug, is removed with the engine shut down) found inside constitute a violation. If the machine has been recently shut down, the inspector should wear gloves to prevent burns.

Photograph 4-5.
Retention Spark Arrester (Top)

Photograph 4-6.
Retention Spark Arrester with Band Removed for Inspection

The other type is the attrition arrester. This arrester will have no clean-out arrangement which makes it more difficult to inspect. The only sure way is to fit a screen of maximum legal-size mesh (.023 inch) over its discharge and observe whether or not any carbon particles are trapped inside the screen during a period of the engine's test operation. Another way would be night observation during normal operation of the machine to observe whether or not incandescent sparks are emitted.

Photograph 4-7.
Retention Spark Arrester, Plug Type

Photograph 4-8.
Attrition Spark Arrester (Screen Type)

Both types of arresters, as well as mufflers, should be checked, either visually or by a probe, to learn if they have been altered internally and are no longer anything but a disguised straight pipe. Spark arresters are manufactured in models designed to perform in either a vertical or horizontal position only. The inspector should determine whether the arrester is installed improperly. An improperly installed spark arrester will not function effectively.

Photograph 4-9.
Spark Arrester being Checked for Internal Burn Out or Modification

The U. S. Forest Service publishes a *"Spark Arrester Guide"* which lists approved spark arresters by make and model together with the type of machine and position for which they are approved. Every inspector, vendor, and owner should be familiar with this publication.

Photograph 4-10.
Spark Arrester Guide

1996 QUALIFIED AND RATED LIST—GENERAL PURPOSE SPARK ARRESTER					
	MANUFACTURER AND MODEL	APPL POS	FLOW	PAGE	REMARKS
1	Acerbis 036 MFS-2	Horizontal	74	55	Retaining screws loosen easily
2	Acerbis 036 MFS-5	Horizontal	60	55	–
3	Acerbis 036 MFS-6	Horizontal	64	55	–
4	Air-Maze C19035-3	Horizontal	120	56	–
5	Air-Maze C19035-3	Vertical	140	56	–
6	Air-Maze C19035-4	Vertical	118	56	–
7	Air-Maze C19035-4	Horizontal	126	56	–
8	Air-Maze C19035-5	Horizontal	217	56	–
9	Air-Maze C19035-5	Vertical	220	56	–
10	Air-Maze C19035-6	Vertical	238	56	–
11	Air-Maze C19035-6	Horizontal	302	56	–
12	Air-Maze C19035-7	Vertical	333	56	–
13	Air-Maze C19035-8	Horizontal	332	56	–
14	Air-Maze C19035-8	Vertical	333	56	–
15	Air-Maze C19035-9	Vertical	640	56	–
16	Air-Maze C19035-10	Vertical	640	56	–
17	Air-Maze C19035-10	Horizontal	679	56	–
18	Air-Maze 4-FA	Vertical	625	56	Horz test #387C/Not recommended for flow above
19	continued	–	–	–	300 cfm-screen type, subject to plugging.
20	Air-Maze 10-FA	Vertical	1,270	56	Horz test# 387C/Flows above 1270 cfm
21	continued	–	–	–	not acceptable.
22	Air-Maze 146-FA	Horizontal	1,335	56	Flow at 0.0 psi back pressure. Unit not
23	continued	–	–	–	rated at 1 psi.
24	Answer, J&R AP-500-D	Horizontal	91	57	See Husqvarna-Krizman KS-500D
25	Answer, J&R AP-650	Horizontal	166	57	See J&R Krizman KS-650
26	Answer, J&R AP-650-A	Horizontal	63	57	See J&R Krizman KS-650A
27	Answer, J&R AP-650-C	Horizontal	63	57	Approved as J&R Krizman
28	Answer, J&R AP-650-C	Horizontal	63	57	Angled body w/insert; band clamp may be replaced
29	continued		–	–	with screws
30	Answer, J&R AP-650-C	Horizontal	97	57	With insert; Required on all AP-650 C
31	Answer, J&R AP-650-C (Angle)	Horizontal	63	57	Angled Body with insert
32	Answer, J&R AP-650-D	Horizontal	67	57	Straight muffler, modified AP-650-0
33	Answer, J&R AP-650-D	Horizontal	67	57	AP-650-0 in a polygon shell
34	Answer, J&R AP-650-M	Horizontal	156	57	Straight muffler, modified AP-650-0

Figure 4-11.
Typical Page in Spark Arrester Guide

The most common place for flammables to collect on an exhaust system is the manifold. The exhaust manifold can become a collection point on any internal combustion engine, gasoline or diesel. Screening the engine compartment, reversing the fan or other design changes can often alleviate the problem. However, it can seldom be completely eliminated. The inspector should always check for accumulations at this point.

Photograph 4-12.
Accumulated Flammables Around Exhaust

Catalytic converters have sometimes been considered responsible for markedly increasing the risk of fire caused by the exhaust systems of gasoline-powered vehicles. Tests conducted by several organizations, both public and private, as well as fire history before catalytic converters were invented, all produce the same conclusion: catalytic converters themselves do not significantly increase the fire starting potential of exhaust systems through direct contact. The temperature of the exhaust pipe is already well above the ignition temperature of dry grass, leaves and needles. On the other hand, the shields installed around many converters to keep them from contacting such flammables often have the opposite effect (i.e., they collect the vegetation between the shield and the converter where it may catch fire and drop out onto a receptive fuel bed). Inspectors should check for such accumulations.

Photograph 4-13.
Catalytic Converter with Shield

Catalytic converters and the tail pipes behind them can sometimes reach temperatures as high as 2000° F. This is the result of a malfunctioning engine (e.g., misfiring spark plug, dirty air cleaner) allowing unburned fuel into the exhaust system. Under such conditions the fuel actually burns in the converter instead of in the cylinders. This can cause catalytic converters to melt down increasing the possibility of multiple fires. For this reason, the engines of vehicles equipped with catalytic converters should be well maintained and tuned-up frequently. (See Appendix D)

4.7 Miscellaneous

Wildland industrial operation fires often start with a machine catching fire. The fire is then transmitted to vegetative fuels. For this reason, the inspector should not only inspect the machine for potential ignition sources but also for the presence of firefighting equipment. A suitable fire extinguisher and appropriate hand tools, especially a shovel, are necessary.

The most common source of machine fires is the fuel system, including refueling procedures. Although this statement applies to all internal combustion engine equipment, it is particularly true of gasoline engines. This is because of the high volatility of gasoline, its low ignition temperature, and the tendency of its fumes to travel in flammable concentrations. Agency inspectors should look for: a) any obvious leaks, b) signs of wear, and c) vibration in fuel lines, especially the high pressure lines from the pump to the injectors on diesel engines. These are minimal safety expectations.

Operating company mechanical inspections should be made by mechanics. Both kinds of inspectors should assure themselves that engines are always shut down and positioned in a sufficiently large area which has been cleared of all flammable materials prior to refueling.

Other items on engines which should be checked during a fire prevention inspection include:

- worn, cracked or deteriorating insulation on electrical systems;

- loose or worn belts; worn or dry bearings and gears;
- flat tires, especially inside duels;
- low fluid level and/or heating in automatic transmissions and torque converters; overheating brakes; etc.

4.8 Operating Area Inspections

Fire prevention inspections of operating areas are made to determine the nature and extent of fire hazards present, the effectiveness of measures taken to abate them, and compliance with requirements for clearings, signs, smoking practices, extinguishers, tools, etc. Observation may be done from the air for larger operations. The best observations are made from the ground, regardless of size. While drive-by inspections can shorten the time involved for an inspection, he/she should expect to spend the majority of that time on foot.

Equipment servicing areas are normally accessible by vehicle. Often the most critical area is near the perimeter of the operating area, accessible only by tracked machines or foot. This is also often true of operations involving chain saws, air drills, cutting and welding equipment, or other portable machines.

4.9 Identification of Item Inspected

Proper identification of the item inspected is essential to avoid misunderstanding, inappropriate corrective action, or enforcement problems. Place or brand names alone are inadequate. There may be two Bear Creeks within a few miles of each other. A single operation may have several bulldozers of the same make and size working. The agency inspector needs to be flexible in his/her approach to identification as he/she is often responsible for inspecting several different types of industries. What is meaningful to one may not be to another.

4.9a Location

Location of the area or item inspected can usually be given by section, township and range. This is meaningful to both the protection agencies and the timber industry. It may not be to other industries. For them, additional location information, such as pit number, lease name and well number, project name, centerline distance number, or timber sale contract name and number, will be necessary. For the timber industry, an additional landmark location description is helpful.

When section, township and range are used, the location should be given as precise as is reasonably possible. There may be several ownerships, and/or operations within a single section. It is not difficult with modern topographic maps to determine location within a quarter section. In many cases, quarter-quarter section (40 acres) designation is entirely practical.

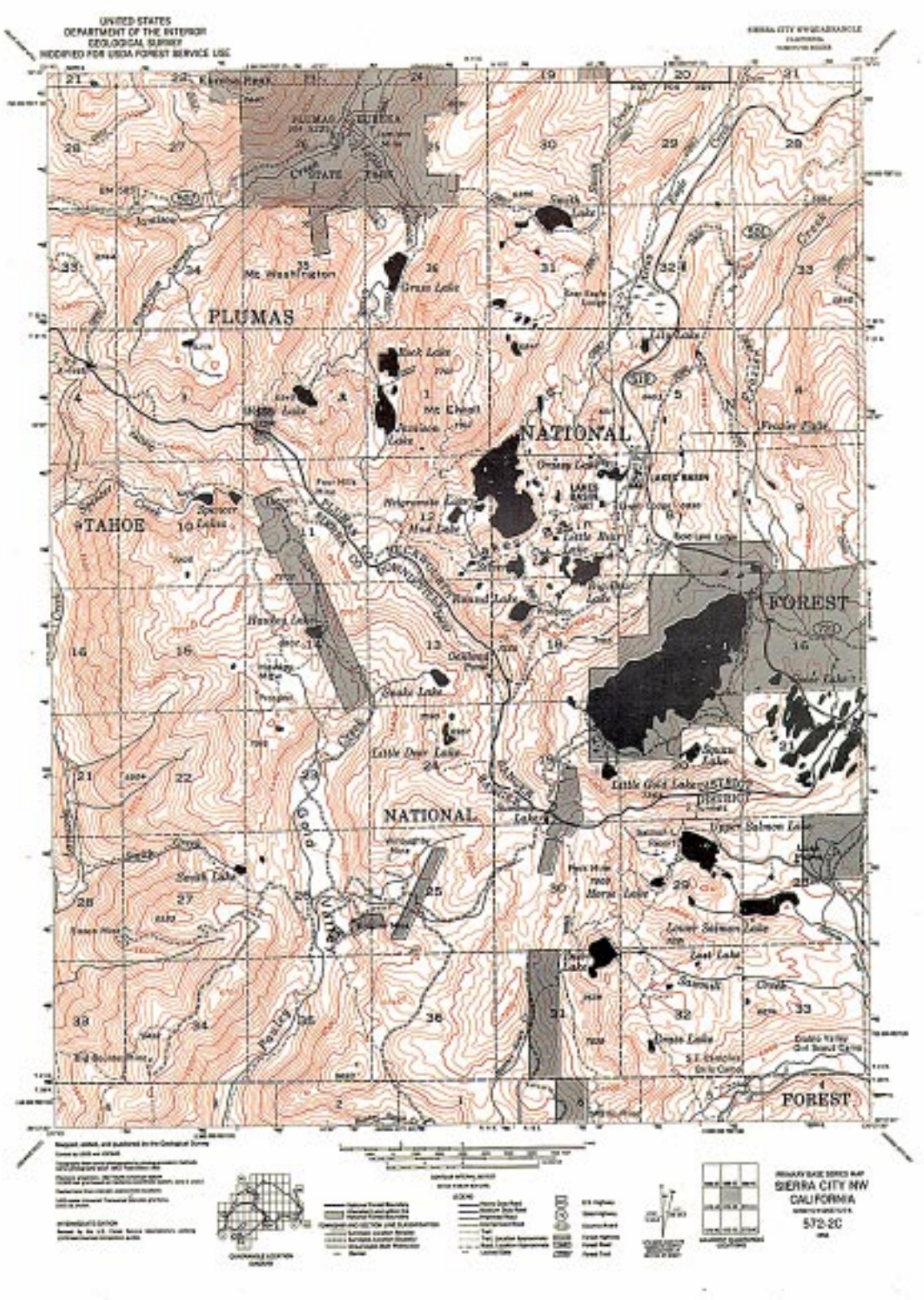


Figure 4-14.
Topographic Map with Property Boundaries Drawn

4.9b Equipment

Equipment should be as fully and precisely identified as reasonably as possible, even if there is only one of a type present during the inspection. Upon return, the inspector may find a substitute or several additional units. The most obvious identification is the brand name and type, such as bulldozer, yarder, end loader, or compressor. In addition, the size and serial number should be recorded. Some operators provide their own identification numbers on the machine. These are easier to use than serial numbers.

Photograph 4-15.
Identification Number on Equipment

5. MAINTENANCE, REPAIR AND SERVICING

The use of machinery vastly increases labor productivity, but it also provides some problems. Not the least of these is that it requires continuous maintenance, repair and servicing. In our concern for the fire problems caused by the machines and their operators, there is a tendency to overlook the serious fire risks that can occur from such activities. If all maintenance, repair and servicing of mechanical equipment could be done in shops or corporation yards, the threat of wildland fire from these activities would be negligible. This, however, is not the case and such activities often take place in highly fire hazardous situations.

5.1 Welding, Cutting and Grinding

- ***PRC §4427 (Clearance and tools required)***
- ***Title 14CCR §918.7 (Welding and blasting watch)***

The primary fire risk from these activities is the falling of sparks, slag or hot metal into dry vegetation fuel beds. There is also some risk of ignition of fumes from volatile fuels or solvents. The electric arc and gas flame are heat sources which are seldom allowed contact with vegetation or other fuels.

Welding, cutting, and grinding are common emergency repairs used to repair disabled machinery. This means that the choice of time and location is severely limited or non-existent. The machine may very well be situated in the middle of a hillside covered with dry grass or pine needles. Before any arc is struck or other repair work started, the area should be made as fire safe as possible.

All flammable vegetation and other fuels must be removed for a minimum radius of 10 feet from the work area. Several companies regularly provide 25 feet clearance. Also, firefighting equipment, including a 46 inch round point shovel and a backpack pump water type fire extinguisher, must be provided close by (i.e., less than 25 feet from the activity).

When fire danger rating is “Very High” or a “Red Flag” condition is in effect, or when winds prevail, a larger clearing radius should be employed. When fire danger rating is “Extreme” or a “Red Flag Fire Alert” is in effect, all welding, cutting or grinding activities in the field should be stopped.

Whenever welding, cutting or grinding is done in the field, a fire-watcher should be on hand during the operation and left at the site for at least one hour after the completion of the repair. Keep in mind that a welder wearing a hood or dark goggles can seldom see a vegetation fire.

Spark arrester and clearing requirements, as discussed later, are applicable to portable generators supplying power to arc welders and grinders. It should also be remembered that the responsibility and liability of the operator is the same although it may be shared, when using an independent contract welder rather than an employee. He/she must be sure the professional welder is aware of and follows fire safe practices and complies with the law.

Much of what is discussed above is included in various timber sale and construction contracts, state law, and in some local ordinances. In those jurisdictions where welding permits are required, clearance and fire tool requirements will usually be included among the conditions of the permit. Fire conscious operators will take these precautions voluntarily.

STATE OF CALIFORNIA—RESOURCES AGENCY—DEPARTMENT OF FORESTY

This Space for Administrative Use Only
Fire Prevention Material Given to Permittee
☐ Yes ☐ No
Field Inspection Made Prior to Issuance
☐ Yes ☐ No

APPLICATION FOR PERMIT TO BURN

No. 713139

Ranger District SHASTA RANGER UNIT

Name of applicant N. M. MADDEN, Telephone 854-3210

Mailing address P.O. BX 7 Town REDDING State CA

hereby applies to: *(Check applicable block below)*

☐ Burn trash in dooryard incinerator
☐ Burn household or dooryard trash in small heaps and piles
☐ Burn small plots of grass or weeds in lots or dooryard premises
☐ Burn small parcels or strips for hazard reduction
☐ Burn agricultural waste

Crop type ____ Acres/Tons ____

☐ Set off fireworks
☒ Other (Explain) WELDING/CUTTING

located at/near DUKE ROAD
Street, Road or other identity

SECEND LOT ON LEFT.

in Sec. ____, Twp. ____, R. ____

County of SHASTA, State of California,

during the period 6/1/99 to 6/30/99

I own or legally control the above-described land. I agree to comply with all fire laws, ordinances, regulations and with all applicable Air Pollution Control District rules and regulations. I further agree to comply with the specific terms of the burning permit issued to me.

Signature of Applicant or Agent ____ Date ____

BURNING PERMIT

This permit is issued to the above applicant to burn the material at the location described above subject to the following terms:

1. No burning shall be undertaken unless weather conditions (particularly the wind) are such that they can reasonably be considered safe (less than fifteen miles per hour during burning period).
2. This permit is void during suspension of burning by proclamation of the Director of Forestry (Sections 4423.1–4423.5, Public Resources Code) or local ordinance.
3. This permit is valid only on those days which are not prohibited by the State Air Resources Board pursuant to Section 41555 of the Health and Safety Code or by the Local Air Pollution Control District.
4. Agricultural waste shall be dried as required, arranged to facilitate efficient burning, free of visible moisture, ignited with approved devices, and be free of other wastes such as tires, rubbish, tar paper, or construction debris.
5. Unless the burning operation authorized by this permit is located in an area cleared of flammable vegetation, it shall be: (a) attended by at least one able-bodied adult person at all times; (b) confined within cleared firebreaks or barriers adequate to prevent it from escaping control; (c) regulated in size at all times to insure proper control by the number of adult persons attending it.
6. When the burning operation authorized by this permit is in an incinerator: (a) a minimum clearance of 10 feet from all flammable material must be provided and maintained; (b) all openings must be screened with nonflammable material with holes not larger than ¼ inch; and (c) must be attended at all times by a responsible person until fire is dead out.
7. This permit does not relieve the permittee of any duty to use reasonable and ordinary care to prevent damage to the property of others or injury to persons as prescribed by law.
8. Burning shall be confined to hours ____ A.M. P.M. to ____ A.M. P.M.
9. This permit valid during period ____ to ____, 19__.

Other requirements: CLEAR SITE 10 FEET TO BARE SOIL FROM ALL FLAMMABLE MATERIAL, HAVE WATER AND SHOVEL, CHECK SITE FOR ONE-HALF HOUR AFTER WORK HAS BEEN COMPLETED.

SEE REVERSE SIDE FOR FURTHER INFORMATION

FOR INFORMATION CALL:

Burning and Fire Safety ____

Air Pollution Control ____

Permit issued 30th day of MAY, 1999

DIRECTOR OF FORESTRY

By [illegible], Agent

Title Fire Prevention Spec

IMPORTANT—REVIEW CONDITIONS AND TERMS OF PERMIT

Figure 5-1.
USFS Issued Welding Permit

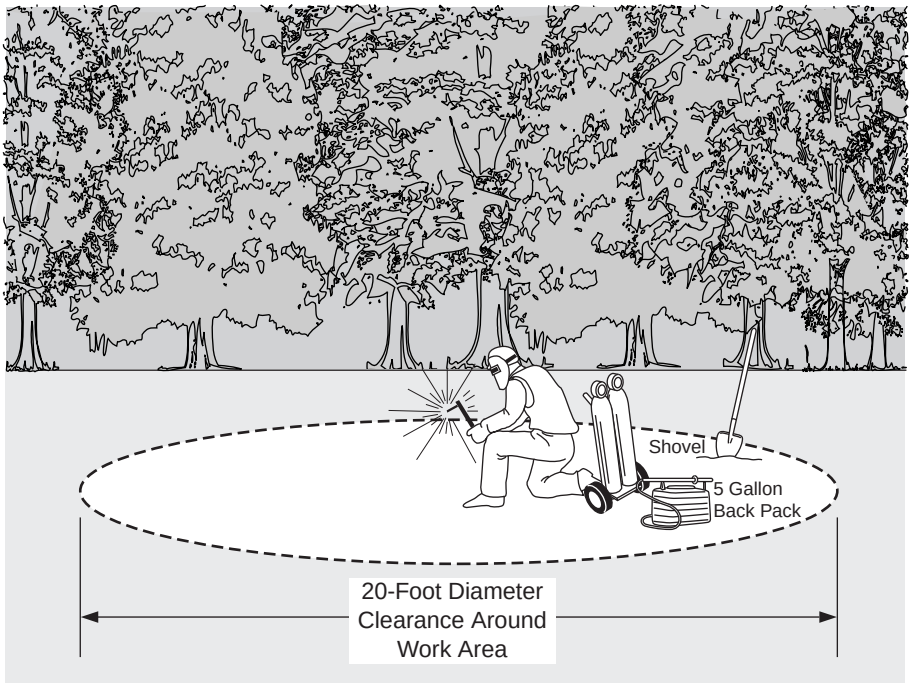


Figure 5-2.
Proper Clearances Around Welding Operation

5.2 Refueling and Lubrication

Whenever possible, refueling and lubrication should be done at properly equipped and cleared shop or yard areas. On logging and many construction operations, this is not reasonably feasible. In these situations, certain precautions should be taken. In the interests of both fire prevention and water pollution control, all drain oil, used oil filters, rags, and other trash should be disposed of by complete removal from the site. These items should be transported to, and deposited in, an appropriate public waste disposal site.

Wheeled or tracked machinery is usually serviced from a truck, which means it will normally be brought to a log landing or other similar cleared area accessible by the service truck. If this is not the case, or if portable equipment (e.g., chain saws or small generators) is being refueled, a clearing to mineral soil for at least a 10-foot radius should be made and the unit to be serviced placed in the center before any fuel transfer takes place. For both fire and personnel safety, all power units should be shutdown and cooled before being serviced. Before restarting, spilled fuel should be wiped off portable units and moved at least 3 feet. The units should then be positioned so that the exhaust points away from the spot where refueling took place.

Photograph 5-3.
Chain Saw Being Refueled

Above ground storage of gasoline in quantities in excess of one 55-gallon drum should be avoided. In any event, a clearing of all vegetation and other flammables should be maintained for at least a 15-foot radius from the container and/or pump. Some companies employ a “hotfoot” clearing around fuel storage areas.

Laws, ordinances, or regulations in many places require that a dike of sufficient height and area to retain the entire contents of the tank (in case of rupture or overflow) be constructed around any tank of 500 gallons or larger capacity. Such quantities of fuels should not be stored within 250 feet of a live stream or 50 feet of any vegetation. Fueling hoses should be fitted with automatic closing valves and nozzles to shut off the flow of fuel. This provides safety in case of hose rupture or nozzle dropping.

5.3 Servicing Equipment

The equipment used to supply servicing is subject to the same laws and regulations as the equipment being serviced, and for the same reasons. The exhaust from a pump engine or air compressor engine is just as dangerous as that from a tractor or a truck. Thus, every internal combustion engine from a one horsepower Briggs and Stratton to a 1000 horsepower motor-generator set, must be equipped with a spark arrester. The only exemption is for muffler-equipped engines on trucks, buses and passenger vehicles. All other engines mounted on such vehicles (e.g., to power fire pumps, compressors, generators, etc.), mounted on trailers or skids, or hand portable, must be spark arrester equipped. In addition, if the unit is not mobile or is to be operated in a given location for a time, a clearing of flammable material must be made around it for a radius of at least 10 feet. Firefighting tools must be provided nearby.

Photograph 5-4.
Generator with Spark Arrester and Clearance

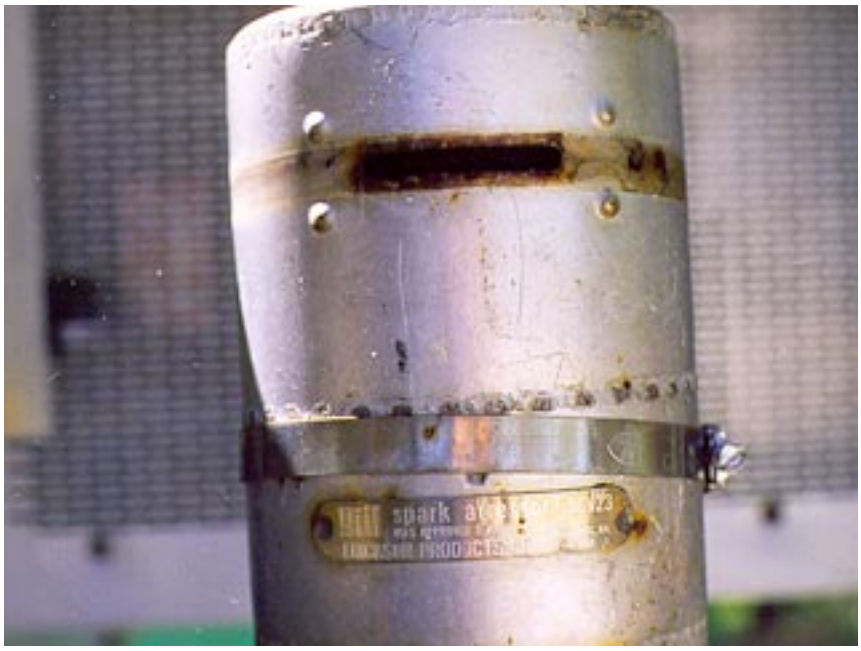
Service vehicles, including fuel and mechanics' trucks, should be equipped with large (i.e., 20-40 lb.) multipurpose fire extinguishers. The operators of these vehicles should be well trained in the use of extinguishers. Operators are often alone and in remote locations when servicing or repairing machinery. It is therefore important they be capable of quick and effective fire suppression action in case an ignition occurs.

Photograph 5-5.
Large Fire Extinguisher on Mechanic's Truck

5.4 Spark Arrester Servicing

Spark arresters are often overlooked or given inadequate attention during servicing of machinery. Every mechanic, operator, and owner knows that the air cleaner on an internal combustion engine must be regularly cleaned or replaced. If it is not, the engine loses power. They are, therefore, conscientious about performing this service. The need for cleaning or emptying the spark arrester is not always apparent. Except in the case of screen-type arresters (usually found only on small multi-position engines), the performance of the engine is not affected. This may cause some operators to disregard routine cleaning. However, when the trap is full (or the screen burned out) the arrester loses its effectiveness causing carbon sparks to be emitted.

Spark arresters should be checked and cleaned often on a regular basis (every 30 days or less). The proper way to do this is to make sure the machine is parked in a cleared fire-safe area. Remove the band or plug, then start the engine and blow out the carbon.



Photograph 5-6.
Retention Spark Arrester with Band Removed

Photograph 5-7.
Retention Spark Arrester with Plug

6. EXPLOSIVES

- ***27 CFR §55.215 (Clearances around Magazines)***
- ***27 CFR §55.41 (Explosives, Licenses, and Permits, Classes of Explosive Materials, Types of Storage Facilities, Locations of Storage Facilities, Construction of Storage Facilities, Quantity and Storage Restrictions, and Required Distances from Exposures)***
- ***29 CFR §1926.900l (Disposal of Explosive Containers)***

Explosives are used by wildland industrial operations, particularly construction and mining. When their use is kept in the hands of experienced personnel, their fire starting potential has proven to be low. However, in the hands of untrained or illegal users, their potential for both fire and blast damage increases significantly.

There is a rather large body of both federal and state laws governing the manufacture, sale, transportation, storage and use of explosives. It is primarily aimed at protecting the public from blast damage as well as theft and terrorism. Such laws also address illegal possession and use.

These laws are administered by law enforcement rather than fire agencies. Unfortunately communication between law enforcement and fire agencies is not always as good as would be desirable in the interest of public safety. Consequently, fire agencies are often unaware of the existence of explosives within their area of jurisdiction. When they are aware of explosives within their jurisdiction they need to notify all fire prevention, detection, and suppression personnel within the unit. For this reason, some fire agencies may require blasting permits in addition to any other required explosive permits. The permitee may also be required to notify the local fire agency of the legal location in order to notify staffed fire lookouts.

In the realm of wildland fire protection, three main problems are related to explosives:

- One is use of fuses rather than electric detonation If properly placed, the explosives themselves will seldom ignite a fire. Cordite, primacord, or other burning fuses, however, will not only ignite any forest fuels they are laid across, but short pieces can be thrown considerable distances by the force of the explosion and cause multiple fires where they land. Therefore, all blasting in forest, range or watershed areas should be detonated electrically.
- Second is the heat of the explosive detonation itself. The rapid (instantaneous) oxidation of the explosive chemicals produces great heat in a small space and time. In contact with, or in close proximity to flammable materials, such heat will cause ignition resulting in fire. Appropriate clearance from forest fuels is mandatory.
- The third fire problem with regard to explosives is storage. This problem has two aspects. One is security. More explosives are stolen from temporary caches on construction and logging projects than from any other location. This is primarily a law enforcement problem; however, significant amounts of the stolen explosives end up being used in the wildland by untrained and inexperienced people and thus become a fire problem.

An explosive becoming exposed to wildfire is the other aspect of the storage problem. Magazines and caches are often deliberately camouflaged. Their locations are usually kept secret as protection against theft. This means that they are often in close contact with forest fuels. Unfortunately, firefighters seldom know where they are. In the interests of fire safety, all magazines and caches for explosives should have no less a clearance of flammable materials around them than that required for

structures in wildland areas (in California this is 30 feet). Several companies provide clearances up to 100 feet. If this cannot be reconciled with the security problem, some other means (e.g., insulation) should be employed to keep the radiated heat of a forest fire from detonating the explosives inside.

Regulations of the Federal Bureau of Alcohol, Tobacco and Firearms (27CFR55.41) provide for explosives licenses and permits, classes of explosive materials, types of storage facilities, location of storage facilities, construction of storage facilities, quantity and storage restrictions, and required distances from exposures. Included among these regulations is one (27CFR55.215) which states, "The area surrounding magazines, or trees (except live trees more than 10 feet tall), for not less than 25 feet in all directions." "Volatile materials are to be kept a distance of not less than 50 feet from outdoor magazines." "Living foliage which is used to stabilize the earthen covering of a magazine need not be removed". A special case of this problem which is related to use rather than storage is discussed under "Choker Setting", in the chapter on "Timber Harvesting."

With the best of control, a certain risk of fire is always associated with the use of explosives in wildland areas. Wildland fuels may be present in an unknown proximity; sparks may be struck by quartz or flint rocks, or some malfunction may occur. Therefore, it is always wise to keep a fire watchers in the area for at least one hour after detonation. Sleeper fires have been known to hang over and spring to life because of the wind, fuel moisture or some other weather change long after work crews have left an area.

6.1 Disposal of Explosive Containers

Federal Regulations 29 CFR 1962.900(l) require the disposal of explosive containers by burning. Burning Permit and approved site may be necessary for large construction projects.

7. MOTOR VEHICLES OPERATION AND MAINTENANCE

Motor vehicles (i.e., trucks, buses, pickups, passenger cars, etc.) are an integral part of every industrial operation in wildland areas. They also comprise the largest single fire risk associated with these operations. The large number of these vehicles and the considerable diversity of their use poses an ever-present fire risk. This risk may be concentrated in an operating area but not necessarily confined to it. It is also present along access routes, in reconnaissance, and in exploration areas.

7.1 Fuel Systems

Gasoline is highly volatile and easily ignited. Diesel fuel has low volatility but will ignite if spilled on an exhaust manifold or exposed to a dead short of a battery cable. Carburated gasoline and unit-injected diesel engines use low-pressure fuel lines, which if cracked or broken will allow fuel to spill or run out onto hot surfaces below the opening. Fuel-injected gasoline and external pump diesel engines employ high-pressure fuel lines, which, if cracked or broken, will spray fuel in and all over the engine compartment, including exhaust manifolds. These conditions are most prevalent in rugged dirt road and off road service.

The best means of preventing fires related to the fuel system is a good preventive maintenance program. The fuel system should be checked weekly for any signs of excessive vibration, cracks, abrasion or loose fittings. This is particularly important on those portions of any system that are above exhaust manifolds or pipes.

The quick suppression of any fire that may ignite is a priority. Each vehicle, therefore, should have, in addition to the usual wildland firefighting tools required, a multipurpose dry powder extinguisher of not less than four pound capacity.

Some companies provide 10 lb. extinguishers for engine compartment fires. The extinguisher should be readily available to the operator without the necessity of unlocking a trunk or compartment to retrieve it.

7.2 Exhaust Systems

A. Exhaust Carbon or Particles

Internal combustion engines can burn fuel inefficiently and can produce carbon when idling, operating at low power or in poor condition. Subsequent revving of the engine associated with “getting rolling”, shifting gears (especially down-shifting), or the application of full throttle, will blow out any accumulated carbon particles, which are commonly at 1000-1200 degrees F. when they leave the exhaust system. These particles are often well above the ignition temperature of dry grass, leaves or needles (500-700 degrees F.) when they reach ground level. Some carbon particles are literally aflame while traveling through the air.

Photograph 7-1.
Vehicle Exhaust Tail Pipe

Operation of motor vehicles with sick or worn engines can produce carbon continuously. Pieces of this resulting carbon can potentially break lose and fly out the exhaust system at any time.

Carbon particles and hot gases can escape and start fires through cracks, breaks, burned, or rusted out holes and loose connections. The entire exhaust system should be inspected at frequent intervals to make sure that none of these conditions exist. California law requires that exhaust systems be maintained in good condition.

B. Direct Contact

Ignition by direct contact with hot metal parts of the exhaust system most often takes place at the muffler, catalytic converter, or exhaust pipe between the manifold and the muffler or converter. Temperatures at any of these points are well above the ignition temperature of dry wildland fuels. The time of greatest risk is during the first minutes a vehicle is parked, whether the engine is left running or not. Vehicles should always and only be parked on an area cleared of all flammable material.

The hottest point on most exhaust systems, under normal operating conditions, is at the first bend behind the manifold where the pipe turns from a vertical to a horizontal alignment. Also, if an engine is not properly tuned, raw gasoline may enter the exhaust system and burn at the converter producing temperatures in excess of 2400 degrees F.

Most catalytic converters are now shielded. Care needs to be taken that material does not become trapped between the shield and the converter, which could then cause a fire.

C. Catalytic Converter Meltdown

Most gasoline-powered motor vehicles today are equipped with a catalytic converter. Catalytic converters have been known to melt down and cause fires. The melting of the converter is caused by

an initial malfunction in the electronic ignition systems which allows raw fuel to go directly into the exhaust system and accumulate at the catalytic converter. This causes the converter to melt and particles to escape the exhaust system.

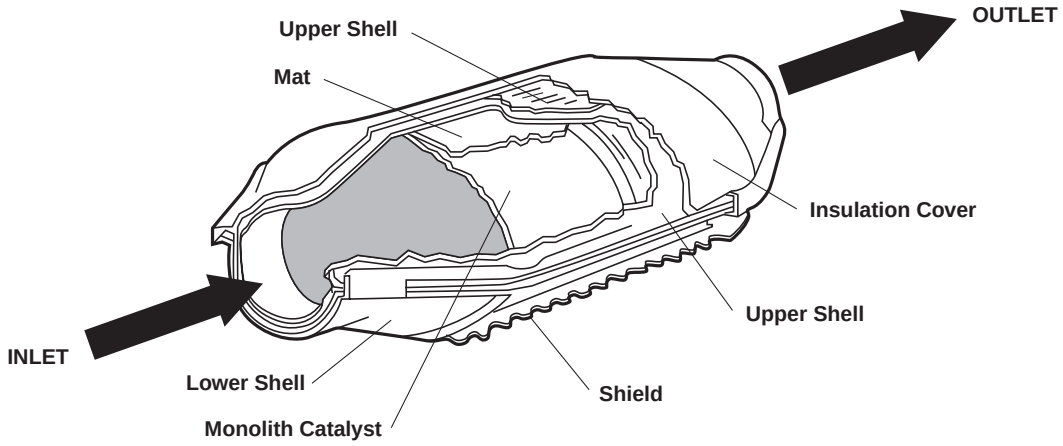


Figure 7-2.
Catalytic Converter

Malfunctions of this nature can cause fires to be spread over a large area. The operator of the vehicle may not be aware that fires are being caused and continue traveling. This malfunction can correct itself and the operator may never be aware of the fires that were caused by him/her.

Records of fires in the Shasta-Trinity Ranger Unit indicate fires are continuing to be caused by this source. A second study that included the entire Coast-Cascade Region indicated fires are being caused by this source throughout the area.

D. Other Exhaust Problems

Another source of fires, is caused by wood chips after they have come into contact with the exhaust system. It is believed that wood chips, when blown into a trailer while the truck is attached, can enter the exhaust system. They can remain in the system and “cook”, becoming light enough to be blown from the exhaust system, usually a distance from the operation area.

A second source of ignition from the wood chips is if they become lodged between the exhaust stack protector and the exhaust stack on trucks, again while being loaded at the operation area. These chips again “cook” from the heat of the exhaust stack and can fall out, causing a fire, usually a distance from the operation area. Additionally, in areas where there are dairies, manure can present the same problem as wood chips.

Photograph 7-3.
Wood Chips Being Loaded

Photograph 7-4.
Exhaust Stack on Semi-Truck with 90-Degree Bend and Shield

Fires from this source can be prevented by either having an extension on the exhaust stack turned 90 degrees from the trailer, or by removing any obstructions in the heat shield which will allow the chips to fall through without being subjected to the heat of the exhaust stack.

E. Electrical Systems

Vehicle electrical systems can start fires in any number of ways. The most common is a short circuit in the wiring. This is usually the result of cracked, broken, or abraded insulation. It can happen anywhere on the vehicle, not only in the ignition wiring. The best prevention is good preventive maintenance and prompt replacement of any wiring which shows signs of age or wear.

Other electrical sources of ignition are short circuits in the starter or at the battery connections and cables, and improper use of jumper cables. All of these cause arcing with the full voltage and amperage rating of the battery, thus intensive heat and sparking.

F. Brake Systems

Brake systems do not cause a large number of fires, but they should not be overlooked. Brake drums, shoes and discs can, and do, overheat if used excessively in mountainous terrain. The best way to avoid overheating brakes is to travel at reduced speed assisting the brakes with engine compression, retarder or jake-brake as available.

Brakes can also cause fires when operators or service personnel spill flammable liquid on them while they are still hot from normal use. Although care in servicing should normally prevent such an occurrence, this is another reason why servicing, including emergency repairs, should only be done in an area cleared of all flammables for a distance of at least 10 feet in all directions.

G. Miscellaneous

Fires can originate from overheated bearings, transmissions, running on a flat tire, etc. The point is, motor vehicles involve a combination of machinery and people, either or both of which can fail at any time. When this happens in wildlands, a wildfire is very likely to result. Constant preventive effort is always needed.

7.3 Tool Requirements

Because motor vehicles may cause wildfires, many laws, contract clauses, and company rules require firefighting tools to be carried on all vehicles used on industrial operations. The most common requirements are a shovel and an axe. Other requirements may be a five-gallon backpack pump and a four-pound or larger ABC rated fire extinguisher.

Photograph 7-5.
Axe and Shovel Mounted on a Logging Truck

8. USE OF FIRE

Fire is used in many ways and for various purposes related to industrial operations in the wildland. In some situations, it is the only practical solution to a problem. In others, it is the worst possible alternative. In the eyes of some, it is a natural process and always preferable to the use of any herbicide. To others, it poses an unacceptable threat of escape and destruction. In some cases, mechanical alternatives are available. In others, the only alternative is excessively expensive hand labor or collection and removal.

Fire is a very useful tool for the wildland fire management officer, land manager or construction contractor. It is also a very dangerous tool which should only be used by a well trained and experienced professional and with the full prior knowledge and permit approval of the responsible fire protection agency.

8.1 Slash Burning

- ***PRC §4423 (Burn permits required)***
- ***PRC §4425 (Violation of burn permits)***
- ***36CFR §261.52k (Violating state law relating to burn permits that threaten National Forest land)***

Before any kind of burning can be done on commercial or private projects, local fire agencies need to issue appropriate burn permits and educate contractors, or private land owners, about air quality regulations and permits.

Logging slash is commonly burned for two reasons. One reason is to abate the greatly increased fire hazard of untreated slash. The other reason is to uncover the soil in preparation for planting or seeding to secure regeneration. Sometimes the slash is piled or wind-rowed before burning. On very steep slopes this pretreatment becomes difficult and expensive. Also, broadcast burns are more common.

Whether the slash is pretreated or broadcast burned there is usually an abundance of cull logs, large limbs and other heavy fuel. Most often there is plenty of fine and medium fuel to ignite this heavy fuel which then retains heat for long periods of time. Rekindled and escaped fires after two to six months, even after heavy rains and snows, are not at all uncommon.

One solution to this problem is yarding unmerchantable material (YUM logging) prior to burning. In the past, this material really was unmerchantable and only public agencies could afford to do it. With the interest in biomass fuel sources this situation may very well change and cause YUM logging to be economically practical. If so, slash burning is most likely to become a much safer operation.

Not all slash burning escapes result from holdovers in heavy fuels. Many of them are almost immediate and are generally the result of inadequate planning, preparation, staffing and/or execution. Logging slash creates a high intensity fire, which can easily escape by radiation, flying firebrands, or convection.

Proper planning includes keeping the size of individual plots to those which can be safely burned by the available staffing in one day. It also includes scheduling the burning of multiple plots over several days or weeks so that too many are not ignited on any given day. In many areas, because of the short interval between the end of fire season and the onset of heavy rains and/or snow, this is not considered practical.

This problem can be overcome by the use of a combustion-enhancing oxidizer fuel formulation developed by scientists at the Jet Propulsion Laboratory and California Institute of Technology in Pasadena (Combustion Science and Technology, 1977, Vol. 17, pp. 79-81). With this mixture plots can be burned at times when surrounding forest fuels are nonflammable. Planning should also include the provision of alternate work for the burning crews on days when weather or other conditions make burning difficult, impossible or unwise.

Preparation for a burn should include construction of adequate control lines, pretreatment (e.g., crushing, lopping, or spraying), and logistics (e.g., manpower, equipment, tools, ignition devices, water, and food). It is not a simple, nor a cheap undertaking.

Staffing involves more than someone to walk around with a fusee or drip torch. Adequate personnel should be present to keep the fire contained within its intended boundaries if it should flare up or make a sudden run. This includes detecting and suppressing spot fires outside the perimeter. In addition to foot troops, this will often require bulldozer or pump operators and other specialized personnel.

The most important position is an overall supervisor or prescribed fire manager to direct both the firing operation and any suppression action that may become necessary. The second most important staffing requirement is someone to patrol and, if necessary, mop up the burned plot until the fire is completely extinguished. As discussed above, this may extend into several months with daily patrols checking for hotspots.

Proper execution of a slash burn involves a thorough understanding of fire behavior, including the effects of topography, local wind patterns, fuel types and densities, etc. Generally, firing should proceed from uphill and downwind toward downhill and upwind. However, this pattern may have to be altered due to local conditions. In any event, firing should always be conducted so that no more heat is built up than can be safely contained by the standby suppression forces. This also prevents excessive amounts of smoke from being borne downwind to populated areas.

Photograph 8-1.
Slash Burn

Where fuel loading is particularly heavy, or very strong or gusty winds are common, serious consideration should be given to mechanical alternatives to slash burning. Several of these have been developed; some especially for forest use, some originally for brush treatment, and some for use anywhere.

The Hydro-Ax should be able to convert either slash or standing trees up to 16 inches in diameter into chip mulch. Several brands of portable chippers will accept woody material up to four inches in diameter and blow the chips onto the forest floor. Other brush cutting machinery will chop material into small pieces and mix them into the top layer of soil. Machines which can effectively treat logging slash are either currently available or under development.

Photograph 8-2.
Chip Harvester

8.2 Land Management Burning

- ***PRC §4423 (Burn permits required)***
- ***PRC §4425 (Violation of burn permits)***
- ***36CFR §261.52k (Violating state law relating to burn permits that threaten NF land)***

Fire is also extensively used as a land management tool. One of the most common of these uses is for cover type conversion (e.g., brush to forest or range). Another is to reduce fire hazard by removing dead material, brush, or under-story trees. Still another is to favor one species or type of vegetation over another without changing the cover type.

In the past, such activities in California, and elsewhere in the West, were accomplished mainly by so-called "controlled burning." Primarily this involved putting a control line around the area to be burned, waiting for a hot dry day without too much wind, and setting the area on fire. Sometimes the objective was accomplished. Often, not. Usually one or more escapes occurred, sometimes exceeding the planned area in size.

Some years ago the concept of burning in accordance with a prescription to achieve a specific goal on a particular site was developed in the South. In recent years prescribed burning has been accepted in the West and is a science. This type of burning involves a four-step process:

1. establishing the object;
2. taking fuel inventories (i.e., amount, size, type, distribution, etc.);
3. establishing the intensity of fire needed to obtain the objective in the existing fuels; and,
4. prescribing the range of weather factors that will produce the desired result on the type of topography where the site is located.

While writing the prescription requires knowledge and skill in the fields of fire physics and plant physiology, the execution of it demands similar knowledge and skill in fire behavior and meteorology. Firing too fast or too slow cannot only negate the objective but also cause an escape. Precise knowledge of local weather patterns is required to know when the prescribed conditions will exist, their duration, and in what ways they will change. The logistics involved can be complicated. Alternate work should be available for the crew in case the prescribed conditions do not develop on the scheduled day of the burn.

8.3 Debris Burning

- ***PRC §4423 (Burn permits required)***
- ***PRC §4425 (Violation of burn permits)***
- ***36CFR §261.52k (Violating state law relating to burn permits that threaten NF land)***

In most metropolitan and valley areas, debris burning is prohibited by air pollution control laws. In mountain areas, it is restricted. In a sense, slash and land management burning is debris burning. However, they are generally allowed under the agricultural or forest management exemptions. Such exemptions are in jeopardy if, in addition to fire safety, smoke production and drift are not properly managed.

Burning of household trash is commonly exempted in rural areas. However, the burning of industrial waste, including woody material resulting from clearing for construction projects, is usually not allowed unless the responsible fire protection agency certifies that the waste constitutes a fire hazard which cannot be abated in some other way. The same is true for burning done for the sole purpose of fire hazard reduction, such as along highway or railroad right-of-way.

Most fire agencies are happy to facilitate such burning projects when the permitee complies with all fire safety provisions and makes some effort to reduce smoke emissions. The local air quality management districts must also be contacted before burning. For waste disposal, this can usually be accomplished by achieving complete combustion in a high intensity fire. A forced-draft air supply is usually necessary. Several systems or pieces of equipment have been developed for this purpose.

For fire hazard reduction, where the primary purpose is usually to eliminate the fine (flash) fuels, both smoke emission reduction and the objective can best be obtained by following a prescription that produces a low intensity fire. This kind of fire will also be reasonably safe from escapes.

Photograph 8-3.
Low Intensity Ground Fire

8.4 Lunch and Warming Fires

- ***PRC §4432 (Neglecting campfire)***
- ***PRC §4425 (Violation of campfire permit)***
- ***PRC §4433 (Campfire permit required)***
- ***PRC §4434 (Escape of campfire)***
- ***Title 14CCR §918.5 (Lunch and warming fire requirements)***
- ***36CFR §261.5f (Campfire clearances required on National Forest land)***
- ***36CFR §261.52 (Campfire permits required and fire restrictions on National Forest land)***

Lunch and warming fires should be kept no larger than needed to cook or provide warmth. They should have a clearing to mineral soil for at least five feet in all directions from the perimeter of the fire. The fire should be confined to a depression scooped in the center of the clearing. At least one adult should be in attendance with firefighting tools (i.e., shovel, backpack pump and axe) readily available until the fire is completely extinguished. Extinguishment should be with water, checked by bare hand.

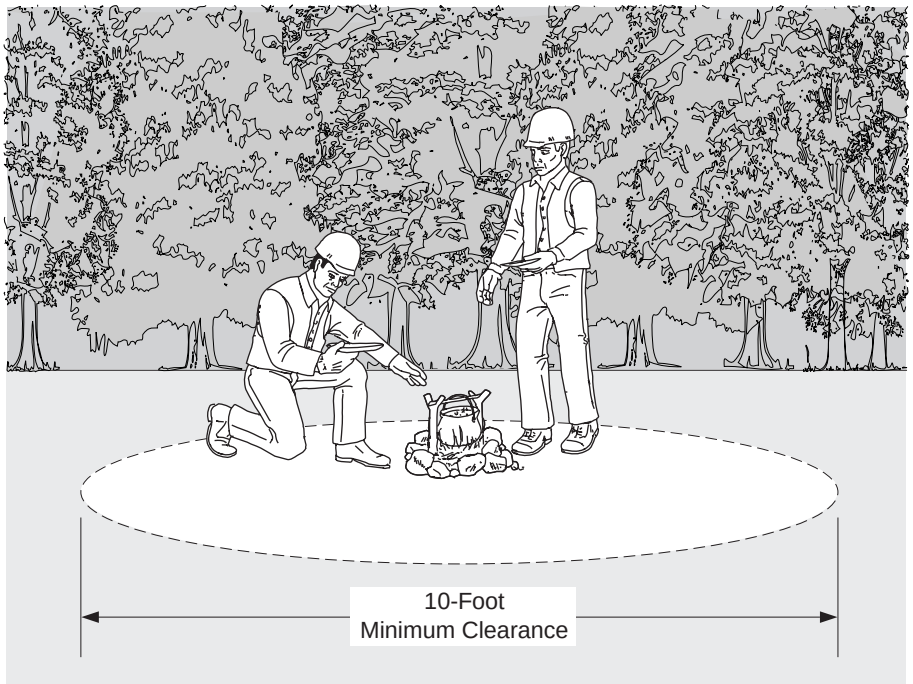


Figure 8-4.
Properly Prepared Campfire

Under weather conditions creating “very high” or “extreme” fire danger, or a “Red Flag” conditions which indicates the probability of high winds, the use of lunch or warming fires should be prohibited. Since the workers may not be aware of these conditions, it is the responsibility of the company management to inform them and enforce the restrictions. Lunch and warming fires should only be used under the terms of a campfire permit issued by the appropriate fire agency and, if on private land, by the owner.

8.5 Infrared Scanning

Infrared scanners can detect concentrations of heat which are not visible to the human eye (e.g., no smoke, area obscured by smoke or darkness).

Infrared scanners come in various models. The most useful to public or private fire specialists are those designed for mounting in aircraft and those that are hand held. In an aircraft (fixed-wing or helicopter), large areas can be checked quickly for holdovers from slash or land management burning or abandoned lunch and warming fires. The hand-held scanners are useful for checking specific suspect locations (e.g., recently extinguished lunch and warming fires, previously burned piles or wind-rows of slash, or areas near the control lines of wild or prescribed fires).

9. TIMBER HARVESTING

In the past, the timber harvesting industry has been responsible for many forest fires including some of the most devastating and costly in American history. Over the years, through the school of hard knocks, the record has been significantly improved. Considering the fact that the timber industry is operating continuously in a highly vulnerable environment, timber harvesting operations cause remarkably few wildfires. Industry personnel suppress most of those fires before the public agency forces arrive. This kind of record cannot, however, be maintained without continuous effort on the part of both the industry and the fire agencies.

With few exceptions, fires caused by timber harvesting operations are the result of ignorance or carelessness. The fully informed and conscientious operator or employee will not willfully risk a fire. Too much is at stake. On the other hand, new or poorly trained employees can unknowingly cause fires. This section also confronts the possibility that veterans in the industry can fall prey to the old saying, “familiarity breeds contempt”, or can be distracted by personal problems or outside influences.

This chapter will present some of the more important fire safety information for the timber harvesting industry. Included is material on machinery, procedure, personal habits, and special areas.

9.1 Chain Saws

- ***PRC §4431 (Gasoline powersaw clearance and tools required).***
- ***PRC §4442 (Spark arresters required).***
- ***36CFR §261.52 (Spark arresters required on National Forest land).***

In the past, chain saws were among the most dangerous machinery in the woods. A modern saw in the hands of a skilled operator will seldom cause a fire. Many older saws were poorly designed and under-powered. Unfortunately, some of them are still around. Design features included discharging the exhaust into the saw cut, or sawdust, fuel filler cap directly above the exhaust system, lack of or poorly designed spark arresters, etc. Under powering led to overheating. In the past, saw operators were either not trained or not required to refuel in cleared areas, keep spark arresters clean and in place, or carry firefighting tools and equipment.

The time of greatest fire danger with regard to a chain saw is during refueling. The saw should always be set firmly in position within an area cleared of all flammables down to mineral soil for a radius of 10 feet. The engine should be stopped and allowed to cool while chain oil is being replenished. The required fire tools (i.e., shovel and fire extinguisher) should be placed nearby. Care should be exercised to avoid spilling any fuel on the engine, especially on or near the exhaust port.

Photograph 9-1.
Refueling Chain Saw in Properly Cleared Area

The next most dangerous operation with a chain saw is cutting dead wood. Unless decomposition has started, the wood is harder than green wood; therefore, the saw has to work harder and both the chain and the engine can overheat. In addition, the sawdust is a highly flammable fine-sized fuel. It can quickly blow onto the engine and ignite. It will not necessarily stay there. Before the operator can notice it, glowing embers can fall off into sawdust or duff below.

The sharper the operator keeps his chain, the easier it will cut; therefore, less heating of both chain and motor will result. If the surface wood is punky the exhaust gases can ignite it. A careful fire watch should be kept on such an area for at least one hour following cutting.

The spark arrester should be checked for holes each time the saw is refueled. If the mesh is fine enough to meet legal standards (.023 in.), screen arresters work quite well when they and the engine are new. Worn engines produce more carbon than new ones, therefore, they tend to clog the screen rapidly.

The wire used to make the screen, though usually a high carbon steel, is necessarily fine. Thus it will burn out under continuous heavy use. In order to avoid excessive back pressure or the escape of carbon particles, these screen arresters require frequent inspection and servicing. They should be inspected for holes at each refueling and cleaned daily. Most professional sawyers carry a spare spark arrester screen to avoid costly shutdown during the day should the installed screen fail.

Photograph 9-2.
Burned Out Chainsaw Spark Arrester Screen

Photograph 9-3.
Chain Saw With Properly Attached Bumper Spike and Heat Shield

9.2 Choker Setting

Although they seldom use machinery, choker setters, like fallers, limbers and buckers, often work alone. Since they are more or less isolated they may be difficult to supervise. They work in areas where fires are most difficult to fight, away from roads with logs and slash on the ground. In addition,

they are generally less skilled and often younger than other wood workers. Some do not realize the fire risk they represent. This is cause for increased concern.

Self-discipline becomes paramount in such situations. Though most companies prohibit smoking in operating areas, and while various laws impose penalties for smoking at inappropriate times and places, (even for the improper discarding of tobacco products and matches), the risk will remain high unless self discipline can be emphasized.

9.3 Tractors, Skidders, Loaders, Etc.

- ***PRC §4428 (Fire tools required)***
- ***PRC §4442 (Spark arresters required)***

The heavy power equipment used in timber harvesting is fundamentally no different from that used by the construction and surface mining industries. Generally speaking, however, the hazards are greater since the logging machines are operating almost continuously over and through flammable forest fuels. Construction and mining equipment, on the other hand, is usually working in this hazardous environment only during the pioneering stages of a project or operation. Consequently manufacturers, distributors, owners and agency inspectors have devoted a great deal of attention to the reduction of the fire-starting potential of logging machines.

Photograph 9-4.
Log Skidder

Exhaust sparks may be a fire risk from logging machinery. This explains the requirement by state law and in most timber sale contracts for spark arresters on all exhaust stacks. This includes the main engine, starting, and other auxiliary internal combustion engines as well. Because the rapidly turning drive blades of a turbocharger tend to chew carbon particles into dust and thus act as an attrition spark arrester such turbochargers are usually accepted in lieu of spark arresters.

This practice should not be followed automatically. The exhaust systems on some older makes and models of engines may be designed so that only a portion of the exhaust gases pass through the turbocharger. The remainder is bypassed directly into the exhaust stack receiving no spark arresting treatment. These machines, even though turbocharged, must be equipped with spark arresters.

Photograph 9-5.
Turbocharger on Equipment

An adequate spark arrester is one which effectively removes carbon particles (sparks) large enough to ignite light fuels (e.g., dry grass, pine needles, or oak leaves) from the exhaust stream. It will only do this if it is the proper size and is properly installed (i.e., vertical or horizontal). Most arresters in use are of the retention type. This means they trap and retain carbon particles. When the trap becomes full, they completely lose their arresting capabilities, and no longer comply with legal or contract requirements. Therefore, the trap should be emptied regularly and often.

The spark arrester on a finely tuned engine should be cleaned every 30-40 operating hours. The proper way of doing this is to park the machine on a landing or other large cleared area. Next, remove the band or plug, start the engine and rev it up to blow out the carbon, shut down the engine, and replace the band or plug. It should be noted some units may require two spark arresters: one for the diesel engine and one for the gasoline starter engine.

Photograph 9-6.
Spark Arrester with Band Removed

OSHA regulations require most new equipment to be fitted with mufflers or silencers. Many older operators and owners are convinced an internal combustion engine cannot operate efficiently with both a muffler and a spark arrester affixed to the exhaust stack. They feel it may create too much back pressure. This is not necessarily so, provided the proper model and size of both is utilized. Many new machines come factory equipped this way. Older machines can be successfully retrofitted if properly engineered.

Photograph 9-7.
Machine Equipped with Both a Muffler and Spark Arrester

Another fire risk, particularly with log skidding equipment (e.g., tractors, chippers and rubber-tired skidders), is the collection of flammable trash inside the engine compartment, particularly on the exhaust manifold or in the belly pan. The danger of the former location is obvious.

Trash in the belly pan restricts cooling of crankcase oil, hydraulic fluid and engine cooling water. It also causes engine overheating. Additionally, it forms a fuel bed to which access for extinguishment of a fire ignited from any source is almost impossible. Such sources could include exhaust sparks, flaming or glowing material falling from the exhaust manifold, or electric short. For these reasons, machines designed for use in the logging industry by all manufacturers in recent years have had the engine compartments enclosed by plates and/or screens. These should always be kept in place while the machine is being operated.

Some operators and mechanics fail to replace said plates and/or screens after servicing or repairing equipment. This creates rather than solves problems. In fact, it would be a good practice to retrofit older machines with these screens.

Those machines which are not so equipped should have all trash removed from the engine compartment, especially the belly pan, regularly and often. Once a day or at every refueling is recommended.

Leakage in the exhaust system is another potential source of ignition of flammable material located either on or off the machine. Since no exhaust system is designed with leaks, this problem is primarily one of inadequate maintenance and repair. Leaks can develop from cracks, missing bolts, burned-out or rusted-out spots, etc.

Some exhaust systems include sections of flexible tubing. These are vulnerable to vibration and burning out. They should be checked regularly for leaks. Any exhaust system which leaks is in violation of the spark arrester laws and regulations.

Photograph 9-8.
Leaking Exhaust System

A source of fire ignition can be an electrical short. All such equipment has an electrical system, either for ignition on a gasoline-starter engine or for power supply to an electric-starter motor. The cables are subject to abrasion, vibration and corrosion and thus to shorts. The resulting arcing will most often ignite a fire on the machine itself, particularly if it has been allowed to accumulate flammable debris and/or oil or grease.

Once the machine catches fire, it becomes a threat to the surrounding forest. Therefore, electrical systems should be checked frequently for any signs of worn insulation, loose connections or corrosion. Also, the entire machine, not just the belly pan, should be kept clean of flammable debris.

As an additional safeguard, it has been suggested that a quick-operating master switch for opening the circuit be located within easy reach of the driver for use in an emergency. Similar protection could be provided by an automatic overload circuit breaker.

Less frequent, but not unknown, causes of fires in logging machinery include: overheated brakes on wheeled equipment, slipping belts, overheated bearings and bushings, sparks struck by track growzers or blades against stones, etc. Most of these, except the latter, can be avoided by good preventive maintenance programs. This will not only make the equipment more fire safe but also improve its efficiency and longevity. Blade and track sparks are difficult to prevent, thus require vigilance and rapid suppression action.

Every piece of mobile equipment used for yarding and loading logs should be equipped with a readily accessible fire extinguisher and is required to have a long-handle, round-point shovel for fire suppression. The extinguisher should be at least a 10-pound multipurpose (ABC) dry-powder type.

9.3a Feller/Hydro Bunchers

Timber harvesting methods of operation are rapidly changing. More and more portable processing equipment is being used to process the forest products at the site where obtained. This has created new fire risks and problems that there are no defined laws to handle.

One such process is the use of machinery that cuts and bunches smaller trees for processing into wood chips either for pulp or hog fuel. These machines are normally referred to as “feller/bunchers”. Although all of the machines pose the same risks of fires from the exhaust system, these type of machines bring their own unique fire risk problems.

Numerous fires have been documented from these types of machines with a saw, instead of a snipper. The saw causes a fire either through friction of cutting the tree off or the saw’s teeth hitting a rock unseen by the operator. Due to the high hydraulic pressure these machines operate under, fires can readily ignite when a leak occurs in the hydraulic system and comes into contact with the hot exhaust or engine. Some timber companies in northern California and Oregon have adopted conditions under which this type of machinery will be voluntarily shut down. (See Appendix E)

Because the weight of most mechanized harvesting equipment is less than some conventional types of equipment, they can pivot and turn more quickly than a bulldozer, creating sparks from the cleats when contacting rocks. When these sparks land in a receptive fuel bed, an ignition can occur.

Photograph 9-9.
Feller Buncher

Another risk which has been created is the process of chipping the material at the location obtained. If the operation is for clean chips for pulp, large piles of byproduct will be generated. These piles have been left behind for other processors to come in and further chip the remains for hog fuel. These piles left behind, which can exceed 10 feet in height and 100 feet in length, can ignite through spontaneous combustion. The Oregon Department of Forestry has done a study on this process. (See Appendix F) The Public Resources Code addresses fire prevention measures for mill wood waste, but the piles left over in the woods are still a wood by-product which the laws do not cover.

9.3b Manual/Automatic Fire Suppression Systems

Many models of heavy equipment have dry chemical fire suppression systems which are mounted inside the engine compartment. It is of significant importance that these models be inspected. There are three parts to the system: the firing mechanism, extinguisher, and the distribution system.

The firing mechanism consists of a nitrogen cartridge which can be visually checked for a manufacturing date stamped on the neck. If the date is over ten years old, the cartridge needs to be replaced. Also, it is necessary to check wiring to the cartridge for any frays as well as for tight mounting brackets.

When inspecting the extinguisher, the top lid can be removed and the dry chemical stirred to check for wetness or clumping. The chemical must be dry and loose to be effective. In accordance with NFPA Standard 17, the chemical must be replaced every six years. Also inspect brackets for tightness.

The distribution network begins at the extinguisher outlet and ends at the nozzles. The following are items to check:

- Check for hoses routed out of the way of all engine compartment parts. The hoses should be secured with connectors and hose tie wraps.
- Look for hose kinks and damaged hose.
- Where hose or pipe runs through metal there must be a rubber grommet in the hole.
- All nozzles must be aimed at hazard areas and the hinge on the cone nozzle cap must be mounted away from the hazard areas.
- There must be spring tension in nozzle caps (not all models have caps), and no debris accumulations on cone caps.
- The battery wiring to the extinguishing system should be checked for flaws.

These systems do not replace the requirements for portable fire extinguishers and are not required by law.

Photograph 9-10.
Fire Suppression System

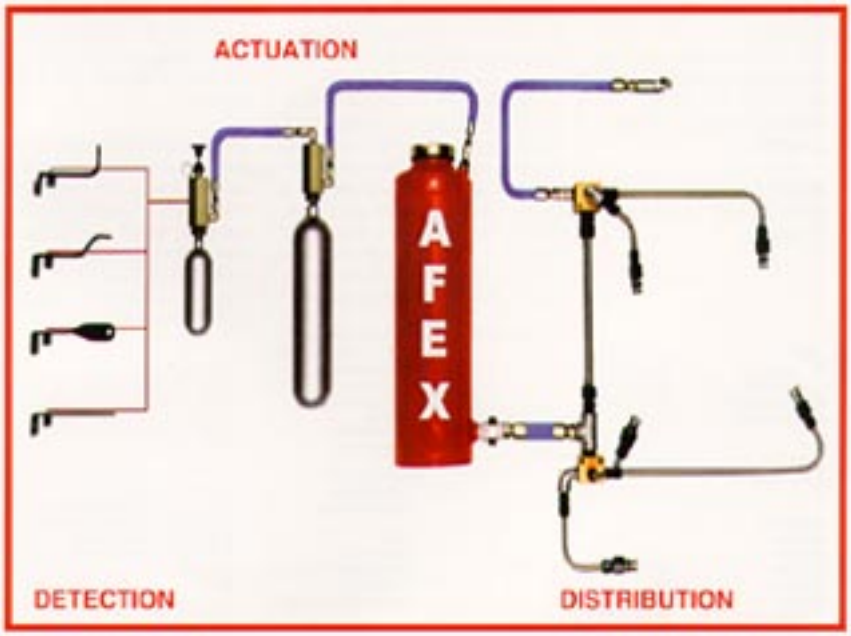


Figure 9-11.
Diagram of Fire Suppression System

9.4 Cable Systems

- ***14CCR §918.10 (Cable block requirements)***

Cable logging systems are composed of yarders, cables, and blocks. They are rigged in three basic configurations (ground lead, high lead and skyline) with many variations of each. Their primary use is for logging country which is too steep for skidder or tractor logging. This means they are found in topography wherein fire suppression is difficult and expensive. Therefore, fire prevention is of utmost importance.

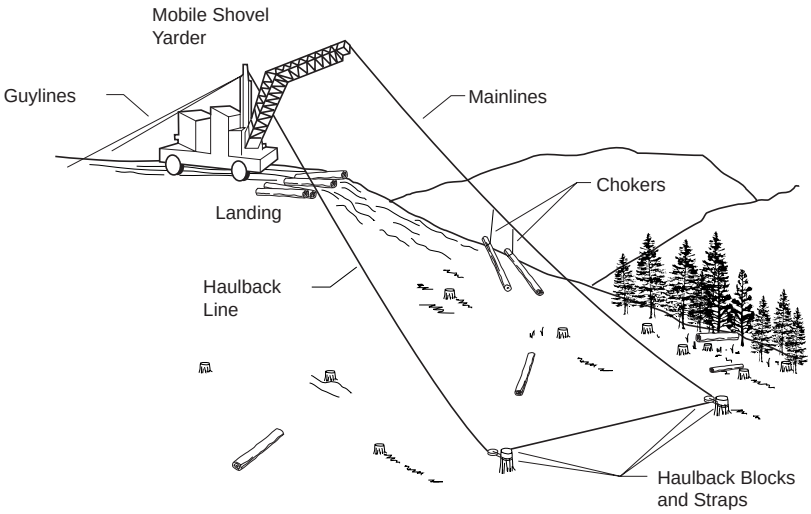


Figure 9-12.
Ground Lead Cable System

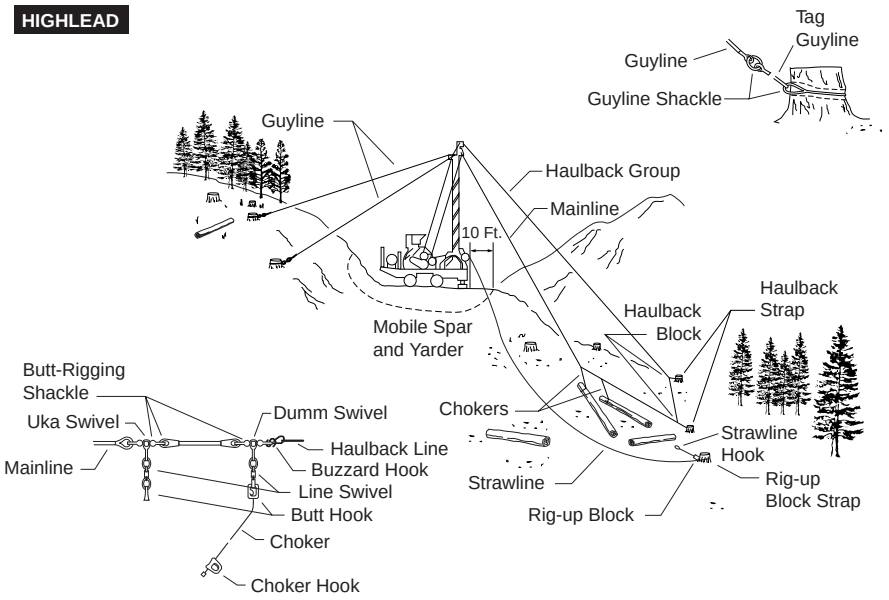


Figure 9-13.
High Lead Cable System

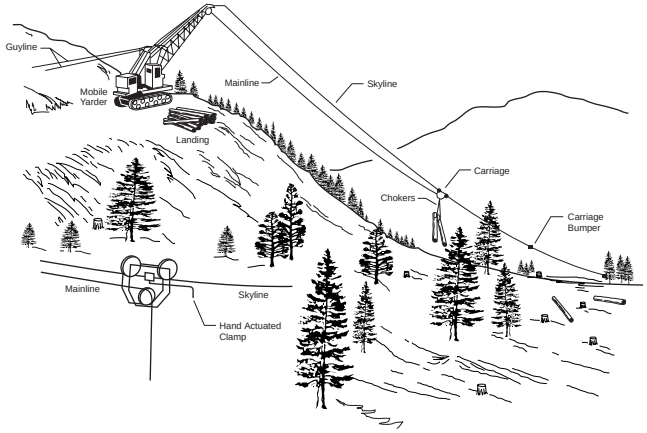


Figure 9-14.
Skyline Cable System

The yarder is, generally speaking, the least dangerous part of a cable logging system from a fire risk standpoint. However, it cannot be ignored. A yarder is composed of an internal combustion engine providing power to a winch with one to four drums and a boom or tower. In some systems the tower is separate. Even though the yarder normally operates in a semi-permanent location (e.g., a landing) which is relatively free of flammable vegetation, the exhaust system is dangerous and is required to be spark arrester equipped. The same recommendations for cleanliness and preventive maintenance apply to this piece of mechanical equipment as to any other. Some special areas where excessive friction can cause fires are the cable drum brakes and the blocks or sheaves on the boom or tower. Fire extinguishers and firefighting tools are required on or close to the yarder.

Photograph 9-15.
Cable Yarder

The cable, being made of steel and, except for a standing skyline, traveling at high rates of speed, can create high frictional heat in anything it rubs against. On live green vegetation this will normally not cause a fire. However, many wildfires have been observed to have been started by cables rubbing against dead woody material, including standing snags, down logs or trees, stumps, dead branches on live trees, etc. Therefore, it is of the utmost importance that all moving cables be laid out and rigged in such a way as to avoid contact with dead woody material at all times during set up and use.

Photograph 9-16.
Cable Rub Marks on Tree

A special problem is presented by skylines and, to a lesser extent, high leads. This is not from a potential for starting fires standpoint. It is from flying hazards to firefighting aircraft.

There have been several near misses by both fixed wing planes and helicopters. Therefore, whenever a fire is known to be in progress on the operating area or nearby, skylines should be lowered to the ground and high lead systems allowed to go slack. Telescoping or hinged towers and booms should also be lowered until it is certain that low-flying aircraft will no longer be in the area.

Skyline cable systems having motorized carriages must be inspected for spark arresters. There is not a great fire risk here, but as with any internal combustion engine, it will require an arrester. Some carriages may be equipped with manual/automatic fire suppression systems in the event of a malfunction which causes the carriage to strike the ground. Since these carriages will have a fuel supply (although not large) and a battery, the intent of the fire suppression system is to activate upon impact and extinguish a fire caused by sparks and fuel. These extinguishing systems are not 100% dependable in carriage or sky cars, but are an attempt by industry to prevent fires. When inspecting carriages, the fire suppression systems are the same as are found in heavy ground equipment.

Photograph 9-17.
Mechanized Carriage

The most fire-hazardous parts of a cable logging system are the blocks. Depending on their position and purpose, these may be known as tail blocks, haul-back blocks, corner blocks, etc. Since fires have started at blocks all protection agencies have special regulations regarding them and many timberland owners have special timber sale contract clauses about them. Common causes of fires at cable blocks are frozen bearings, dead wood jammed between the cable and the block and the block resting on flammables.

Tail and side block requirements:

- Located in the center of an area that is cleared to mineral soil and is at least 15 feet in diameter.
- Placing of firefighting equipment: shovel and an operational full 5 gallon backpack pump or a 4A fire extinguisher within 25 feet of such blocks prior to yarding.

Photograph 9-18.
Tools at Tail Block Site

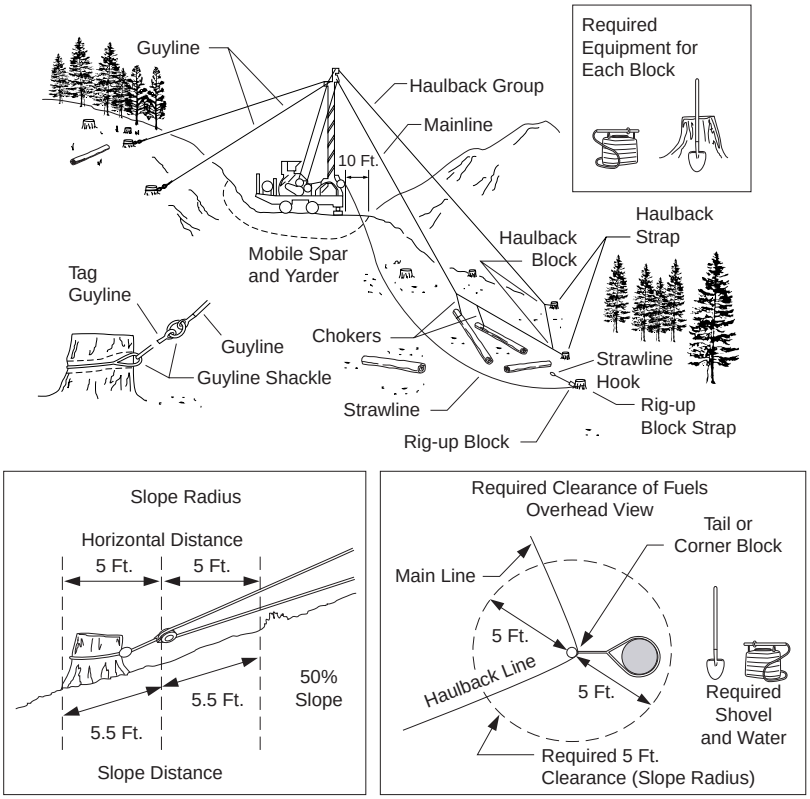


Figure 9-19.
Clearance Required for Cable Block

9.5 HELICOPTER LOGGING

The equipment used in helicopter logging is not inherently any more dangerous from a fire stand point than that used in any other logging system (and less than some). There are however, two matters of some concern: refueling and accessibility for fire suppression.

Photograph 9-20.
Helicopter Logging

Very large helicopters needed to lift loads are powered by turbine engines and thus use much less volatile fuel (Jet A) than gasoline engines. Still, large quantities of the fuel must be stored and transported to heliports on or near the operating area. Special precautions must be taken to contain spills and to combat petroleum fires. This is accomplished by burying or blocking tanks and building dikes around tanks.

Fire Extinguisher requirements for helicopter refueling:

Aircraft refuelers:

- Must be equipped with at least two fire extinguishers having a minimum rating of 20-B:C (U.F.C. Standard No. 10-1)
- A fire extinguisher must be readily accessible from either side of vehicle.

- Portable fire extinguishers at aircraft motor vehicle fuel dispensing stations shall be located such that pumps and dispensers are not more than 75 feet from one such extinguisher.

Open hose discharge capacity for fueling system less than 200 gallons per minute:

- At least two fire extinguishers minimum rating of 20-B:C (U.F.C. Standard No. 10-1)

Open hose discharge capacity for fueling system more than 200 gallons per minute but not over 350 gallons per minute:

- At least one wheeled extinguisher having a minimum rating of 80-B:C (U.F.C. Standard No. 10-1) and having a minimum capacity of 125 lbs. of agent shall be provided.

Open hose discharge capacity for fueling system more than 350 gallons per minute:

- At least two wheeled extinguishers having a minimum rating of 80-B:C (U.F.C. Standard No. 10-1) and having a minimum capacity of 125 lbs. of agent shall be provided.

Because of the economics involved, helicopter logging is seldom used where cable, tractor, or skidder yarding can be done. Therefore, large portions of the operating area are accessible only by air or on foot where the rugged terrain promotes rapid spread and difficult control of fires. Fallers, limbers, buckers, choker setters, or rigging slingers are working in semi-isolation and with minimum supervision and communications. Their capacity for initial attack is limited. The only feasible means of fire response by protection agencies is by helicopter. Foot travel is much too slow. On National Forest Land and some private timber sales the operator is required to have a water tank and a drop bucket, or helitank available at the landing.

Extreme caution must be taken when approaching fires by helicopter to avoid scattering the fire with the downdraft of the rotor blades.

9.6 Landings

It would be easy to consider log landings as fireproof as they are often carved out of a hillside and/or located on bare soil. They are, however, seldom any larger than necessary to perform the yarding and loading operations and thus are closely surrounded by forest vegetation. In addition, they have a tendency to quickly accumulate trash and debris including bark, limbs, paper, oil, etc. It is, therefore, necessary to maintain suitable fire prevention and suppression defenses which include:

- properly serviced spark arresters on all internal combustion engines,
- clearance of flammables,
- fire tools,
- fire extinguishers,
- horn (or other alarm system),
- smoking rules, etc.

Photograph 9-21.
Log Landing

9.7 Timber Cooperators

In some areas of California large timber landowners and operators have formed fire protection cooperatives. The purpose of these cooperatives is to implement and coordinate the use of industrial manpower and equipment to fight wildland fire and to provide liaison between industrial and public control forces. These groups provide a service of great value to both their members and the public agencies at a very nominal cost (usually of a few cents per acre or per thousand board feet of timber harvested per year). The only expense is salary, transportation and communications for a seasonal employee. In both cases, they hire a forester-firefighter. This individual collects copies of all timber operator fire plans in his/her area, attends industry-agency meetings, assists in training and physical testing, assists agency dispatch in ordering, assigning and demobilizing industry forces during fires, etc.

The following is a typical duty statement for an industry-agency liaison position:

I. Pre-season Activities

A. Attend annual spring industry-agency and air patrol meetings.

B. Promote and help conduct employee fire training and physical testing.

II. Inventories

A. Prepare and maintain records of available equipment and manpower.

B. Coordinate pre-season equipment qualifying inspections.

C. Keep current on changes in operating areas.

D. Coordinate private aerial fire patrol with agency patrols.

III. Ordering Forces

A. Function as an integral part of agency dispatching system when industry manpower and equipment are required for emergency firefighting.

IV. During Fire Operations

A. Fills Industry Liaison position in fire line organization.

B. Coordinates relief, equipment use, welfare, etc., for industry forces.

C. Assists agency in rotating forces, obtaining replacements and attempting to share the burden of the fire equally among operators.

D. Inform or alert the agency and/or operator as to any potential problems developing.

V. Demobilization

A. Assists agency in establishing priorities of release of industry manpower and equipment.

B. Assists in coordinating transportation of industry personnel and equipment.

9.8 Firefighting Equipment

- ***PRC §4427 (Tools required for welding/cutting/grinding)***
- ***PRC §4428 (Fire tools required on industrial operations)***
- ***PRC §4431 (Gasoline powersaw and power tool–tool requirements)***
- ***14CCR §918.10 (Cable block requirements)***

As set forth in the chapter on Fire Plans, a rather comprehensive set of standards for provision of firefighting equipment on timber operating areas has been worked out over a period of years. Although minor differences exist between regulations of various agencies and between different timber sale contracts, the following chart of locations and corresponding equipment will be found to satisfy most requirements.

Location	Required Tool(s)
Motor, torch, grinder, etc.	Shovel and 5-gallon backpack pump.
Log landing, construction field office or service area, mine headquarters, etc.	Fire toolbox with enough tools to equip each employee, plus chain saw and tractor headlights.
Motor vehicle, tractor, skidder, scraper, etc.	Shovel, axe, 4BC fire extinguisher or larger.
Portable power tools (including chain saw, tamper etc.)	Shovel and approved fire extinguisher.
Cable block	Shovel and 5-gallon backpack pump or 4A fire extinguisher.
Yarder, loader, crane, service truck, etc.	4 ABC fire extinguisher or larger
Helicopter refueling area.	20 ABC fire extinguisher or larger
Choker setter.	Shovel.
USFS ONLY - Mechanized-harvesting equipment with hydraulic systems powered by internal combustion engines (chipper, feller/buncher, harvester, forwarder, etc.), except tractors and skidders.	**USFS ONLY** - At least two 10 lb. 4A/60 B:C fire extinguishers or equivalent. Concentrations of wood dust shall be removed daily from equipment.

10. CONSTRUCTION AND SURFACE MINING

Construction and surface mining are treated together. Each has certain operations and equipment unique to itself. Likewise, they generally involve similar operations (e.g., earth moving, drilling, and blasting) and equipment (e.g., bulldozers, loaders, and air compressors). Construction includes building dams, highways, railroads, pipelines, powerlines, etc., as well as grading for real estate developments, realigning or widening highways, etc. Surface mining includes rock and stone quarries, sand and gravel pits, cement quarries as well as mines for specific ores such as iron, coal, borax, diatomaceous earth, etc.

The time of greatest fire danger in any of these activities occurs during the pioneering or right-of-way clearing phase. At this time, people and machines are working in and among vegetative fuels which are highly flammable during a major portion of the year.

Later, as earth is moved much of the operation takes place on bare mineral soil or rock. However, fire prevention activities and fire suppression readiness cannot be ignored. There is always a fringe or border zone where vegetation meets the working area, and there are always access routes. The latter are particularly important since a major portion of wildland fires associated with construction and mining start along such access routes from motor vehicles and/or their operators.

10.1 Earth Moving Equipment

- ***PRC §4428 (Fire tools required)***
- ***PRC §4442 (Spark arresters required)***

Earth moving equipment (e.g., bulldozers, scrapers, end loaders, and trenchers) comprises the majority of construction and surface mining equipment. It is the bulk of the fire risk in these activities.

This section applies equally, however, to all other mobile equipment used in these industries (e.g., pavement spreaders and rollers, forklifts, sidebooms, and compactors). These types of equipment are powered by internal combustion engines and therefore required to be fitted with a properly functioning spark arrester when operating on forest, brush or grass-covered land.

“Operating on” has been interpreted as meaning either actually on and over these vegetative fuels or in proximity thereof. Nearly anywhere on a highway, powerline or pipeline right-of-way would be included, as would all areas within 50 to 100 feet inside the perimeter of open pit mines, quarries, dam site clearings, or anywhere outside such perimeters.

A “properly functioning spark arrester” normally includes a turbocharger, providing none of the exhaust gases are allowed to bypass the impeller blades. If the arrester is of the common retention type, it is “properly functioning” only if the carbon trap is empty enough to actually retain carbon particles. The frequency of cleaning the trap to meet this standard will vary with type and condition of engines, and type and amount of use. Generally, however, spark arrester traps should be emptied no less often than once a week. A well-tuned engine operating continuously at, or near, full power will usually produce the fewest exhaust carbon particles. An engine that is in poor condition, and is allowed to idle for an appreciable time will, when revved up, produces large quantities of carbon particles. Most equipment is operated and maintained somewhere between these two extremes.

Photograph 10-1.
Spark Arrester on Bulldozer

The escape of carbon particles out the top of the stack is the most frequent source of wildland fire from the use of these machines. Other parts of the exhaust system can, and sometimes do, provide ignition sources. These primarily include leaks and accumulations of flammable debris. During any routine maintenance, the entire exhaust system, from manifold to end of stack, should be inspected for cracks, burned out holes, missing bolts, broken gaskets, etc., and for accumulations of debris. Appropriate corrections must be made. A leaking exhaust system is in violation of spark arrester laws and regulations.

Other sources of ignition from these machines include sparks from blades or tracks scraping against rocks, overheated brakes on wheeled equipment, friction from worn or unaligned belts and drive chains, and burned out bearings or bushings. The first of these is difficult to prevent. Operators should be aware that sparks can, and do, fly from rock/metal contact. They should be prepared and equipped to take immediate suppression action. The other hazards result primarily from inadequate maintenance. The prevention indicated is obvious.

A common fuel bed, which presents a fire hazard to both the machine and the surrounding vegetation, is accumulated debris in the belly pan. Such debris, which may include soil, is usually soaked with oil and therefore more flammable than in its natural state. It also restricts air flow around the crankcase and causes overheating of lubricating oil.

Two remedies are available: 1) screening the debris out of the engine compartment, and 2) washing or blowing the debris out during servicing and maintenance. This trash problem has been so serious in the logging industry that all major manufacturers now equip their new logging machines with screens or grates to completely enclose the engine compartment. In the interest of fire safety, all owners and operators in any type of service should have their machines similarly equipped.

Photograph 10-2.
Engine Compartment Screen

All such equipment has an electrical system, either for direct starting or for ignition on a gasoline starting motor. These electrical systems occasionally develop shorts and electric arcing which often ignites a fire. It has been suggested that all machines, both new and old, be equipped with a conveniently located master switch by which the operator can instantly open the circuit to stop any arcing. An alternative would be an automatic overload circuit breaker.

All construction equipment, whether tracked or wheeled, and whether for highway or non-highway use, should be equipped with a shovel and axe. Both should be mounted so as to be readily available to the operator in case of fire, not locked away in a compartment or trunk. The shovel should be long-handled and round-pointed. Some of the large and expensive machines may be equipped with manual/automatic fire suppression systems.

10.2 Stationary and Portable Equipment

- ***PRC §4431 (Gasoline powersaw clearance and tools required)***
- ***PRC §4442 (Spark arresters required)***
- ***36CFR §261.52 (Spark arresters required on National Forest land)***

This section covers equipment which may be mounted on wheels, tracks or skids, is usually not self-propelled, and is normally operated in a given location for an appreciable time, from a few hours to several months. Such equipment can be highly varied but is typified by: air compressors, chippers, generators, derricks or cranes (other than electric), etc. This machinery would usually be in the way if placed directly in the operating area.

As with all internal combustion engine-powered equipment, the greatest fire danger comes from the exhaust system. The problems and their solutions for this type of equipment are different than for mobile equipment. This type of equipment is often governed to run at a steady speed, but not necessarily at a

steady load. Being in a fixed location, grass can grow up under and around it. Leaves and needles can blow against it even though it may have been placed on bare ground at the outset.

Over the years, various laws, ordinances, and regulations have been adopted regarding such equipment. They require the same type of exhaust spark arresters as for mobile equipment, a clearance of all flammable materials of at least 10 feet in all directions from the machine and the provision of a shovel and a backpack pump water fire extinguisher in the immediate area. It is good firesafe practice to inspect the exhaust system on these machines periodically for leaks as discussed in "Earth Moving Equipment."

Photograph 10-3.
Clearance Around a Stationary Engine

10.3 Trenching Equipment

A modern piece of equipment being used to trench through rock is a rock saw. This piece of equipment requires a 10-foot clearance like any other grinding equipment. Due to the terrain that this equipment is used in, a 10-foot clearance is often unattainable. In this case, a water tender of 2000 gallons may be required to be on site and saturate the area prior to operating.

Photograph 10-4.
Rock Saw

10.4 Small Multi-position Engines

- ***PRC §4431 (Gasoline powersaw clearances and tools required)***
- ***PRC §4442 (Spark arrester required)***
- ***36CFR §261.52 (Spark arrester required on National Forest land)***

These engines power all types of hand-held power equipment, including chain or rotary saws, posthole diggers, weed cutters, compactors, etc. They must be equipped with spark arresters like all other internal combustion engines used on forest, brush, or grass-covered land. The retention spark arresters and turbochargers commonly used on larger engines are too bulky and heavy for these hand-held engines. Therefore, they are commonly fitted with attrition screen-type spark arresters.

If the mesh is fine enough to meet legal standards (.023 in.), screen arresters work quite well when they and the engine are new. Worn engines produce more carbon than new ones; therefore, they tend to clog the screen rather rapidly. The wire used to make the screen, though usually high carbon steel, is necessarily so fine that it will burn out under continuous heavy use. Thus, in order to avoid either excessive back pressure or the escape of carbon particles, these screen arresters require frequent inspection and servicing. They should be inspected for holes at each refueling and cleaned daily.

Probably the most hazardous time in the use of these small engines is during refueling. They are built compactly and most use gasoline for fuel. The proximity of the gas tank filler opening to the exhaust outlet and other very hot engine parts makes it easy to spill gasoline in a place where it will burst into flame. Therefore, the same laws and rules are applicable to all these machines as to chain saws discussed under “Timber Harvesting.”

Basically, these laws and rules include:

- having fire fighting equipment readily at hand,
- refueling only in an area cleared to mineral earth at least 10 feet in all directions,

- when restarting engines, move the equipment away from any fumes, turning it so the exhaust points away from the refueling location.

Photograph 10-5.
Refueling a Chainsaw

Since July 1, 1978, all the Pacific Coast states have required new multi position small engines to be equipped with exhaust systems or spark arresters which meet SAE (Society of Automotive Engineers) Standard J335 (b). Some older equipment met this standard. All operators in wildland areas should make sure all their small engines meet this standard for surface and exhaust gas temperatures, debris accumulation, durability and serviceability.

Another source of fire from these machines is the cutting edge, or other rapidly moving metal part, striking a rock and causing a spark. This has been a frequent occurrence with rotary mowers used to clear dry grass and weeds. It can happen with any of the types of machines discussed here. Whether a fire starts from this cause, from exhaust sparks or from fuel spillage during refueling, it is imperative that the operator be prepared to immediately shut down the machine and commence fighting the fire. This is why California law, and that of several other states, requires that a long-handled, round-point shovel, or a fire extinguisher be kept within 25 feet at all times during operation and refueling.

10.5 Crushers and Pavement Plants

Photograph 10-6.
Rock Crushing Operation

These plants are usually erected on large areas of bare soil, sand or rock and are thus not, in themselves, wildland fire risks. The greatest source of fire danger around the plants is people and machines that work in and around them. The most frequent location of fire starts is along the access routes. People smoke and sometimes build lunch or warming fires. Motor vehicles and other mobile equipment emit exhaust sparks, have electric shorts, develop fuel leaks, etc. Thus, even though the plants themselves are not great fire risks, their mere existence creates an increased fire risk in the area. This warrants extra fire prevention effort.

10.6 Servicing and Maintenance of Equipment

For a more complete treatment of this subject, please refer to the chapter on "Maintenance, Repair and Servicing." The most important points to remember are:

- whenever possible, bring equipment to a service area which is free of flammables;
- if the machine cannot be moved, clear all flammables to mineral soil for at least 10 feet in all directions from it;
- in any case, always have firefighting equipment available nearby (i.e., within 25 feet); and
- have spark arresters on all internal combustion engines.

10.7 Training

Construction and mining employees are less likely to have had previous training and experience in fighting wildland fire than loggers. Therefore, for their own protection, as well as their employer's, it is important they be given training in wildland fire control.

11. WELL DRILLING AND OPERATING

- ***PRC§4427 (Clearance and tools required for welding and cutting)***
- ***PRC §4442 (Using equipment without a spark arrester)***
- ***PRC §4442.5 (Spark arrester notice to buyer or lessee of necessity of use)***
- ***14CCR §918.7 (Welding and blasting watch)***
- ***CFR §261.52 (Spark arresters required on National Forest land)***

There have not been a large number of fires resulting from well drilling or operating but those that have occurred have caused considerable damage and were difficult to suppress. The greatest hazard is associated with petroleum and gas wells because of the expected presence of methane and/or hydrogen sulfide gas, both highly flammable. Other deep drilling (e.g., geothermal or water) can produce such flammable gases. For example, drillers searching for water have been known to discover natural gas fields.

The same state laws apply to drilling rigs as any other machine operated on forest-covered, brush-covered, or grass-covered land (i.e., all internal combustion engines, except muffler-equipped motive power for highway licensed vehicles, must be equipped with an effective spark arrester; in addition, all such machines operating in a fixed location must have a clearing of all flammable materials of at least 10 feet in all directions). For oil and gas drilling, this is not enough. Consequently, many local ordinances and company rules call for much more.

Among the more common requirements are water-cooled exhaust systems, explosion-proof lights, smoking prohibition, provision of fire extinguishers, additional clearance of flammables, “fire watch” during welding, and cutting or welding only under special short-term permit.

Historically, the greatest wildland fire risk associated with well drilling has been welding. If there is any possibility of the presence of methane, hydrogen sulfide, or any other flammable gas, no welding should be done within 50 feet of the well head. In any event, no welding should be done without first clearing all flammable vegetation down to mineral soil for a radius of at least 10 feet from the location where the welding is to be done. Five-gallon backpump and a shovel within 25 feet of the operation are required on site.

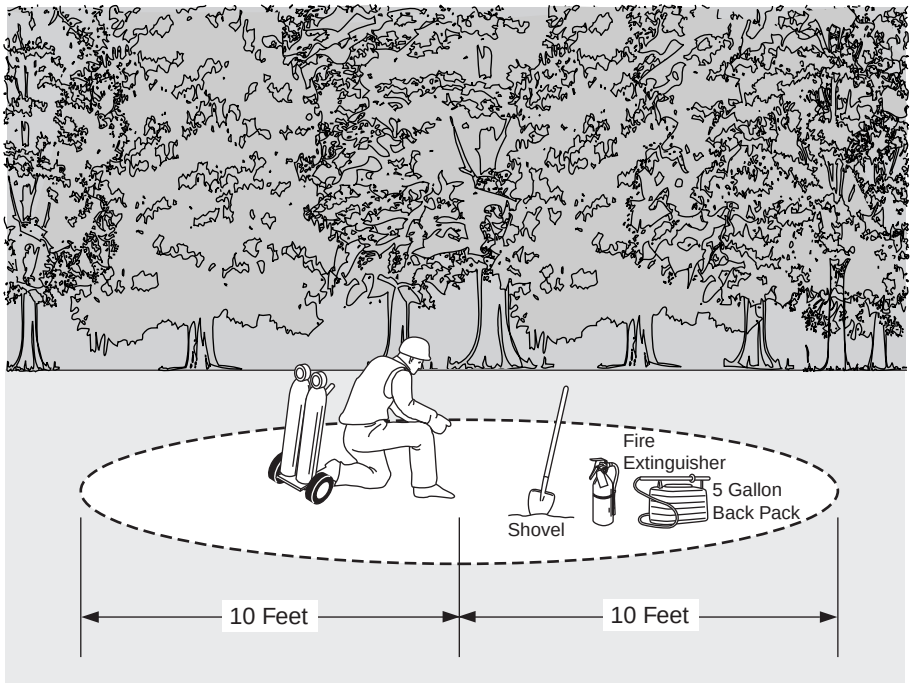


Figure 11-1.
Clearance Around Pipe Welding Operation

A fire problem associated with the operation of wells is the direct ignition of dry grass or leaves by high temperature steam lines laid on the surface of the ground. These pipes may be for recharging oil wells or for collecting geothermal steam for a power plant. Any of three solutions seem to be satisfactory: 1) to bury the pipe to insulate it, 2) to treat the soil for a foot or two on each side of it with a proper herbicide, 3) or soil sterilizer.

12. COMMERCIAL TRANSPORTATION AND STORAGE

- ***H&SC §12105 (Storage of hazardous waste)***
- ***1996 North American Emergency Response Guidebook***
- ***UFC Article 82, Section 82.105(d) and Section 82.111***

Commercial transportation, commonly by truck, is a large industry in many wildland areas. Supplies and consumer products are delivered, raw materials taken to processing plants, and finished products hauled to markets. Most of the commodities represent little or no fire hazard; some are very dangerous. The vehicles used represent one of the highest fire risks present in the wildlands (see the chapter on Motor Vehicle Operation and Maintenance). Some vehicle operators are also serious fire risks (i.e., smoking and driving habits, lack of knowledge regarding cargoes and firefighting, etc.).

Associated with much of the transportation activity are storage and distribution facilities (e.g., warehouses, bulk petroleum plants, explosives magazines, or LPG distributors). A number of products involved, and their chemical or physical properties related to fire, are unknown to local firefighters. Often bills-of-lading do not provide adequate information to either the driver or firefighters about the nature of the cargo.

The subject of hazardous materials occupies a full semester course in fire science curricula; only a few highlights can be presented here. There are three major kinds of hazards to be aware of and protected against: 1) violent rupture potential, 2) explosive, and 3) toxic. The smoke or fumes of any of these should be avoided or protected against with a self-contained breathing apparatus and/or protective clothing.

Loads containing more than 100 pounds of a hazardous material (or with some types, 1000 pounds) are required to be identified with placards. The placards are diamond-shaped and of various colors. The categories are:

- explosives
- gases (flammable and non-flammable)
- flammable liquids (and combustible liquids [US])
- flammable solids
- oxidizers and organic peroxides
- toxic (poison) materials and infectious substances
- radio-active materials
- corrosives
- miscellaneous dangerous goods

All flammable gases have violent rupture potential (VRP). Some are also toxic (e.g., carbon monoxide, hydrogen sulfide, and vinyl chloride). Flammable gases commonly transported in wildland areas include liquefied petroleum gas (LPG), propane, and vinyl chloride. Any of them will usually ignite if a rupture or serious leak in the container occurs. If not, it will form a gas cloud that is easily ignited.

The proper fire suppression technique is to stop the flow of gas by closing a valve. If this is not possible, allow the gas to completely burn while keeping the container cool with water. Tanks containing flammable gases that are exposed to intense heat are likely to rupture violently and engulf the immediate area in a large fireball. When tanks are thus exposed, consider initial downwind evacuation for at least one-half mile.

The most fire-hazardous operation with LPG is during, and immediately following, transfer from one tank to another. Transfers occur at bulk plants, both incoming and outgoing, and at points of use, residential and commercial. This operation takes place thousands of times each day because LPG is so widely used outside of metropolitan areas served by natural gas. Leaks can happen from cracked, broken or poorly connected fittings, ruptured hoses, and human error, such as failing to disconnect before driving away. Ignitions can occur from any of a number of sources, which may or may not be associated with the transfer operation itself since escaping gas will travel and often find a heat source.

Another fire hazard with LPG is the threat of overheating and rupture of containers, pipes and fittings by wildfires. All LPG containers, whether at bulk plants or at points of use, should be well protected from this danger by adequate clearance of dry grass, brush and unlimbed trees for at least 10 feet in all directions. They should also be separated from each other and from buildings depending on their size: Less than 100 gallons is five feet, 100 to 500 gallons is 10 feet, 500 to1200 gallons is twenty five feet, and over 1200 gallons is 50 feet (U.F.C. Article 82, Section 82.105 [d]).

There are three groups of explosives: primary or initiating high explosives, secondary high explosives, and low explosives. Primary or initiating high explosives are easily detonated by applying small amounts of heat, mechanical shock, or pressure. Their chief function is to initiate detonations in secondary high explosives. The major ingredients in primary explosives include but are not limited to lead azide, lead styphnate, and mercury fulminate. Electric blasting caps and detonating cord delay connectors are both examples of primary high explosives.

Secondary high explosives are much less sensitive to heat and mechanical shock, but are considerably more powerful than primary explosives. Secondary explosives are usually detonated by use of primary explosives. Products such as TNT, nitroglycerin, and dynamite are considered to be secondary high explosives and can be found in commercial blasting and military operations.

Low explosives or propellants usually operate by deflagration (rapid burning) rather than by detonation. Major propellants include such materials as solid rocket fuels, black powder, and smokeless powder. Under the proper conditions, some low explosives may detonate.

Poisons are divided into two categories, A and B. All are very toxic and many have VRP. Poisons A are gases and are extremely toxic. They must be avoided by all personnel except specialists with protective clothing and breathing apparatus. If leaking, personnel should be evacuated as far as necessary to avoid any contact. Examples of these materials include nitric oxide, parathion gas (VRP), organic phosphates and phosgene (VRP).

Poisons B are mostly liquids or solids. Continued contact, inhalation or ingestion can cause illness or death. Try to prevent spread by constructing dykes, berms or dams. Examples include cyanide (dry), parathion (liquid or dry), tetraethyl lead (VRP), and chlorine (VRP).

Figure 12-1.
Common Hazardous Materials Placards

Flammable liquids (placarded "Flammable") are all toxic and most have VRP. They give off flammable vapors when spilled which will ignite upon contact with an open flame, spark or hot surface. The vapors are usually heavier than air and will flow downhill and into depressions. Common examples are gasoline, benzene, ether, alcohol, and vinyl acetate. When containers are involved in a fire, personnel should be evacuated one-half mile. All sources of ignition (e.g., smoking, internal combustion engines, or welding) should be eliminated from the area where the vapors are expected to flow.

Nonflammable gases have VRP and many are toxic. Numerous also exclude oxygen and therefore can cause asphyxiation. Gas clouds are not always visible and some have no odor. If containers are exposed to intense heat, personnel should be evacuated for one-half mile. Examples include anhydrous ammonia, hydrogen chloride, and nitrous oxide. Chlorine is classed as both a Poison and Nonflammable Gas and is both toxic and VRP.

Flammable solids can cause fires by self-ignition or spontaneous combustion if exposed to proper conditions (e.g., getting wet, being crushed, and contact with corrosives). Some have VRP. The most dangerous to firefighters are those bearing a white crossed-out W on a blue triangle in the upper portion of the placard. This symbol means "dangerous when wet." Avoid use of water in fire suppression operations near these materials. Examples include calcium carbide, magnesium, potassium, and sodium.

Oxidizers release oxygen when heated and thus greatly stimulate combustion of other fuels. All have VRP. Some, if mixed with petroleum products, become explosive (e.g., ammonium nitrate). If these materials become involved in fires, personnel should be evacuated for one-half mile. Examples include hydrogen peroxide, calcium chlorate, potassium perchlorate, and urea peroxide.

Corrosives are all toxic. Contact with any of them can cause serious eye, skin or respiratory injury. Their fumes are usually just as toxic as the liquid and must be avoided by unprotected personnel. Since mixing with other chemicals can cause fire or explosion, spills should be contained as quickly as possible. Examples include hydrochloric acid, sulfuric acid, and caustic soda.

Combustible liquids (placarded "Combustible") which have a flash point greater than 60.5º C (141º F) and below 93º C. (200º F) can burn when heated. If spilled they will extend and complicate an existing fire (e.g., truck wreck). Examples include diesel fuel, anti-freeze compound, and cut-back asphalt.

Radioactive materials are all toxic. If a spill occurs, personnel should be evacuated for at least 330 feet and, in the case of a fire, for at least 1000 feet. All personnel should be evacuated for one-quarter mile until the area is monitored and declared safe by specialists. If smoke clouds drift, personnel should be kept well clear of the smoke.

All firefighters and anyone involved in transporting any of these hazardous materials should learn all they can about said materials and keep themselves continuously updated. New materials are constantly being developed for agriculture and industry, many of which are hazardous in one way or another. Some, although common, present hazards in unusual ways that are known to only a few.

One of these is chloral hydrate, which is used in large quantities by paper mills. It is usually transported as a liquid, which is relatively inert, though toxic. However, when it is spilled, as in a wreck, it dries into a crystalline form which is extremely flammable when exposed to abrasion. The clothing of firefighters and plant workers has been known to burst into flame by the simple act of walking after having chloral hydrate spilled on it and then drying out. Leather-soled shoes have produced similar results. Emergency information concerning specific materials can be obtained by telephoning Chemtrec (800) 424-9300.

13. PRODUCT PROCESSING AND HANDLING

Most industrial operations in the wildlands, other than construction, produce some product, which requires processing, storage and handling. These operations not only create some fire risks themselves, but often produce conditions which make fire suppression difficult. Since, historically, the greatest fire problems in this category have been related to forest products, the bulk of this chapter is devoted to them, with minor sections on other products.

13.1 Sawmills

This general heading includes all types of timber processing plants except paper or particleboard plants which use chips or other preprocessed raw materials: permanent sawmills, portable sawmills, veneer plants, shingle mills, re-manufacturing plants, molding mills, planing mills, etc. Since the waste products in these mills are small cellulosic materials (e.g., sawdust, shavings, trimmings, edgings) and often very dry, they are highly flammable. Thus, effective fire prevention and suppression measures are a must to protect the large investment involved. This is particularly true when fire-killed or insect-killed salvage lumber is being processed.

Cleanliness is the most important fire prevention measure for sawmills. Most mills have conveyor and vacuum systems to remove waste materials, but they are never 100 percent effective. This is particularly true of conveyors, which have a tendency to jam and overflow. Regular daily sweeping and hand pick-up are required to avoid accumulations of waste in dangerous places.

Smoking is prohibited in most sawmills. This is a valuable rule which should be enforced in all mills on visitors as well as employees. Since the former are more difficult to control than the latter, their access should be restricted to areas where fire hazards are minimal.

Mills and yards should be laid out with adequate clearances provided for fire equipment to work. Their designs should incorporate enough space to avoid ignition caused by radiated heat of one building, lumber stack or log deck from another, or from a surrounding forest. California law requires a 30-foot clearance of flammable vegetation. The National Fire Protection Association (NFPA) recommends 100 feet from vegetation and a minimum of 30 feet between buildings, piles, and decks.

Most modern mills are equipped with automatic fire sprinklers, fire standpipes and hydrants, hose and nozzles, fire extinguishers, etc. All mills should have these protection devices. Also, it is important that all employees, including new ones, be trained in their use and in the fire defense roles which may be assigned to them. Formation of a company fire brigade handles this training most effectively.

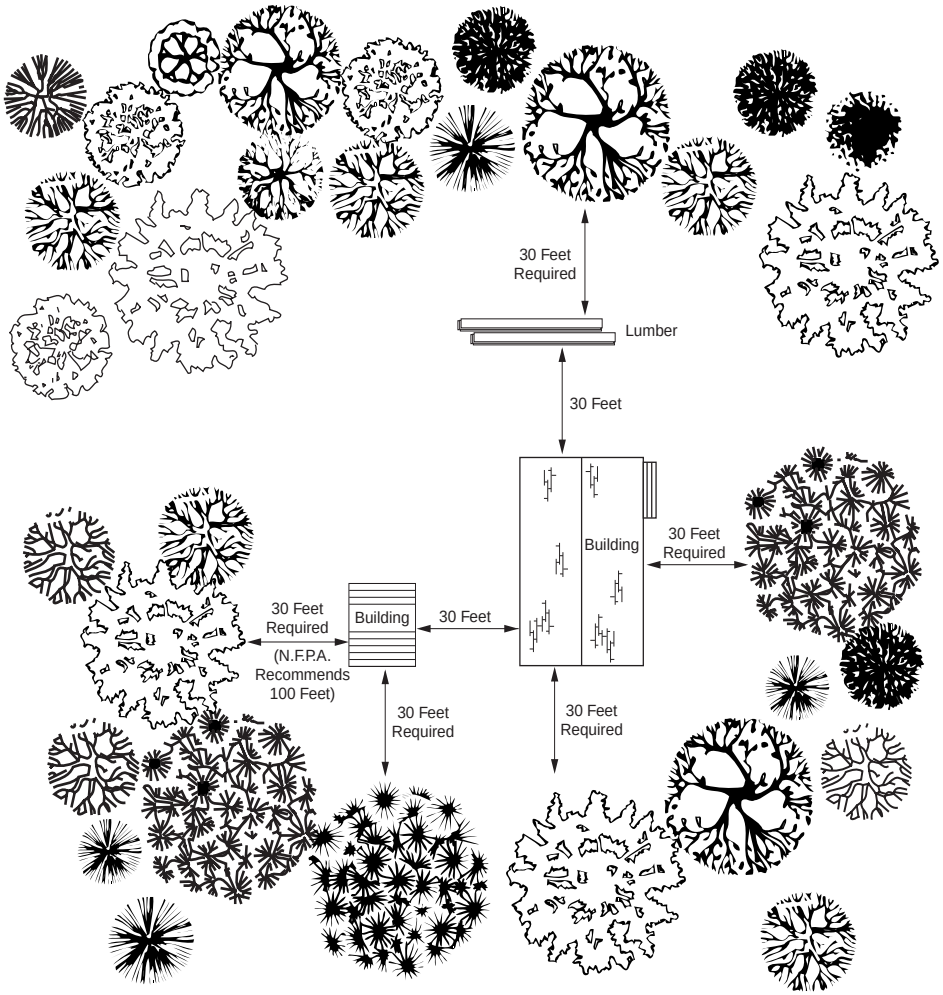


Figure 13-1.
Proper Separation of Buildings

In addition to the built-in fire protection previously discussed, a mill is required in California to have a box or cache of wildland firefighting tools sufficient to equip 50% of the employees. Employees also require training in the effective use of these tools. The types and minimum amounts of tools are set forth in Public Resources Code (PRC) Section 4429.

Since the conversion or replacement of most steam-powered sawmills to electric power, vast quantities of waste material have required disposal. For many years this was done primarily by burning either in open pits or in teepee burners. This was a highly hazardous practice which caused so many fires that special fire laws were passed to regulate it.

In California, these laws are contained in PRC Sections 4437-41. The restrictions were later tightened under air pollution control laws and regulations causing some operators to resort to landfills. In this activity, both water pollution and spontaneous combustion problems were encountered. Much of the waste is now processed into byproducts (e.g., paper chips, synthetic fireplace logs, and briquettes) and some is used as direct boiler fuel on the mill site, often for co-generation of electric power.

Portable sawmills present special fire problems in addition to any discussed above. By their very nature, they do not have the financial resources of large permanent mills. Therefore, they seldom have any built-in fire protection systems and cannot afford a legal waste burner. They rarely have any byproduct processing ability and thus create a much higher proportion of flammable waste than do permanent mills.

An internal combustion engine, either in direct drive or as a motor-generator set, powers most portable mills. These engines are normally located at the mill site where their exhaust systems and the prevalent sawdust create a potentially explosive mixture. All told, such mills are a serious fire hazard, both to themselves and to the surrounding country.

As a minimum, they should be surrounded by a 30-foot wide firebreak. They should be kept as clean as possible while operating and the waste pile should be removed or burned during the following winter.

13.2 Portable Processing Equipment

In the world of timber harvesting, methods of operation are rapidly changing. More and more portable processing equipment is being used to process the forest products at the site where obtained. This has created new fire risks and created problems which have no law to define the handling of such risk.

One example is the process of chipping the material at the location obtained. If the operation is to chip for pulp, large piles of by-product will be generated. These piles have been left behind for other processors to come in and further chip the remains for hog fuel. Some piles exceed ten feet in height and 100 feet in length and can ignite through spontaneous combustion.

The Oregon Department of Forestry has completed a study on this process. The Public Resources Code addresses fire prevention measures for mill wood waste. However, the piles left over in the woods are still a wood byproduct which the laws do not cover. (See Appendix F)

Photograph 13-2.
Chipper

13.3 Log Decks

- ***UFC Article 30 Section 3005.2 (Log storage areas)***
- ***NFPA 46 - Recommended safe practice for storage of forest products 1996 edition, chapter 7 outside storage of logs, 7-1 application, 7-2 general, 7-3 basic log yard protection and 7-4 special yard log protection***

Log decks are to be found in three places: landings, transfer points, and mill yards. Decks on landings are relatively small, continually rotated and have equipment immediately available to break them up in case of fire. They therefore pose only a minor fire problem.

Log decks at transfer points and in mill yards commonly contain several million board feet and may not be moved for months at a time. Unless special measures are taken they present a very serious fire problem. The most basic precaution is to keep the piles small enough and with enough separation that in case one does catch on fire the fire can be confined to that pile and not consume the entire yard. According to National Fire Protection Association (NFPA) Pamphlet 46 (1996) individual piles should never exceed 300 feet in width, 20 feet in height and 500 feet in length.

Photograph 13-3.
Proper Log Deck Separation

Wherever an adequate water supply is available log decks should be kept continuously wet. The moisture not only promotes fire protection but retards blue stain and other deterioration and down-grading. If the sprinkler system is properly designed with adequate drainage back into a sump for recirculation, the amount of water needed is greatly reduced. Still some loss to evaporation must be expected.

Photograph 13-4.
Sprinklered Log Deck

Another fire safety measure for log decks is the provision of fire mains, hydrants, hose and nozzles. The initial investment for this is very high and can usually only be justified in mill yards. For basic fire protection, a hydrant system should be capable of supplying at least 4-2½ inch hose streams simultaneously 1000 GPM minimum while maintaining a positive residual pressure in the fire protection hydrant system. Where large-scale firefighting operations may be expected, larger water supplies with adequate mains are needed.

13.4 Outside Storage of Wood Chips and Hog Material

- ***UFC Article 30 Section 3006.2 (Size of piles)***
- ***NFPA 46-Recommended safe practice for storage of forest products 1996 edition, chapter 6 outside storage of wood chips and hog material, 6-1 application, 6-2 general, 6-3 pile protection***

This subject is well covered in NFPA pamphlet 46 (1996). It is recommended that anyone involved in operating or protecting such facilities become thoroughly acquainted with that publication. A few items not covered in NFPA pamphlet 46 will be discussed here.

The practices recommended in NFPA pamphlet 46 for chips generally apply to sawdust as well. Some differences, however, apply to stored bark chips. Bark chips, once piled, have a tendency to lock in place. They do not flow into conveyors as easily as paper chips or sawdust. Therefore, the common method of moving them out of storage is with end loaders.

In the scooping operation of the loaders, a vertical or sometimes overhanging wall of chips often results. Oxygen can then get into the top center of the pile and spontaneously ignite the sawdust. The best protection against this phenomenon is to keep the vertical or overhanging wall from forming by continually pushing bark from the top of the pile down to the scooping area with a bulldozer or similar machine.

Photograph 13-5.
Sawdust Pile with Conveyor System

Not enough emphasis can be placed on close working relationships between the operator of any chip, sawdust, or bark storage facility and the public fire protection agency in the area. Fires in such piles are extremely expensive to extinguish and result in high product loss. If fires escape additional liability is incurred. It is always cheaper to prevent the fires than to experience them. However, once a fire exists, quick suppression, while the fire is still very small, is the cheapest method. The local fire chief, ranger, or fire marshal can help with either of these goals.

13.5 Ore and Aggregate Plants

The products of ore and aggregate plants are generally nonflammable. Therefore, the fire problems involved relate mostly to the structure and machinery. Basically they are no different from those of any other industrial plant. An exception, however, is they are often in isolated or remote locations where public fire suppression forces are unavailable or not suited to structural protection. A good built-in fire protection system and a company fire brigade, therefore, become very important. Assistance in these matters can be obtained from local fire authorities, insurance companies, and consulting fire protection engineers.

13.6 Oil and Gas

Almost all processing and storage of petroleum and natural gas is done at locations remote from the producing wells and usually outside of forest and watershed areas. Storage and transportation of consumer products is discussed in the chapter on “Commercial Transportation.” Fire safety in pumping plants is so critical to personnel and capital safety that it is adequately provided for in governmental regulations, insurance company requirements, and operating company rules. Thus, the fire threat to wildlands is minimal.

13.7 Electrical Power Use

Most modern industrial plants, wherever located, are powered by electricity. Many of these plants now generate their own electricity either through burning of wood products producing steam to turn the generators or through the use of natural gas.

The most concern to wildland fire prevention is large stockpiles of chips for the wood fueled generation plants. This type of operation has almost totally eliminated the large wood waste piles at the sawmills which constantly were catching fire and posing fire control problems. Often these piles once on fire, continued to burn for years, even though fire control efforts were constantly being applied. Although the wood chips used at the co-generation plants are susceptible to fires caused by spontaneous combustion or other outside ignition sources, once the fire is discovered, after containment, the chips can be burned through the generating process, thus giving full extinguishment of the fires.

When a co-generation plant is to be established, consideration should be given to requiring that all chips be burned through the generation process at a minimum of every six months.

14. FILM INDUSTRY

- ***"Filming in California" - a Fire Protection Handbook, Published by the California State Fire Marshal Film Industry Unit***
- ***PRC§ 4255 (Smoking and fires in area, prohibition, camping)***
- ***PRC§ 4331 (Smoking or building fires upon National Forest Lands)***
- ***PRC§ 4427 (Use of machinery in area where burning permits are required, required clearing and fire tools)***
- ***PRC§ 4431 (Gasoline power saws etc., firefighting equipment)***
- ***PRC§ 4442 (Spark Arresters required)***
- ***PRC§ 4433 (Campfire Permit Required)***
- ***PRC§ 4442.5 (Spark Arresters or Fire Prevention measures; Notice to buyer or lessee of necessity of use)***
- ***PRC§ 4443 (Portable power saws, etc., regulations for use)***
- ***36CFR §261.5(a)-(f) (Causing a fire, firing tracer bullets, causing timber or slash to burn, leaving a fire, allowing a fire to escape, building a fire without clearances)***
- ***CCR Title 19 (Fireworks in California)***

California's film industry generates billions of dollars in revenues to the state, furnishes countless jobs, and many times requests to work on the state's wildlands. Thus, it is imperative that fire prevention personnel be familiar with the intricacies of this business.

First it must be recognized what specific types of filming activities are to occur and in particular, when a production company is preparing for action-type sequences. Once the activity is outlined, specifically the who, what, when, where and how aspects of filming, it must be determined whether or not the proposed filming activity is safe and can be approved.

It is important to know who to contact on the set as well as who is responsible for obtaining filming or special use permits. Common production will be; feature, television, commercial, documentary, student film, or still photography. Each may have differing fire safety needs. Once the type of filming is known the following should be determined:

- How much and what type of equipment will be brought to the filming location?
- Is any set construction required?
- How long will the company be filming? (hours, days, or weeks)
- What is the size of the cast?
- What type of parking do they require?
- Are they using flammable liquids, gases or pyrotechnic special effects?
- Are they using aircraft?
- What type of stunt sequences are planned?
- What type of gasoline or diesel operated equipment will be used?

It is important to know who some of the key people on the set are and what they do.

FILMING STAFF

Director: Has ultimate control of the set.
First Assistant Director: In charge of the set and everything that happens on it. This person is the most important contact on the day of filming.
Location Manager: Responsible for all location details and liaison with governmental agencies (film permit office, police, fire, park rangers, lifeguards, etc.).
Special Effects Coordinator: Required to have permits issued by the fire agency having jurisdiction whenever pyrotechnic special effects are to be used.

During agency review of a proposed activity by a film production company, the following guidelines and sequence of events should occur.

- Fire Agency and film production company representatives should discuss the proposed activity (pre-production construction, special effects or other fire/life safety hazards, dates, and times).
- A film production liaison should be named to the fire agency; i.e. location manager or unit production manager.
- Appropriate agencies issue special use permits, permits for special effects, welding/cutting permits, and check spark arresters.
- Determine if periodic site inspection will suffice or if a fire prevention person is needed to stand by.
- Make an inspection on the day prior to production and pass pertinent information on to new inspectors.
- Production company should be in compliance of all fire safety requirements prior to agency personnel arriving on the first day of filming.
- If a stand-by fire prevention person is assigned to the set, then an on-site inspection should be done.

If the film production company has changes after the agreed upon fire-safety requirements are set, the company is obligated to notify the fire agency. The fire agency in turn should advise the company that additional inspections may be made.

14.1 Special Use

On national forests, special use permit inspections are an essential part of the fire prevention program. These operations range from powerlines, road maintenance, resorts, summer homes, special events, and filmmaking and may include equipment requiring both single or multiple-position spark arresters. Most special use permits, if structures are present, will have fire plans much like the typical industrial operations. All inspections should be documented and the violations corrected.

Appendix A

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Appendix B

STATUTES AND REGULATIONS

This appendix has been designed to present only those laws and regulations, or portions thereof, which pertain more or less directly to wildland fire prevention on industrial operations. As such, this appendix should only be used as a quick field reference. For full and current text, meaning and proper context of laws and regulations reference should be made to the applicable codes, manuals, directives, etc.

I. FEDERAL LAWS

TITLE 18 UNITED STATES CODE (18USC)

Section 1855 - Timber set afire.

Whoever, willfully and without authority, sets on fire any timber, underbrush, or grass or other inflammable material upon the public domain or upon any lands owned or leased by or under the partial, concurrent, or exclusive jurisdiction of the United States, or under contract for purchase or for the acquisition of which condemnation proceedings have been instituted, or upon any Indian reservation or lands belonging to or occupied by any tribe or group of Indians under authority of the United States, or upon any Indian allotment while the title to the same shall be held in trust by the Government, or while the same shall remain inalienable by the allottee without the consent of the United States, shall be fined under this title or imprisoned not more than five years, or both. This section shall not apply in the case of a fire set by an allottee in the reasonable exercise of his proprietary rights in the allotment.

Section 1865 - Fires left unattended and unextinguished.

Whoever, having kindled or caused to be kindled, a fire in or near any forest, timber, or other inflammable material upon any lands owned, controlled or leased by, or under the partial, concurrent, or exclusive jurisdiction of the United States, including lands under contract for purchase or for the acquisition of which condemnation proceedings have been instituted, and including any Indian reservation or lands belonging to or occupied by any tribe or group of Indians under the authority of the United States, or any Indian allotment while the title to the same is held in trust by the United States, or while the same shall remain inalienable by the allottee without the consent of the United States, leaves said fire without totally extinguishing the same, or permits or suffers said fire to burn or spread beyond his control, or leaves or suffers said fire to burn unattended, shall be fined under this title or imprisoned not more than six months, or both.

II. FEDERAL REGULATIONS

A. U. S. FOREST SERVICE TITLE 36 CODE OF FEDERAL REGULATIONS (36 CFR)

Section 261.1 - Scope.

(a) The prohibitions in this part apply, except as otherwise provided, when:
  (1) An act or omission occurs in the National Forest System or on a Forest development road or trail.
  (2) An act or omission affects, threatens, or endangers property of the United States administered by the Forest Service.

(3) An act or omission affects, threatens, or endangers a person using, or engaged in the protection, improvement or administration of the National Forest System or a Forest development road or trail.

(4) An act or omission occurs within the designated boundaries of a component of the National Wild and Scenic Rivers System.

(b) Nothing in this part shall preclude activities as authorized by the Wilderness Act of 1964 or the U.S. Mining Laws Act of 1872 as amended.

Section 261.2 - Definitions.

The following definitions apply to this part: [partial listing] “Campfire” means a fire, not within any building, mobile home or living accommodation mounted on a motor vehicle, which is used for cooking, personal warmth, lighting, ceremonial, or esthetic purposes. “Fire” includes campfire.

“Forest officer” means an employee of the Forest Service. “National Forest System” includes all national forest lands and waters reserved or withdrawn from the public domain of the United States, national forest lands and waters acquired through purchase exchange, donation, or other means, national grasslands and land utilization projects and waters administered under Title III of the Bankhead-Jones Farm Tenant Act (50 stat. 525, 7 U.S.C. 1010-1012), and other lands, waters, or interests therein acquired under the Wild and Scenic River Act (16 U.S.C. 1271-1287) or National Trails System Act (16 U.S.C. 1241-1249).

“Permit” means authorization in writing by a forest officer.

“State” means any State, the Commonwealth of Puerto Rico, and the District of Columbia.

“State law” means the law of any State in whose exterior boundaries an act or omission occurs regardless of whether State law is otherwise applicable.

“Stove fire” means a campfire built inside an enclosed stove or grill, a portable brazier, or a pressurized liquid or gas stove, including a space-heating device.

Section 261.5 - Fire.

The following are prohibited:

(a) Carelessly or negligently throwing or placing any ignited substance or other substance that may cause a fire.

(b) Firing any tracer bullet or incendiary ammunition.

(c) Causing timber, trees, slash, brush or grass to burn except as authorized by permit.

(d) Leaving a fire without completely extinguishing it.

(e) Allowing a fire to escape from control.

(f) Building, attending, maintaining, or using a campfire without removing all flammable material from around the campfire adequate to prevent its escape.

Section 261.50 - Orders.

(a) The Chief, each Regional Forester, each Experiment Station Director, the Administrator of the Lake Tahoe Basin Management Unit and each Forest Supervisor may issue orders which close or restrict the use of described areas within the area over which he has jurisdiction. An order may close an area to entry or may restrict the use of an area by applying any or all of the prohibitions authorized in this subpart or any portion thereof.

(b) ...

Section 261.52 - Fire.

When provided by an order, the following are prohibited:

(a) Building, maintaining, attending or using a fire, campfire, or stove fire.
(b) Using an explosive.
(c) Smoking.
(d) Smoking, except within an enclosed vehicle or building, a developed recreation site, or while stopped in an area at least three feet in diameter that is barren or cleared of all flammable material.
(e) Going into or being upon an area.
(f) Possessing, discharging or using any kind of firework or other pyrotechnic device.
(g) Entering an area without any firefighting tool prescribed by the order.
(h) Operating an internal combustion engine except on a road.
(i) Welding, or operating an acetylene or other torch with open flame.
(j) Operating or using any internal or external combustion engine without a spark arresting device properly installed, maintained and in effective working order, meeting either:
  (1) Department of Agriculture, Forest Service Standard 5100-la; or
  (2) the appropriate Society of Automotive Engineers (SAE) recommended practice J335(b) and J350(a).
(k) Violating any state law specified in the order concerning burning, fires or which is for the purpose of preventing, or restricting the spread of fires.

Note: By authority of this regulation, several California statutes have been adopted as Federal Regulations on National Forest land. See below.

Order No. 91-1.

Fire Restrictions-Pacific Southwest Region

Pursuant to 36 CFR 261.50 (a) and (b), each of the following is prohibited on lands, Forest Development Roads or Trails under my jurisdiction:

1. Building, maintaining, attending or using a fire, campfire or stove fire in any area outside a developed recreation site. 36 CFR 261.52(a).
   (a) In Zone A as defined in California Public Resources Code 4413.
   (b) In Zone B as defined in California Public Resources Code 4413, from May 1 until the date the hazardous fire conditions have been proclaimed abated for the year.
2. Using an explosive. 36 CFR 261.52(b)
3. Smoking, except within an enclosed vehicle or building, a developed recreation site, a designated smoking area, or while stopped in an area at least three feet in diameter that is barren or cleared of all flammable material. 36 CFR 261.52(d).
   (a) In Zone A as defined in California Public Resources Code 4413.
   (b) In Zone B as defined in California Public Resources Code 4413, from May 1 until the date the hazardous fire conditions have been proclaimed abated for the year.
4. Possessing, discharging or using any kind of firework or other pyrotechnic device. 36 CFR 261.52(f).
5. Welding or operating any acetylene or other torch with open flame. 36 CFR 261.52(i).
   (a) In Zone A as defined in California Public Resources Code 4413.
   (b) In Zone B as defined in California Public Resources Code 4413, from May 1 until the date that the hazardous fire conditions have been proclaimed abated for the year.
6. Operating or using any internal or external combustion engine on any timber, without a spark

arresting device properly installed, maintained and in effective working order meeting either:

(1) Department of Agriculture, Forest Service Standard 5100-la; or

(2) appropriate Society of Automotive Engineers (SAE) Recommended Practice J335(b) and J350(a). Motor trucks, truck tractors, buses and passenger vehicles, except motorcycles, are not subject to the provisions if the exhaust system is equipped with a muffler as defined in the California Vehicle Code. 36 CFR 261.52(j).

7. Violating any of the following California State Forest and Fire Laws on National Forest Boundary, or adjacent thereto, when such act or omission affects, threatens, or endangers property of the United States administered by the Forest Service. 36 CFR 261.52(k). Public Resources Code:

* 4291 - Reduction of Fire Hazards Around Buildings
* 4292 - Powerline Hazard Reduction
* 4293 - Powerline Clearance Required
* 4296.5 - Railroad Rights-of-way Clearance
* 4373 - Minimum Requirements for Rubbish Dumps (under permit)
* 4374 - Minimum Requirements for Rubbish Dumps
* 4423 - Written Permit Required for Burning
* 4427 - Clearance and Tools Required
* 4428 - Firefighting Tools Required on Industrial Operations
* 4429 - Industrial Camp Tool Cache
* 4430 - Steam-operated Engine Equipment Requirements
* 4431 - Gasoline Power Saw - Clearance and Equipment Required
* 4438 - Forest Product Waste Disposal (enclosed)
* 4439 - Forest Product Waste Disposal (open)
* 4440 - Forest Product Waste Storage
* 4446 - Incinerator Standards

Pursuant to 36 CFR 261.50(e), each of the following are exempt from this Order:

a. Persons with a permit specifically authorizing the otherwise prohibited act or omission.

b. Any Federal, State, or local officer, or member of an organized rescue or fire fighting force in the performance of an official duty.

This order supersedes Order 83-2, issued August 16, 1983. These Prohibitions are in addition to the General Publications in 36 CFR Part 261. This Order may be made more restrictive by temporary orders issued by the Regional Forester or a Forest Supervisor during periods of fire danger.

Executed in San Francisco, California this 24th day of July 1991.

/s/ Laurence Bembry
for Ronald E. Stewart
Regional Forester
Pacific Southwest Region

Violation of these prohibitions is punishable by a fine of not more than $5,000.00 for an individual, or $10,000.00 for an organization, or imprisonment for not more than six months or both. See Title 18, U.S. Code Section 3571.

B. U.S. BUREAU OF LAND MANAGEMENT TITLE 43 CODE OF FEDERAL REGULATIONS (43 CFR)

Section 2801.1-5 - Terms and conditions.

An applicant, by accepting a right-of-way, agrees and consents to comply with and be bound by the following terms and conditions, excepting those which the Secretary may waive in a particular case:

(a) To comply with State and Federal laws applicable to the project for which the right-of-way is approved, and to the lands which are included in the right-of-way, and lawful existing regulations thereunder.

(b) To clear and keep clear the lands within the right-of-way to the extent and in the manner directed by the superintendent in charge; and to dispose of all vegetative and other material cut, uprooted, or otherwise accumulated during the construction and maintenance of the project in such manner as to decrease the fire hazard and also in accordance with such instructions as the superintendent in charge may specify.

(c) ...

(d) To do everything reasonably within his power, both independently and on request of any duly authorized representative of the United States, to prevent and suppress fires on or near the lands to be occupied under the right-of-way, including making available such construction and maintenance forces as may be reasonably obtainable for the suppression of such fires.

(e) ...

Section 6010.4 - Closure of lands.

In the management of lands to protect the public and assure proper resource utilization, conservation, and protection, public use and travel may be temporarily restricted. For instance, areas may be closed during periods of high fire danger or unsafe conditions, or where use will interfere with or delay mineral development, timber, and livestock operations, or other authorized use of lands. Areas may also be closed temporarily to:

(a) Protect the public health and safety.

(b) Prevent excessive erosion.

(c) Prevent unnecessary destruction of plant life and wildlife habitat.

(d) Protect the natural environment.

(e) Preserve areas having cultural or historical value.

(f) Protect scientific studies.

Section 6010.5 - State and local laws.

Except as otherwise provided by law, State and local laws and ordinances shall apply. This refers, but is not limited, to laws and ordinances governing:

(a) Operation and use of motor vehicles, aircraft, and boats.

(b) Hunting and fishing.

(c) Use of firearms.

(d) Injury to persons or destruction of property.
(e) Air and water pollution.
(f) Littering.
(g) Sanitation.
(h) Use of fire.

Section 6010.6 - Criminal penalties.

Any person who knowingly and willfully violates any rule of conduct described in 60102 or violates any closure order issued under 6010.4 shall be fined not more than $1,000 or imprisoned not more than 12 months, or both.

Section 8363.4 - State and local laws.

Except as otherwise provided by law, State and local laws and ordinances shall apply. This refers, but is not limited, to laws and ordinances governing:

(a) Operation and use of motor vehicles, aircraft, and boats.
(b) Hunting and fishing.
(c) Use of firearms.
(d) Injury to persons or destruction of property.
(e) Air and water pollution.
(f) Littering.
(g) Sanitation.
(h) Use of fire.

Section 8364.1 - Closure of lands.

In the management of land to protect the public and assure proper resource utilization, conservation, and protection, public use and travel may be temporarily restricted. For instance, areas may be closed during periods of high fire danger or unsafe conditions, or where use will interfere with or delay mineral development, timber, and livestock operations, or other authorized use of the lands. Areas may also be closed temporarily to:

(a) Protect the public health and safety.
(b) Prevent excessive erosion.
(c) Prevent unnecessary destruction of plant life and wildlife habitat.
(d) Protect the natural environment.
(e) Preserve areas having cultural or historical value.
(f) Protect scientific studies, or preserve scientific values.

C. FEDERAL OSHA (29 CFR)

Subpart U. Section 1926.900 - Blasting and the use of explosives.

General provisions.

(a) The employer shall permit only authorized and qualified persons to handle and use explosives.
(b) Smoking, firearms, matches, open flame lamps, and other fires, flame or heat producing devices and sparks shall be prohibited in or near explosive magazines or while explosives are being handled, transported or used.
(c) No person shall be allowed to handle or use explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs.

(d) All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine, unavailable to persons not authorized to handle them. The employer shall maintain an inventory and use record of all explosives. Appropriate authorities shall be notified of any loss, theft, or unauthorized entry into a magazine.

(e) No explosives or blasting agents shall be abandoned.

(f) No fire shall be fought where the fire is in imminent danger of contact with explosives. All employees shall be removed to a safe area and the fire area guarded against intruders.

(g) Original containers, or Class II magazines, shall be used for taking detonators and other explosives from storage magazines to the blasting area.

(h) When blasting is done in congested areas or in proximity to a structure, railway, or highway, or any other installation that may be damaged, the blaster shall take special precautions in the loading, delaying, initiation, and confinement of each blast with mats or other methods so as to control the throw of fragments, and thus prevent bodily injury to employees.

(i) Employees authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution including, but not limited to, visual and audible warning signals, flags, or barricades, to ensure employee safety.

(j) Insofar as possible, blasting operations above ground shall be conducted between sunup and sundown.

(k) Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lightning, adjacent powerlines, dust storms, or other sources of extraneous electricity. These precautions shall include:

(1) Detonators shall be short-circuited in holes which have been primed and shunted until wired into the blasting circuit.

(2) The suspension of all blasting operations and removal of persons from the blasting area during the approach and progress of an electric storm;

(3) (i) The prominent display of adequate signs, warning against the use of mobile radio transmitters, on all roads within 1,000 feet of blasting operations. Whenever adherence to the 1,000-foot distance would create an operational handicap, a competent person shall be consulted to evaluate the particular situation, and alternative provisions may be made which are adequately designed to prevent any premature firing of electric blasting caps. A description of any such alternatives shall be reduced to writing and shall be certified as meeting the purposes of this subdivision by the competent person consulted. The description shall be maintained at the construction site during the duration of the work, and shall be available for inspection by representatives of the Secretary of Labor.

(ii) Specimens of signs which wouldmeet the requirements of paragraph (k)(3) of this section are the following: [GRAPHIC OMITTED]

(4) Ensuring that mobile radio transmitters which are less than 100 feet away from electric blasting caps, in other than original containers, shall be deenergized and effectively locked;

(5) Compliance with the recommendations of The Institute of the Makers of Explosives with regard to blasting in the vicinity of radio transmitters as stipulated in Radio Frequency Energy - A Potential Hazard in the Use of Electric Blasting Caps, IME Publication No. 20, March 1971.

(l) Empty boxes and paper and fiber packing materials, which have previously contained high explosives, shall not be used again for any purpose, but shall be destroyed by burning at an approved location.

(m) Explosives, blasting agents, and blasting supplies that are obviously deteriorated or damaged shall not be used.

(n) Delivery and issue of explosives shall only be made by and to authorized persons and into authorized magazines or approved temporary storage or handling areas.

(o) Blasting operations in the proximity of overhead power lines, communication lines, utility services, or other services and structures shall not be carried on until the operators and/or owners have been notified and measures for safe control have been taken.

(p) The use of black powder shall be prohibited.

(q) All loading and firing shall be directed and supervised by competent persons thoroughly experienced in this field.

(r) All blasts shall be fired electrically with an electric blasting machine or properly designed electric power source, except as provided in Sec. 1926.906 (a) and (r).

(s) Buildings used for the mixing of blasting agents shall conform to the requirements of this section.

(1) Buildings shall be of noncombustible construction or sheet metal on wood studs.

(2) Floors in a mixing plant shall be of concrete or of other nonabsorbent materials.

(3) All fuel oil storage facilities shall be separated from the mixing plant and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building.

(4) The building shall be well ventilated.

(5) Heating units which do not depend on combustion processes, when properly designed and located, may be used in the building. All direct sources of heat shall be provided exclusively from units located outside the mixing building.

(6) All internal-combustion engines used for electric power generation shall be located outside the mixing plant building, or shall be properly ventilated and isolated by a firewall. The exhaust systems on all such engines shall be located so any spark emission cannot be a hazard to any materials in or adjacent to the plant.

(t) Buildings used for the mixing of water gels shall conform to the requirements of this subdivision.

(1) Buildings shall be of noncombustible construction or sheet metal on wood studs.

(2) Floors in a mixing plant shall be of concrete or of other nonabsorbent materials.

(3) Where fuel oil is used all fuel oil storage facilities shall be separated from the mixing plant and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building.

(4) The building shall be well ventilated.

(5) Heating units that do not depend on combustion processes, when properly designed and located, may be used in the building. All direct sources of heat shall be provided exclusively from units located outside of the mixing building.

(6) All internal-combustion engines used for electric power generation shall be located outside the mixing plant building, or shall be properly ventilated and isolated by a firewall. The exhaust systems on all such engines shall be located so any spark emission cannot be a hazard to any materials in or adjacent to the plant.

III. STATE LAWS

A. HEALTH AND SAFETY CODE (HSC)

Section 12000 - Defined.

For the purposes of this part, "explosives" means any substance, or combination of substances, the primary or common purpose of which is detonation or rapid combustion, and which is capable of a relatively instantaneous or rapid release of gas and heat, or any substance, the primary purpose of which, when combined with others, is to form a substance capable of a relatively instantaneous or rapid release of gas and heat. "Explosives" includes, but is not limited to, any explosives as defined in Section 841 of Title 18 of the United States Code and published pursuant to Section 55.23 of Title 27 of the Code of Federal Regulations, and any of the following:

(a) Dynamite, nitroglycerine, picric acid, lead azide, fulminate of mercury, black powder, smokeless powder, propellant explosives, detonating primers, blasting caps, or commercial boosters.

(b) Substances determined to be division 1.1, 1.2, 1.3, or 1.6 explosives as classified by the United States Department of Transportation.

(c) Nitro carbo nitrate substances (blasting agent) classified as division 1.5 explosives by the United States Department of Transportation.

(d) Any material designated as an explosive by the State Fire Marshal. The designation shall be made pursuant to the classification standards established by the United States Department of Transportation. The State Fire Marshal shall adopt regulations in accordance with the Government Code to establish procedures for the classification and designation of explosive materials or explosive devices that are not under the jurisdiction of the United States Department of Transportation pursuant to provisions of Section 841 of Title 18 of the United States Code and published pursuant to Section 55.23 of Title 27 of the Code of Federal Regulations that define explosives.

(e) Certain division 1.4 explosives as designated by the United States Department of Transportation when listed in regulations adopted by the State Fire Marshal.

(f) For the purposes of this part, "explosives" does not include any destructive device, as defined in Section 12301 of the Penal Code, nor does it include ammunition or small arms primers manufactured for use in shotguns, rifles, and pistols.

Section 12002 - City and County Ordinance.

Except when transporting explosives on highways and at safe stopping places established under the provisions of Division 14 (commencing with Section 31600) of the Vehicle Code, this part does not affect the operation of provisions of any city, county, or city and county ordinance respecting the delivery, storage, and handling of explosives which are at least as restrictive as the provisions of this part.

Section 12081 - Regulations.

Except as limited by Chapter 6 (commencing with Section 140) of Division 1 of the Labor Code and Section 18930, the State Fire Marshal shall prepare and adopt, in accordance with Chapter 3.5 (commencing at Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code, reasonable regulations that are not in conflict with this part, relating to the sale, use, handling, possession, and storage of explosives.

The building standards adopted and submitted for approval pursuant to Chapter 4 (commencing with Section 18935) of Part 2.5 of Division 13 and the other regulations adopted by the State Fire Marshal

shall do all of the following:

(a) Make reasonable allowances for storage facilities in existence when the regulations become effective. No allowance, however, shall be made for storage facilities which constitute a distinct hazard to life and property, nor shall any allowance be made for storage facilities wherein proper safeguards for the control and security of explosives cannot be maintained.

(b) Be based on performance standards wherever possible.

(c) Make reasonable allowances for the storage of gunpowder for commercial and private use. No allowance, however, shall be made for storage facilities which constitute a distinct hazard to life and property, nor shall any allowance be made for storage facilities wherein proper safeguards for the control and security of explosives cannot be maintained.

(d) Set uniform requirements for the use and handling of explosives that would apply statewide.

(e) The building standards published in the California Building Standards Code relating to storage of explosives and the other regulations adopted by the State Fire Marshal pursuant to this section shall apply uniformly throughout the state, and no city, county, city and county, or other political subdivision of this state, including, but not limited to, a chartered city, county, or city and county, shall adopt or enforce any ordinance or regulation that is inconsistent with this section.

(f) In making the regulations, the State Fire Marshal shall consider as evidence of generally accepted safety standards the publications of the National Fire Protection Association, the United States Bureau of Mines, the United States Department of Defense, and the Institute of Makers of Explosives.

(g) The regulations shall establish standards relating to the size, form, contents, and location of caution placards to be placed on or near storage facilities for division 1.1, 1.2, and 1.3 explosives as set forth in Article 77 of the Uniform Fire Code of the International Conference of Building Officials and the Western Fire Chiefs Association, Inc. or similar standards that are consistent with the United States Department of Transportation classifications, or for any explosives as defined in Section 841 of Title 18 of the United States Code and published pursuant to Section 55.23 of Title 27 of the Code of Federal Regulations.

Section 12101 Permit Required.

(a) No person shall do any one of the following without first having made application for and received a permit in accordance with this section:

(1) Manufacture explosives.

(2) Sell, furnish, or give away explosives.

(3) Receive, store, or possess explosives.

(4) Transport explosives.

(5) Use explosives.

(6) Operate a terminal for handling explosives.

(7) Park or leave standing any vehicle carrying explosives, except when parked or left standing in or at a safe stopping place designated as such by the Department of the California Highway Patrol under Division 14 (commencing with Section 31600) of the Vehicle Code.

(b) Application for a permit shall be made to the appropriate issuing authority.

(c) (1) A permit shall be obtained from the issuing authority having the responsibility in the area where the activity, as specified in subdivision (a), is to be conducted.

(2) If the person holding a valid permit for the use or storage of explosives desires to purchase or receive explosives in a jurisdiction other than that of intended use or storage, the person shall first present the permit to the issuing authority in the jurisdiction of purchase or receipt for endorsement. The issuing authority may include any reasonable restrictions or conditions which the authority finds necessary for the prevention of fire and explosion, the preservation of life, safety, or the control and security of explosives within the authority's jurisdiction. If, for any reason, the issuing authority refuses to endorse the permit previously issued in the area of intended use or storage, the authority shall immediately notify both the issuing authority who issued the permit and the Department of Justice of the fact of the refusal and the reasons for the refusal.

(3) Every person who sells, gives away, delivers, or otherwise disposes of explosives to another person shall first be satisfied that the person receiving the explosives has a permit valid for that purpose. When the permit to receive explosives indicates that the intended storage or use of the explosives is other than in that area in which the permittee receives the explosives, the person who sells, gives away, delivers, or otherwise disposes of the explosives shall insure that the permit has been properly endorsed by a local issuing authority and, further, shall immediately send a copy of the record of sale to the issuing authority who originally issued the permit in the area of intended storage or use. The issuing authority in the area in which the explosives are received or sold shall not issue a permit for the possession, use, or storage of explosives in an area not within the authority's jurisdiction.

(d) In the event any person desires to receive explosives for use in an area outside of this state, a permit to receive the explosives shall be obtained from the State Fire Marshal.

(e) A permit may include any restrictions or conditions which the issuing authority finds necessary for the prevention of fire and explosion, the preservation of life, safety, or the control and security of explosives.

(f) A permit shall remain valid only until the time when the act or acts authorized by the permit are performed, but in no event shall the permit remain valid for a period longer than one year from the date of issuance of the permit.

(g) Any valid permit which authorizes the performance of any act shall not constitute authorization for the performance of any act not stipulated in the permit.

(h) An issuing authority shall not issue a permit authorizing the transportation of explosives pursuant to this section if the display of placards for that transportation is required by Section 27903 of the Vehicle Code, unless the driver possesses a license for the transportation of hazardous materials issued pursuant to Division 14.1 (commencing with Section 32000) of the Vehicle Code, or the explosives are a hazardous waste or extremely hazardous waste, as defined in Sections 25117 and 25115 of the Health and Safety Code, and the transporter is currently registered as a hazardous waste hauler pursuant to Section 25163 of the Health and Safety Code.

(i) An issuing authority shall not issue a permit pursuant to this section authorizing the

handling or storage of division 1.1, 1.2, or 1.3 explosives in a building, unless the building has caution placards which meet the standards established pursuant to subdivision (g) of Section 12081.

(j) (1) A permit shall not be issued to a person who meets any of the following criteria:

(A) He or she has been convicted of a felony.

(B) He or she is addicted to a narcotic drug.

(C) He or she is in a class prohibited by Section 8100 or 8103 of the Welfare and Institutions Code or Section 12021 or 12021.1 of the Penal Code.

(2) For purposes of determining whether a person meets any of the criteria set forth in this subdivision, the issuing authority shall obtain two sets of fingerprints on prescribed cards from all persons applying for a permit under this section and shall submit these cards to the Department of Justice. The Department of Justice shall utilize the fingerprint cards to make inquiries both within this state and to the Federal Bureau of Investigation regarding the criminal history of the applicant identified on the fingerprint card.

This paragraph does not apply to any person possessing a current certificate of eligibility issued pursuant to paragraph (4) of subdivision (a) of Section 12071.

(k) An issuing authority shall inquire with the Department of Justice for the purposes of determining whether a person who is applying for a permit meets any of the criteria specified in subdivision (j). The Department of Justice shall determine whether a person who is applying for a permit meets any of the criteria specified in subdivision (j) and shall either grant or deny clearance for a permit to be issued pursuant to the determination. The Department of Justice shall not disclose the contents of a person's records to any person who is not authorized to receive the information in order to ensure confidentiality.

Section 12150 - Containers.

Except for explosives kept only at an explosive manufacturing plant, no person shall possess, keep, or store any explosive which is not completely encased in a tight metal, wooden, or fiber container, or a container approved by the Interstate Commerce Commission. No person having any explosives in his possession or control shall under any circumstances permit or allow any grains or particles of such explosives to be or remain on the outside of, or about, the containers in which such explosives are kept.

Section 12150.5 - Blasting Caps.

Every person having any blasting caps (electric or nonelectric) in his possession or control shall keep the same securely deposited in a locked approved magazine, except when taken therefrom for actual use, transportation, or sale.

Section 12151 - Regulations.

Except while in the custody of a common carrier or in course of transportation pending delivery to a consignee, all explosives shall be kept or stored as specified in the rules or regulations adopted by the State Fire Marshal pursuant to this part.

Section 13000 - Responsibility in Control of Fire.

Every person is guilty of a misdemeanor who allows a fire kindled or attended by him to escape from his control or to spread to the lands of any person other than the builder of the fire without using every reasonable and proper precaution to prevent the fire from escaping.

Section 13001 - Causing Fire, Misdemeanor.

Every person is guilty of a misdemeanor who, through careless or negligent action, throws or places any lighted cigarette, cigar, ashes, or other flaming or glowing substance, or any substance or thing which may cause a fire, in any place where it may directly or indirectly start a fire, or who uses or operates a welding torch, tar pot or any other device which may cause a fire who does not clear the inflammable material surrounding the operation or take such other reasonable precautions necessary to insure against the starting and spreading of fire.

Section 13002 - Throwing From Vehicle Substance Which May Cause Fire.

(a) Every person is guilty of a misdemeanor who throws or discharges any lighted or nonlighted cigarette, cigar, match, or any flaming or glowing substance, or any substance or thing which may cause a fire upon any highway, including any portion of the right-of-way of any highway, upon any sidewalk, or upon any public or private property. This subdivision does not restrict a private owner in the use of his or her own private property, unless the placing, depositing, or dumping of the waste matter on the property creates a public health and safety hazard, a public nuisance, or a fire hazard, as determined by a local health department, local fire department or fire district, or the Department of Forestry and Fire Protection, in which case this section applies.

(b) Every person convicted of a violation of this section shall be punished by a mandatory fine of not less than one hundred dollars ($100) nor more than one thousand dollars ($1,000) upon a first conviction, by a mandatory fine of not less than five hundred dollars ($500) nor more than one thousand dollars ($1,000) upon a second conviction, and by a mandatory fine of not less than seven hundred fifty dollars ($750) nor more than one thousand dollars ($1,000) upon a third or subsequent conviction.

The court may, in addition to the fine imposed upon a conviction, require as a condition of probation, in addition to any other condition, that any person convicted of a violation of this section pick up litter at a time and place within the jurisdiction of the court for not less than eight hours.

Section 13003 - Spark arresters required on steam powered equipment.

Every person is guilty of a misdemeanor who uses any steam-powered logging locomotive, donkey, or threshing engine, or any other steam engine or steam boiler, in or near any forest, brush, grass, grain, or stubble land, unless the steam engine or steam boiler is provided with adequate devices to prevent the escape of fire or sparks and unless he uses every reasonable precaution to prevent the causing of fire thereby.

Section 13007 - Liability for Damage.

Any person who personally or through another willfully, negligently, or in violation of law, sets fire to, allows fire to be set to, or allows a fire kindled or attended by him to escape to, the property of another, whether privately or publicly owned, is liable to the owner of such property for any damages to the property caused by the fire.

Section 13008 - Due Diligence Required.

Any person who allows any fire burning upon his property to escape to the property of another, whether privately or publicly owned, without exercising due diligence to control such fire, is liable to the owner of such property for the damages to the property caused by the fire.

Section 13009 - Suppression Cost Collectible.

(a) Any person (1) who negligently, or in violation of the law, sets a fire, allows a fire to be set, or allows a fire kindled or attended by him or her to escape onto any public or private property, (2) other than a mortgagee, who, being in actual possession of a structure, fails or refuses to correct, within the time allotted for correction, despite having the right to do so, a fire hazard prohibited by law, for which a public agency properly has issued a notice of violation respecting the hazard, or (3) including a mortgagee, who, having an obligation under other provisions of law to correct a fire hazard prohibited by law, for which a public agency has properly issued a notice of violation respecting the hazard, fails or refuses to correct the hazard within the time allotted for correction, despite having the right to do so, is liable for the fire suppression costs incurred in fighting the fire and for the cost of providing rescue or emergency medical services, and those costs shall be a charge against that person. The charge shall constitute a debt of that person, and is collectible by the person, or by the federal, state, county, public, or private agency, incurring those costs in the same manner as in the case of an obligation under a contract, expressed or implied.

(b) Public agencies participating in fire suppression, rescue, or emergency medical services as set forth in subdivision (a), may designate one or more of the participating agencies to bring an action to recover costs incurred by all of the participating agencies. An agency designated by the other participating agencies to bring an action pursuant to this section shall declare that authorization and its basis in the complaint, and shall itemize in the complaint the total amounts claimed under this section by each represented agency.

(c) Any costs incurred by the Department of Forestry and Fire Protection in suppressing any wildland fire originating or spreading from a prescribed burning operation conducted by the department pursuant to a contract entered into pursuant to Article 2 (commencing with Section 4475) of Chapter 7 of Part 2 of Division 4 of the Public Resources Code shall not be collectible from any party to the contract, including any private consultant or contractor who entered into an agreement with that party pursuant to subdivision (d) of Section 4475.5 of the Public Resources Code, as provided in subdivision (a), to the extent that those costs were not incurred as a result of a violation of any provision of the contract.

(d) This section applies to all areas of the state, regardless of whether primarily wildlands, sparsely developed, or urban.

Section 13009.1 - Fire Hazard; Correction.

(a) Any person (2) other than a mortgagee, who, being in actual possession of a structure, fails or refuses to correct, within the time allotted for correction, despite having the right to do so, afire hazard prohibited by law, for which a public agency properly has issued a notice of violation respecting the hazard, or (3) including a mortgagee, who, having an obligation under other provisions of law to correct a fire hazard prohibited by law, for which a public agency properly has issued a notice of violation respecting the hazard, fails or refuses to correct the hazard within the time allotted for correction, despite having the right to do so, is liable for both of the following:

(1) The cost of investigating and making any reports with respect to the fire.

(2) The costs relating to accounting for that fire and the collection of any funds pursuant to Section 13009, including, but not limited to, the administrative costs of operating a fire suppression cost recovery program. The liability imposed pursuant to this

paragraph is limited to the actual amount expended which is attributable to the fire.

(b) In any civil action brought for the recovery of costs provided in this section, the court in its discretion may impose the amount of liability for costs described in subdivision (a).

(c) The burden of proof as to liability shall be on the plaintiff and shall be by a preponderance of the evidence in an action alleging that the defendant is liable for costs pursuant to this section. The burden of proof as to the amount of costs recoverable shall be on the plaintiff and shall be by a preponderance of the evidence in any action brought pursuant to this section.

(d) Any testimony, admission, or any other statement made by the defendant in any proceeding brought pursuant to this section, or any evidence derived from the testimony, admission or other statement, shall not be admitted or otherwise used in any criminal proceeding arising out of the same conduct.

(e) The liability constitutes a debt of that person and is collectible by the person, or by the federal, state, county, public, or private agency, incurring those costs in the same manner as in the case of an obligation under a contract, expressed or implied.

(f) This section applies in all areas of the state, regardless of whether primarily wildlands, sparsely developed, or urban.

Section 13009.5 - Inmate Labor; Charges.

Where the Department of Forestry and Fire Protection utilizes inmate labor for fighting fires, the charge for their use, for the purpose of Section 13009, shall be set by the Director of Forestry and Fire Protection. In determining the charges, he or she may consider, in addition to costs incurred by the department, the per capita cost to the state of maintaining the inmates.

Section 13009.6 - Emergency Response; Expenses.

(a)(1) Those expenses of an emergency response necessary to protect the public from a real and imminent threat to health and safety by a public agency to confine, prevent, or mitigate the release, escape, or burning of hazardous substances described in subdivision (c) are a charge against any person whose negligence causes the incident, if either of the following occurs:

(A) Evacuation beyond the property where the incident originates is necessary to prevent loss of life or injury.

(B) The incident results in the spread of hazardous substances or fire posing a real and imminent threat to public health and safety beyond the property of origin.

(2) Expenses reimbursable to a public agency under this section are a debt of the person liable therefor, and shall be collectible in the same manner as in the case of an obligation under contract, express or implied.

(3) The charge created against the person by this subdivision is also a charge against the person’s employer if the negligence causing the incident occurs in the course of the person’s employment.

(4) The public agencies participating in an emergency response meeting the requirements of paragraph (1) of this subdivision may designate one or more of the participating agencies to bring an action to recover the expenses incurred by all of the designating agencies which are reimbursable under this section.

(5) An action to recover expenses under this section may be joined with any civil action for penalties, fines, injunctive, or other relief brought against the responsible person or employer, or both, arising out of the same incident.

(b) There shall be deducted from any amount otherwise recoverable under this section, the amount of any reimbursement for eligible costs received by a public agency pursuant to Chapter 6.8 (commencing with Section 25300) of Division 20. The amount so reimbursed may be recovered as provided in Section 25360.

(c) As used in this section, "hazardous substance" means any hazardous substance listed in Section 25316 of this code or in Section 6382 of the Labor Code.

(d) As used in this section, "mitigate" includes actions by a public agency to monitor or model ambient levels of airborne hazardous substances for the purpose of determining or assisting in the determination of whether or not to evacuate areas around the property where the incident originates, or to determine or assist in the determination of which areas around the property where the incident originates should be evacuated.

Section 13160 - Regulations: State Fire Marshal.

With the advice of the State Fire Advisory Board, the State Fire Marshal shall adopt, in accordance with the provisions of Chapter 3.5 (commencing with Section 11340), Part 1 of Division 3 of Title 2 of the Government Code, and administer regulations and standards as he or she may deem necessary for the protection and preservation of life and property to control the servicing, including charging, and testing, of all portable fire extinguishers for controlling and extinguishing fires, and for controlling the sale and marketing of all such devices with respect to conformance with standards of their use, capacity, and effectiveness. In adopting the regulations, the State Fire Marshal shall consider the standards of the National Fire Protection Association.

Section 13162 - Requirements: distribution, etc.

No person shall market, distribute or sell any portable fire extinguisher in this state unless it meets the following requirements:

(a) It complies with regulations and standards adopted by the State Fire Marshal pursuant to Section 13160.

(b) It has been examined by and bears the label of Underwriters' Laboratories Inc. or another testing laboratory which is approved by the State Fire Marshal as qualified to test portable fire extinguishers. Any testing laboratory approved by the State Fire Marshal shall have facilities, personnel, and operating procedures equivalent to those of the Underwriters' Laboratories, Inc.

(c) It does not use as an extinguishing agent any carbon tetrachloride, chlorbromomethane or methyl bromide.

The State Fire Marshal may grant reasonable exceptions to this subdivision when the extinguisher is intended for industrial use in places to which the public is not invited or admitted. The provisions of this section apply to the state and any political subdivision thereof.

C. PUBLIC RESOURCES CODE (PRC)

Section 4021 - Penalty.

Except as otherwise provided the willful or negligent commission of any of the acts prohibited or the omission of any of the acts required by Chapter 2 (commencing with Section 4251) to Chapter 6 (commencing with Section 4411), inclusive, of Part 2 of this division is a misdemeanor.

Section 4101 - "Person" Defined.

"Person" includes any agency of the state, county, city, district, or other local public agency, and any individual, firm, association, partnership, business trust, corporation or company.

Section 4103 - "Forest Fire" Defined.

"Forest Fire" means a fire burning uncontrolled on lands covered wholly or in part by timber, brush, grass, grain, or other flammable vegetation.

Section 4103.4 - Open Fire Defined.

"Open fire" means any fire, controlled or uncontrolled, including a campfire, burning outside of any structure, mobilehome, or living accommodation mounted on a motor vehicle. "Open fire" does not include portable lanterns designed to emit light resulting from a combustion process.

Section 4103.5 - Campfire Defined.

"Campfire" means a fire which is used for cooking, personal warmth, lighting, ceremonial, or aesthetic purposes, including fires contained within outdoor fireplaces and enclosed stoves with flues or chimneys, stoves using jellied, liquid, solid, or gaseous fuels, portable barbecue pits and braziers, or space heating devices which are used outside any structure, mobilehome, or living accommodation mounted on a motor vehicle. "Campfire" does not include portable lanterns designed to emit light resulting from a combustion process.

Section 4104 - "Uncontrolled Fire" Defined.

The term "uncontrolled fire," as used in this division, means any fire which threatens to destroy life, property, or resources and either: (1) unattended by any person; (2) is attended by persons unable to prevent its unrestricted spread; or (3) is burning with such velocity or intensity that it could not be readily controlled with those ordinary tools available to private persons at the fire scene.

Section 4117 - Local Ordinances.

Any county, city, or district may adopt ordinances, rules, or regulations to provide fire prevention restrictions or regulations that are necessary to meet local conditions of weather, vegetation, or other fire hazards. Such ordinances, rules, or regulations may be more restrictive than state statutes in order to meet local fire hazard conditions.

Section 4118 - Burning of Vegetation, Public Purpose.

The burning of growing, dead, or downed vegetation is for a public purpose if the department has determined that the burning of such vegetation is necessary for the prevention or suppression of forest fires.

Section 4119 - Enforcement of State Forest and Fire Laws.

The department, or its duly authorized agent, shall enforce the state forest and fire laws. The department may inspect all properties, except the interior of dwellings, subject to the state forest and fire laws, for the purpose of ascertaining compliance with such laws.

Note: By interagency agreement, many employees of the U. S. Forest Service, Bureau of Land Management, National Park Service and certain county fire departments are "duly authorized agents" of the Department of Forestry and Fire Protection.

Section 4170 - Uncontrolled Fire is Public Nuisance.

Any uncontrolled fire burning on any lands covered wholly or in part by timber, brush, grass, grain or

any other flammable material, without proper precaution being taken to prevent its spread notwithstanding the origin of such fire, is a public nuisance by reason of its menace to life and property.

Section 4171 - Public Nuisances-Defined.

Any condition endangering public safety by creating a fire hazard and which exists upon any property which is included within any state responsibility area is a public nuisance.

Section 4172 - Abatement of Nuisance, Notice.

Whenever the director determines that a public nuisance, as defined in Section 4171, exists, he shall notify the owner of the property to abate the public nuisance. If the owner is unknown, a copy of the notice shall be posted upon the property.

Section 4291 - Firebreaks; Trimming of Trees; Chimney Screens; Variance or Exemption.

Any person that owns, leases, controls, operates, or maintains any building or structure in, upon, or adjoining any mountainous area or forest-covered lands, brush-covered lands, or grass-covered lands, or any land which is covered with flammable material, shall at all times do all of the following:

(a) Maintain around and adjacent to such building or structure a firebreak made by removing and clearing away, for a distance of not less than 30 feet on each side thereof or to the property line, whichever is nearer, all flammable vegetation or other combustible growth. This subdivision does not apply to single specimens of trees, ornamental shrubbery, or similar plants which are used as ground cover, if they do not form a means of rapidly transmitting fire from the native growth to any building or structure.

(b) Maintain around and adjacent to any such building or structure additional fire protection or firebreak made by removing all brush, flammable vegetation, or combustible growth which is located from 30 feet to 100 feet from such building or structure or to the property line, whichever is nearer, as may be required by the director if he finds that, because of extra hazardous conditions, a firebreak of only 30 feet around such building or structure is not sufficient to provide reasonable fire safety. Grass and other vegetation located more than 30 feet from such building or structure and less than 18 inches in height above the ground may be maintained where necessary to stabilize the soil and prevent erosion.

(c) Remove that portion of any tree which extends within 10 feet of the outlet of any chimney or stovepipe.

(d) Maintain any tree adjacent to or overhanging any building free of dead or dying wood.

(e) Maintain the roof of any structure free of leaves, needles, or other dead vegetative growth.

(f) Provide and maintain at all times a screen over the outlet of every chimney or stovepipe that is attached to any fireplace, stove, or other device that burns any solid or liquid fuel. The screen shall be constructed of nonflammable material with openings of not more than one-half inch in size.

(g) Except as provided in Section 18930 of the Health and Safety Code, the director may adopt regulations exempting structures with exteriors constructed entirely of nonflammable materials, or conditioned upon the contents and composition of same, he may vary the requirements respecting the removing or clearing away of flammable

vegetation or other combustible growth with respect to the area surrounding said structures.

No such exemption or variance shall apply unless and until the occupant thereof, or if there be no occupant, then the owner thereof, files with the department, in such form as the director shall prescribe, a written consent to the inspection of the interior and contents of such structure to ascertain whether the provisions hereof and the regulations adopted hereunder are complied with at all times.

Note: Wooden culverts, trestles and bridges are considered as structures insofar as this code section is concerned.

Section 4291.1 - Defensible Space; Violation.

(a) Notwithstanding Section 4021, a violation of Section 4291 is an infraction punishable by a fine of not less than one hundred dollars ($100), nor more than five hundred dollars ($500). If a person is convicted of a second violation of Section 4291 within five years, that person shall be punished by a fine of not less than two hundred fifty dollars ($250), nor more than five hundred dollars ($500). If a person is convicted of a third violation of Section 4291 within five years, that person is guilty of a misdemeanor and shall be punished by a fine of not less than five hundred dollars ($500). If a person is convicted of a third violation of Section 4291 within five years, the department may perform or contract for the performance of work necessary to comply with Section 4291 and may bill the person convicted for the costs incurred, in which case the person convicted, upon payment of those costs, shall not be required to pay the fine. If a person convicted of a violation of Section 4291 is granted probation, the court shall impose as a term or condition of probation, in addition to any other term or condition of probation, that the person pay at least the minimum fine prescribed in this section.

(b) If a person convicted of a violation of Section 4291 produces in court verification prior to imposition of a fine by the court, that the condition resulting in the citation no longer exists, the court may reduce the fine imposed for the violation of Section 4291 to fifty dollars ($50).

Section 4413 - “Zone A”

Includes Mono, Inyo, San Bernardino, Santa Barbara, Ventura, Los Angeles, Orange, Riverside, San Diego, and Imperial Counties.

Section 4414 - “Zone B ”

Includes any county and portion of any county which is not included in Zone A.

Section 4422 - Allowing Fire to Escape.

A person shall not do any of the following:

(a) Willfully or knowingly allow fire to burn uncontrolled on land which he owns or controls, or to escape to the lands of any person other than that of the owner.

(b) Allow any fire kindled or attended by him to escape from his control or to spread to the land of any person other than from the land from which the fire originated.

Section 4423 - Burning Permits, Zones, Times.

A person shall not burn any brush, stumps, logs, fallen timber, fallows, slash, grass-covered land, brush-covered land, forest-covered land, or other flammable material, in any state responsibility area, area receiving fire protection by the department by contract, or upon federal lands administered by the

United States Department of Agriculture or Department of the Interior, unless the person has a written permit from the department or its duly authorized representative or the authorized federal officer on federal lands administered by the United States Department of Agriculture or of the Interior and in strict accordance with the terms of the permit:

(a) At any time in Zone A.

(b) At any time in Zone B between May 1st and the date the director declares, by proclamation, that the hazardous fire conditions have abated for that year, or at any other time in Zone B during any year when the director has declared, by proclamation, that unusual fire hazard conditions exist in the area.

The issuing agency may require the permittee to contact the agency to determine permit suspension status prior to burning.

Note: See Sections 4413 and 4414 above.

Section 4423.1 - Burning Permits; Proclamation.

Burning under permit by any person on public or private lands, except within incorporated cities, may be suspended, restricted, or otherwise prohibited by proclamation. Any of the following public officers may issue a proclamation, which shall be applicable within their respective jurisdictions:

(a) The director or his or her designee.

(b) Any county fire warden with the approval of the director.

(c) The federal officers directing activities within California of the United States Bureau of Land Management, the National Park Service, and the United States Forest Service. The proclamation may be issued when, in the judgment of the issuing public official, the menace of destruction by fire to life, improved property, or natural resources is, or is forecast to become, extreme due to critical fire weather, fire suppression forces being heavily committed to control fires already burning, acute dryness of the vegetation, or other factors that may cause the rapid spread of fire. A proclamation is effective on issuance or at a time specified therein and shall remain in effect until a proclamation removing the suspension, restriction, or prohibition is issued. The proclamation may be effective for a single day or longer. The proclamation shall declare the conditions that necessitate its issuance, designate the geographic area to which it applies, require that all or specified burning under permit be suspended, restricted, or prohibited until the conditions necessitating the proclamation abate, and identify the public official issuing the proclamation. The proclamation may be in the form of a verbal or tape-recorded telephone message, a press release, or a posted order. The proclamation may be issued without complying with Chapter 3.5 (commencing with Section 11340) and Chapter 5 (commencing with Section 11500) of Part 1 of Division 3 of Title 2 of the Government Code.4423.2.

Section 4423.2 - Burning Permits; Temporary.

(a) Whenever the burning under permit has been suspended, restricted, or prohibited by proclamation pursuant to Section 4423.1, the officer having jurisdiction may issue a restricted temporary burning permit in instances in which the continuation of burning maybe essential for reasons of public health, safety, or welfare. The permit may stipulate any special precautions that are required to be followed to reduce the risk of uncontrolled fire originating from the operation.

(b) Violation of the terms of a restricted temporary burning permit is a misdemeanor, and any person upon conviction thereof shall be punished by a fine of not less than two hundred fifty dollars ($250). No part of the fine shall be suspended. The court may permit the fine prescribed by this section to be paid in installments if the court determines that the defendant is unable to pay the fine in one lump sum.

Section 4423.3 - Burning Permits; Campfires.

The use of a campfire is not restricted or prohibited by a proclamation issued pursuant to Section 4423.1, unless specifically restricted or prohibited in that or a subsequent proclamation. If restricted by proclamation, campfires shall be confined to facilities constructed for that purpose within the confines of a campground established, maintained, and open for public use, whether publicly or privately owned.

Section 4423.4 - Outside Smoking.

Outdoor smoking is not restricted or prohibited by a proclamation issued pursuant to Section 4423.1, unless specifically restricted or prohibited in that or a subsequent proclamation. If restricted by proclamation, smoking shall be confined to the following:

(a) Within motor vehicles while operating or parked on established roads, rest stops, or parking areas cleared of flammable vegetation.

(b) Within established campgrounds open to the public.

(c) Within an area that is at least three feet or approximately one meter in diameter which has been cleared to mineral soil by removal of all flammable vegetation and duff. The exempted locations may be included within the smoking ban if specifically noticed in the proclamation.

Section 4423.5 - Burning in “Closed” Area; Violation.

Use of open fire or burning under permit within an area closed by proclamation pursuant to the provisions of Section 4423.1,except as provided in Sections 4423.2, 4423.3, and 4423.4, is a misdemeanor and any person upon conviction thereof shall be punished by a fine of not less than one hundred dollars ($100). No part of such fine shall be suspended. The court may permit the fine prescribed by this section to be paid in installments if the court determines that the defendant is unable to pay the fine in one lump sum.

Section 4425 - Violations of Permit, Effect.

Any violation of the terms of a burning permit issued pursuant to Section 4423, a restricted temporary burning permit issued pursuant to Section 4423.2, or a campfire permit issued pursuant to Section 4433 renders the permit null and void.

Section 4427 - Clearing and Tools Required.

During any time of the year when burning permits are required in an area pursuant to this article, no person shall use or operate any motor, engine, boiler, stationary equipment, welding equipment, cutting torches, tarpots, or grinding devices from which a spark, fire, or flame may originate, which is located on or near any forest-covered land, brush-covered land, or grass-covered land, without doing both of the following:

(a) First clearing away all flammable material, including snags, from the area around such operation for a distance of 10 feet.

(b) Maintain one serviceable round point shovel with an overall length of not less than forty-six (46) inches and one backpack pump water-type fire extinguisher fully equipped and ready for use at the immediate area during the operation.

This section does not apply to portable powersaws and other portable tools powered by a gasoline-

fueled internal combustion engine. (see Sec. 4431 re powersaws).

Section 4428 - Fire Fighting Tools Required on Industrial Operations; Power Equipment and Log Landings.

No person, except any member of an emergency crew or except the driver or owner of any service vehicle owned or operated by or for, or operated under contract with, a publicly or privately owned utility, which is used in the construction, operation, removal, or repair of the property or facilities of such utility when engaged in emergency operations, shall use or operate any vehicle, machine, tool or equipment powered by an internal combustion engine operated on hydrocarbon fuels, in any industrial operation located on or near any forest, brush, or grass-covered land between April 1 and December 1 of any year, or at any other time when ground litter and vegetation will sustain combustion permitting the spread of fire, without providing and maintaining, for firefighting purposes only, suitable and serviceable tools in the amounts, manner and location prescribed in this section.

(a) On any such operation a sealed box of tools shall be located, within the operating area, at a point accessible in the event of fire. This fire toolbox shall contain: one backpack pump-type fire extinguisher filled with water, two axes, two McLeod fire tools, and a sufficient number of shovels so that each employee at the operation can be equipped to fight fire.

(b) One or more serviceable chainsaws of three and one-half or more horsepower with a cutting bar 20 inches in length or longer shall be immediately available within the operating area, or, in the alternative a full set of timber-felling tools shall be located in the fire toolbox, including one crosscut falling saw six feet in length, one double-bit ax with a 36-inch handle, one sledge hammer or maul with a head weight of six, or more, pounds and handle length of 32 inches, or more, and not less than two falling wedges.

(c) Each rail speeder and passenger vehicle, used on such operation shall be equipped with one shovel and one ax, and any other vehicle used on the operation shall be equipped with one shovel. Each tractor used in such operation shall be equipped with one shovel.

(d) As used in this section:

1) “Vehicle” means a device by which any person or property may be propelled, moved, or drawn over any land surface, excepting a device moved by human power or used exclusively upon stationary rails or tracks.

2) “Passenger vehicle” means a vehicle which is self-propelled and which is designed for carrying not more than 10 persons including the driver, and which is used or maintained for the transportation of persons, but does not include any motortruck or truck tractor.

Section 4429 - Fire Tool Boxes Required.

During any time of the year when burning permits are required in an area pursuant to this article, at any camp maintained in such area for the residence of employees, or at any local headquarters in such area of any industrial, agricultural, or other operations on or near any forest-covered land or brush-covered land, there shall be provided and maintained at all times, in a specific location, for firefighting purposes only, a sufficient supply of serviceable tools to equip 50 percent of the able-bodied, personnel, resident of such camp, or working out of such headquarters, for fighting fires. Among these tools shall be included shovels, axes, saws, backpack pumps, and scraping tools. With such tools there shall also be

one serviceable headlight adaptable for attachment to at least one-half of the tractor-bulldozers used on the operation, and a sufficient number of canteens and flashlights to equip a third of the able-bodied personnel.

Section 4431 - Gasoline Power Saw-Clearance and Equipment Required.

During any time of the year when burning permits are required in an area pursuant to this article, no person shall use or operate or cause to be operated in the area any portable saw, auger, drill, tamper, or other portable tool powered by a gasoline-fueled internal combustion engine on or near any forest-covered land, brush-covered land, or grass-covered land, within 25 feet from any flammable material, without providing and maintaining at the immediate locations of use or operation of the saw or tool, for firefighting purposes one serviceable round point shovel, with an overall length of not less than 46 inches, or one serviceable fire extinguisher. The Director of Forestry and Fire Protection shall by administrative regulation specify the type and size of fire extinguisher necessary to provide at least minimum assurance of controlling fire caused by use of portable power tools under various climatic and fuel conditions. The required fire tools shall at no time be farther from the point of operation of the power saw or tool than 25 feet with unrestricted access for the operator from the point of operation.

Section 4432 - Neglecting Campfire.

A person shall not leave a campfire, kindled or attended by him, burning or unextinguished unless one of the following requirements is satisfied:

(a) He leaves some person in attendance.

(b) The fire is enclosed within a stove, oven, drum, or other nonflammable container, in such manner that the fire cannot escape from the container.

No person shall allow a campfire, kindled or attended by him, to spread after it is built.

Note: A campfire: A fire used by one or more persons while camping, picnicking, recreating, or working on grass, brush, or forest-covered land, to provide any one or a combination of the following: heat for cooking, heat for personal warmth, light for ceremonial, esthetic or other purposes. Campfires include open fires, those contained within fireplaces or enclosed stoves with flues or chimneys, stoves using pressurized liquid or gaseous fuels, portable braziers or space-heating devices which are used outside of any building, trailer, house, or living accommodation mounted on motor vehicle. Liability: A campfire builder will be held liable for the cost of suppression and damages caused by any wildfire that starts through negligence on his part.

Section 4433 - Same: Permits Required.

A person shall not light, maintain, or use a campfire upon any brush-covered land, grass-covered land, or forest-covered land which is the property of another person unless he first obtains a written permit from the owner, lessee, or agent of the owner or lessee of the property. If, however, campsites and special areas have been established by the property owner and posted as areas for camping, a permit is not necessary. A written campfire permit duly issued by or under the authority of the United States Forest Service is necessary for use on land under the jurisdiction and control of the United States Forest Service.

Section 4434 - Campfire Escape.

The escape of any campfire from the control of any person who is maintaining the campfire is prima facie evidence that such person was negligent in maintaining the campfire.

Section 4435 - Origination of Fire-Negligence.

If any fire originates from the operation or use of any engine, machine, barbecue, incinerator, railroad rolling stock, chimney, or any other device which may kindle a fire, the occurrence of the fire is prima

facie evidence of negligence in the maintenance, operation, or use of such engine, machine, barbecue, incinerator, railroad rolling stock, chimney or other device. If such fire escapes from the place where it originated and it can be determined which person's negligence caused such fire, such person is guilty of a misdemeanor.

Section 4436 - Refusal to Fight Fire.

A person shall not refuse or fail to render assistance in combating a forest, brush, or grass fire at the summons of the department, or its authorized agent who is charged with the prevention or suppression of fire or the enforcement of the state fire laws, or any county firewarden, fireman, or county officer who is charged with the duty of preventing or combating forest, brush, or grass fires, or any officer of a county fire protection district, unless prevented from so doing by sickness or physical disability.

Section 4437 - Disposal of Flammable Mill Waste.

(a) Outside the exterior boundaries of cities, every processor of forest products shall exercise due diligence in the disposal of flammable material incident to the processing, so that the material does not cause the inception or spread of uncontrolled fire.

(b) Every person, copartnership, firm, corporation, or company that operates a sawmill or plant engaged in the processing or converting of forest products into lumber, shook, ties, poles, posts, veneer, shakes, shingles, planed, or milled products, shall dispose of flammable material incident to that operation. If such flammable material is not to be used as fuel, or as a byproduct, within the operation, it shall be disposed of by burning or by other alternative methods which effectively prevent the flammable material from constituting a fire hazard. Such disposal or storage of flammable waste material or residue shall be made in any of the ways which are prescribed in Section 4438, 4439, or 4440.

(c) The director may establish regulations for the storage, disposal, or use of forest waste or residue on land as a soil amendment or soil protection measure or for its disposal by fire. Regulations shall be adopted by the director in accordance with the provisions of Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code for the purpose of eliminating the potential of fire resulting from spontaneous combustion, other ignition sources, or wildfire escaping the forest product waste or residue storage, use, or disposal areas.

Section 4438 - Same.

Flammable forest product waste material may be disposed of by means of fire in an enclosed device effective in preventing the spread of sparks or fire, situated in an area cleared of grass, grain, brush, slash, litter, and snags for a distance of 30.5 meters (100 feet) surrounding the device or by landfill or other methods which meet applicable state and local fire safety, air, and water quality standards.

A burning permit shall be obtained for the use of the device pursuant to Section 4423 and all other provisions of law.

Section 4439 - Same: Open Burning.

(a) Flammable forest product waste material may be disposed of by means of fire in an area which is cleared of grass, grain, brush, slash, litter, snags and forest cover for a distance of 121.9 meters (400 feet) from the periphery of the fire and for any greater distance necessary to provide 30.5 meters (100 feet) of cleared area around any lumber pile or structure which may be situated within 121.9 meters (400 feet) of the fire.

(b) Sound and living trees beyond 30.5 meters (100 feet) from the periphery of the fire may be left standing within the area required to be cleared, provided the following requirements are met:

(1) Wildfire cannot travel into the canopy of any tree left standing.

(2) Any tree left standing does not pose a fire safety threat or prevent fire equipment access to and near the flammable forest waste material.

(3) All dead limbs, and all limbs within 3 meters (10 feet) of the ground are removed from any tree left standing.

(c) The disposal by fire in the cleared area is the responsibility of the operator or landowner, or of the operator and landowner, jointly, and shall be in conformance with Section 4423 and all other provisions of law.

Section 4440 Same: Accumulated Flammable Residue.

(a) Flammable forest product residue may be accumulated in piles, within any state responsibility area, within any area receiving fire protection by the director by contract, or upon federal lands administered by the United States Department of Agriculture or the Department of Interior, when the area surrounding the piles is cleared and kept clear of all flammable vegetation and debris, including trees, snags, brush, grass, slash, and litter in accordance with one of the following procedures:

(1) Clearing to a distance of 45.7 meters (150 feet) from the periphery of the piles of flammable residue and all structures and lumber piles which are situated within 15.2 meters (50 feet) of the residue piles.

(2) Clearing to a distance of 30.5 meters (100 feet) from the periphery of the piles of flammable residue and all structures and lumber piles which are situated within 15.2 meters (50 feet) of the residue piles, and maintaining at all times a firebreak three meters (10 feet) or more in width cleared of all flammable material and constructed in a continuous line surrounding the accumulation at a distance of not less than 15.2 meters (50 feet) nor more than 91.4 meters (300 feet) from the periphery of the clearing surrounding the accumulation. All snags and dead trees between the firebreak and the periphery of the clearing shall be felled.

(3) Sound and living trees may be left standing within the areas required to be cleared of flammable residue, provided the following requirements are met:

(A) Wildfire cannot travel into the canopy of any tree left standing.

(B) Any tree left standing does not pose a fire safety threat or prevent fire equipment access to and near the flammable forest waste material.

(C) All dead limbs, and all limbs within 3 meters (10 feet) of the ground are removed from any tree left standing.

(D) Diseased or dead trees are removed entirely.

(b) Disposal by fire, if contemplated, is a responsibility of the operator or landowner or the operator and landowner, jointly, and shall be accomplished in conformance with Section 4423 and all other applicable provisions of law.

Section 4441 - Same: Penalty for Failure to Dispose of Accumulated Waste.

Any person who permits or allows accumulation of waste material or residue in violation of the provisions of Sections 4437 to 4440, inclusive, is guilty of a misdemeanor and shall be punished for a first conviction,

by a fine not to exceed two hundred fifty dollars ($250), and, for a second or subsequent conviction within five years of a prior conviction of a violation of one of those provisions, by a fine not less than two hundred fifty dollars ($250) or more than one thousand dollars ($1,000) or imprisonment in the county jail for a period not to exceed 30 days, or both that fine and imprisonment. Each and every day of violation is a separate and distinct offense.

Section 4442 - Using Equipment Without Spark Arrester.

(a) Except as otherwise provided in this section, no person shall use, operate, or allow to be used or operated, any internal combustion engine which uses hydrocarbon fuels on any forest-covered land, brush-covered land, or grass-covered land unless the engine is equipped with a spark arrester, as defined in subdivision (c), maintained in effective working order or the engine is constructed, equipped, and maintained for the prevention of fire pursuant to Section 4443.

(b) Spark arresters affixed to the exhaust system of engines or vehicles subject to this section shall not be placed or mounted in such a manner as to allow flames or heat from the exhaust system to ignite any flammable material.

(c) A spark arrester is a device constructed of nonflammable materials specifically for the purpose of removing and retaining carbon and other flammable particles over 0.0232 of an inch in size from the exhaust flow of an internal combustion engine that uses hydrocarbon fuels or which is qualified and rated by the United States Forest Service.

(d) Engines used to provide motive power for trucks, truck tractors, buses, and passenger vehicles, except motorcycles, are not subject to this section if the exhaust system is equipped with a muffler as defined in the Vehicle Code.

(e) Turbocharged engines are not subject to this section if all exhausted gases pass through the rotating turbine wheel, there is no exhaust bypass to the atmosphere, and the turbocharger is in effective mechanical condition.

(f) Motor vehicles when being operated in an organized racing or competitive event upon a closed course are not subject to this section if the event is conducted under the auspices of a recognized sanctioning body and by permit issued by the fire protection authority having jurisdiction.

Section 4442.5 - Spark arrester; notice to buyer or lessee of necessity of use.

No person shall sell, offer for sale, lease, or rent to any person any internal combustion engine subject to Section 4442 or 4443, and not subject to Section 13005 of the Health and Safety Code, unless the person provides a written notice to the purchaser or bailee, at the time of sale or at the time of entering into the lease or rental contract, stating that it is a violation of Section 4442 or 4443 to use or operate the engine on any forest-covered, brush-covered, or grass-covered land unless the engine is equipped with a spark arrester, as defined in Section 4442, maintained in effective working order or the engine is constructed, equipped, and maintained for the prevention of fire pursuant to Section 4443.

Section 4443 - Handheld portable internal combustion engines.

No person shall use, operate, or cause to be operated on any forest-covered land, brush-covered land, or grass-covered land any handheld portable, multiposition, internal-combustion engine manufactured after June 30, 1978, which is operated on hydrocarbon fuels, unless it is constructed and equipped and maintained for the prevention of fire.

The board shall, by regulation, specify standards for construction, equipment, and maintenance of such engines for the prevention of fire and shall specify a uniform method of testing to be used by engine and

equipment manufacturers, governmental agencies, and equipment users. The regulations shall include specification of exhaust system standards for carbon particle retention or destruction, exposed surface temperature, gas temperature, flammable debris accumulation, durability, and serviceability.

Portable power saw and other portable equipment described in this section which were manufactured prior to July 1, 1978, shall be subject to fire safety design specifications as prescribed by the board.

IV. STATE REGULATIONS

TITLE 14, CALIFORNIA CODE OF REGULATIONS (14 CCR)

Section 895.1 - Definitions.

The definitions contained in the Z'berg-Nejedly Forest Practice Act of 1973 as amended (commencing with section 4511 of the Public Resources Code) shall apply to this chapter, as well as the following definitions, unless the context clearly requires otherwise. "Coastal Commission Special Treatment Area" means an identifiable and geographically bounded forest area designated within the Coastal Zone that constitutes a significant wildlife and/or plant habitat area, area of special scenic significance, and any land where timber operations could adversely affect public recreation areas or the biological productivity of any wetland, estuary, or stream especially valuable because of its role in a coastal ecosystem. "Fire Protection Zone" means that portion of the logging area within 100 feet (30.48 m), as measured along the surface of the ground, from the edge of the traveled surface of all public roads and railroads; and 50 feet (15.24 m) as measured along the surface of the ground from the traveled surface of all private roads, and within 100 feet (30.48 m), as measured along the surface of the ground, from permanently located structures currently maintained for human habitation. "Logging Area" means that area on which timber operations are being conducted as shown on the map accompanying the Timber Harvesting Plan, and within 100 feet (30.48 m) as measured on the surface of the ground, from the edge of the traveled surface of appurtenant roads owned or controlled by the timber operator or timber owner, and being used during the harvesting of the particular area. "Lopping" means severing and spreading of slash so that no part of it remains more than 30 inches (76.2 cm) above the ground. "Skidding or Yarding" means that movement of forest products from the point of felling to a landing. "Tractor roads" means constructed trails or established paths used by tractors or other vehicles for skidding logs. Also known as "skid trails".

Section 918 - Fire Protection.

When burning permits are required by Public Resources Code 4423, timber operators shall: (a) observe the fire prevention and control rules within this article, and (b) submit each year, either before April 1st or before the start of timber operations a fire suppression resources inventory to the Department as required by the rules.

Section 918.1 - Fire Suppression Resource Inventory.

The Fire Suppression Resources Inventory shall include, as a minimum, the following information:

(a) Name, address and 24-hour telephone number of an individual and an alternate who has authority to respond to Department requests for resources to suppress fires.

(b) Number of individuals available for fire fighting duty and their skills.

(c) Equipment available for fire fighting.

The Fire Suppression Resource Inventory shall be submitted to the ranger unit headquarters office of the Department having jurisdiction for the timber operation.

Section 918.2 - Fire Plan Contents.

Timber operators' written fire prevention and fire control plan shall include, but not be limited to, the

following information:

(a) The name, address, and 24-hour telephone number(s) of responsible persons who have authority to act for the operator in fire suppression operations.

(b) Location and number of persons available for firefighting duty.

(c) Kind, type and location of tools and equipment, including bulldozers, and water tank trucks suitable and available for firefighting purposes.

(d) The fire plan shall set forth the general procedure which will be followed for the detection, control, and suppression of uncontrolled fires.

(e) Sketch map and land subdivision description of logging areas upon which timber operations may currently be conducted or are anticipated will be conducted during the ensuing forest fire season.

(f) Detailed provisions for inspection following cessation of felling, skidding, and loading operations as required in Section 918.8.

Section 918.3 - Roads to be Kept Passable.

Timber operators shall keep all logging Truck roads in a passable condition during the dry season for fire truck travel until snag and slash disposal have been completed.

Section 918.4 - Smoking and Matches.

Subject to any law or ordinance prohibiting or otherwise regulating smoking, smoking by persons engaged in timber operations shall be limited to occasions where they are not moving about and are confined to cleared landings and areas of bare soil at least three feet (.914 m) in diameter. Burning material shall be extinguished in such areas of bare soil before discarding. The timber operator shall specify procedures to guide actions of his employees or other persons in his employment consistent with this subsection.

Section 918.5 - Lunch and Warming Fires.

Subject to any law or ordinance regulating or prohibiting fires, warming fires or other fires used for the comfort or convenience of employees or other persons engaged in timber operations shall be limited to the following conditions:

1. There shall be a clearance of 10 feet (3.05 m) or more from the perimeter of such fires of flammable vegetation or other substances conducive to the spread of fire.
2. Warming fires shall be built in a depression in the soil to hold the ash created by such fires.
3. The timber operator shall establish procedures to guide actions of his employees or other persons in their employment regarding the setting, maintenance, or use of such fires that are consistent with (a) and (b) of this subsection.

Section 918.6 - Posting Procedures.

Timber operators shall post notices which set forth lists of procedures that have established consistent with Sections 918.4 and 918.5. Such notices shall be posted in sufficient quantity and location throughout their logging areas so that all employees, or other persons employed by them to work, shall be informed of such procedures. Timber operators shall provide for diligent supervision of such procedures throughout their operations.

Section 918.7 - Blasting and Welding.

Timber operators shall provide for a diligent fire watch service at the scene of any blasting or welding

operations conducted on their logging areas to prevent and extinguish fires resulting from such operations.

Section 918.8 - Inspection for Fire.

The timber operator and his/her agent shall conduct a diligent aerial or ground inspection within the first two hours after cessation of felling, yarding, or loading operations each day during the dry period when fire is likely to spread. The person conducting the inspection shall have adequate communication available for prompt reporting of any fire that may be detected.

Section 918.10 - Cable Blocks.

During the period when burning permits are required, all tail and side blocks on a cable setting shall be located in the center of an area that is either cleared to mineral soil or covered with a fireproof blanket that is at least 15 feet in diameter. A shovel and an operational full five-gallon back pump or fire extinguisher bearing a label showing at least a 4A rating must be located within 25 feet of each such block before yarding.

Note: The above regulations are for the Coast Forest District. Slightly different but very similar regulations apply to the Northern and Southern Forest Districts.

Section 1230 - Purpose.

These regulations have been prepared and adopted for the purpose of establishing minimum standards respecting the type and size of fire extinguisher necessary to provide at least minimum assurance of controlling fire caused by use of a portable saw or tool powered by a gasoline fueled internal combustion engine.

Section 1233 - Effectiveness Evaluation.

Only fire extinguishers which meet each of the following requirements will be approved by the Director.

(a) An extinguisher must completely extinguish both Class A and Class B fires in each type of fuel bed in each test.

(b) Operating instructions must be plainly printed on the extinguisher; and the average user must be able to operate the extinguisher within 5 seconds after having it in hand.

(c) Extinguisher must be portable, provided with belt carriers or be equipped with hangers which will adequately serve as belt loops for carrying on the person. Gross weight of a fully loaded extinguisher shall not exceed 2 pounds 8 ounces (1.134 kg).

Section 1240 - Multiposition Small Engine, Defined.

Multiposition small engine (MSE) means-any internal combustion engine operated on hydrocarbon fuels that normally is handheld when operated by one or more persons, which can and may be operated in any position, including but not limited to inverted and includes all of the engines to which the provisions of PRC 4443 are applicable.

Section 1241 - Minimum Performance Standards for Multiposition Small Engine Exhaust System Fire Ignition Suppression for Engines Manufactured after June 30, 1978.

The following minimum performance standards for MSE. exhaust systems are established to prevent the ignition of fire in organic fuels consisting of, or developed from forest, brush or grass vegetation.

(a) Carbon Particle Retention or Destruction. Each MSE. exhaust system or a spark arrester used in or with such exhaust system shall be designed to retain or destroy 90% or more of the carbon particles having a major diameter greater than 0.023 in.

(0.584 mm) as determined when tested in accordance with the provisions of part 3 of the Society of Automotive Engineers (SAE) Recommended Practice J335 (b) .

(b) Exposed Surface Temperature. The MSE. exhaust system shall be designed so that the exposed surface temperature shall not exceed 550° F (288° C) as determined when tested in accordance with the provisions of part 4 of SAE Recommended Practice J335 (b).

(c) Exhaust Gas Temperature. The MSE. exhaust system shall be designed so that the exhaust gas temperature shall not exceed 475° (246° C) as determined when tested in accordance with the provisions of part 5 of SAE Recommended Practice J335 (b).

(d) Debris Accumulation. The MSE exhaust system shall be designed in such a manner that there are no pockets or corners where flammable material might accumulate. Pockets are permissible only if it can be substantiated by suitable test that material can be prevented from accumulating in the pockets.

(e) Durability. The MSE. exhaust system must be constructed of durable material and so designed that it will, with normal use and maintenance, provide a reasonable service life. Parts designed for easy replacement as a part of routine maintenance shall have a service life of no less than 50 hours. Cleaning of parts shall not be required more frequently than once for each 8 hours of operation.

(f) Serviceability. A spark arrester shall be so designed that it may be readily inspected and cleaned.

Section 1241.1 - Test Procedures for Multiposition Small Engine Exhaust System Fire Ignition Suppression for Engines Manufactured after June 30, 1978.

The exhaust system of MSE shall be tested and evaluated (qualified and rated) for compliance with the minimum performance standards established therefore, by 14 CCR 1241 by using SAE Recommended Practice J335(b) as adopted December 15, 1976. Practice J335(b) is adopted by reference as though set forth at length herein.

Section 1301 - Methods of Disposal.

Forest products waste or residue may be disposed of:

(a) As a soil amendment layered on agricultural land, provided that, within one year of disposal, it is covered with soil or worked into the soil by plow, disc, or other means;

(b) As a soil protection measure to be spread in forest areas on tractor roads, skid trails, and fill slopes of truck roads except where such areas are used as fuelbreaks or where the waste or residue can wash into streams during rain runoff;

(c) By burning, where approved by air pollution control authorities and where appropriate burning permits are obtained; or

Use of waste or residue as a soil amendment or soil protection measure may occur only where the waste or residue has been converted into pieces generally smaller than two inches (five centimeters) in any dimension.

V. LOCAL ORDINANCE

It is not uncommon for counties, cities and special districts to have fire ordinances that affect industrial operations. These ordinances are too numerous and varied to list here. Knowledge of and compliance with the provisions of these ordinances is important for company and protection agency employees alike.

VI. PERMITS AND EASEMENTS

Most construction operations and many mining and drilling operations are done under terms of permits, easements or leases. Often these documents contain fire protection clauses in addition to any federal or state laws or regulations which may apply. Some of them are so old that, with changes in personnel, their provisions have been forgotten. Both fire protection agency and company managers, therefore, should review the documents periodically.

VII. CONTRACT REQUIREMENTS

Most logging, construction and drilling operations are conducted by contractors. Whether the contracted be a public agency or a private property owner the contract often contains specific fire prevention clauses the violation of which can void the contract. These contracts are usually worked out at high managerial levels and involve thousands or millions of dollars. It is, therefore, very important that contractor supervisory personnel and the owner's field inspectors be thoroughly familiar with the terms applicable to their specific contracts. Some of the most common ones are discussed briefly below but only as samples. In actual cases the specific contract clauses must be followed.

A. U. S. Forest Service Timber Sales

The U. S. Forest Service has developed a set of standard provisions for scaled timber sales. They are divided into A, B and C Divisions. Division A is for specific contract provisions; Division B establishes nationwide standards; Division C is for Regional standards. Each division is divided into parts.

Part B7 relates to Fire Precautions and Control. It contains sections on: fire plans, fire precautions, substitute precautions, emergency precautions, fire control, purchaser's reinforcement obligations, suspension of operations, manpower, equipment, fire suppression costs, operations fires, negligent fires, other fires on sale area, state law, and performance by a contractor. Part C7 for Region 5 (California and Hawaii) modifies B7 to meet local conditions. It contains sections on: fire tools and equipment, fire extinguishers, spark arresters, power saws, fire foremen and fire patrolmen, seasonal permits, blasting, time of snag felling, clearing of fuels, oil filters and glass jugs, smoking, reporting fires, tank trucks, skyline tank units, special requirements for helicopter logging, communications, activity levels, and negligence.

B. California Department Of Transportation (Caltrans)

Caltrans, with assistance from the California Department of Forestry and Fire Protection, has established a set of standard clauses for its construction contracts. Individual clauses are made parts of contracts as local conditions warrant. A given contract may contain all or only certain ones. They cover such items as establishing communications with the local fire agency, reporting fires, restricting open fires, preventing fire escapes from project area, spark arresters, clearance around equipment service and parking areas and fuel storage areas, fire tools, fire patrolman with vehicle and tools, fire indexes, curtailment of activities, smoking, blasting, and welding.

C. Private Landowners

Most large landowners, particularly timber companies, will have similar clauses in their construction, logging, drilling or service contracts. No two clauses are alike, thus it is not feasible to list them, but they are just as important and as enforceable under contract law as are those of the public agencies.

Appendix C

NORTHERN CALIFORNIA
FIRE ASSOCIATION
P. O. BOX 990898
REDDING, CA 96099-0898

September 6, 1996

TO: NCFA MEMBERS

Having reviewed your responses to my letter of July 17 regarding fire safety on operations using circular saw blade shears (“hotsaws”), it is the consensus of NCFA members that the following should be the minimum standards for hotsaw shearing operations on member-owned or controlled lands:

1. All harvesting with the hotsaw shear during declared fire season will cease when the ten (10) hour fuelstick reaches four (4) and the relative humidity reaches twenty percent (20%).
2. Humidity and fuelstick measurements will be taken by the operator on site every two hours, commencing no later than 8:00 a.m. each day.
3. A daily log of these measurements will be kept and maintained by the operator on site and will be available for inspection at all times.

All that is required to take the above measurements is a belt weather kit at an approximate cost of $150 and a 10-hour fuelstick and scales at an approximate cost of $150 to $200. I will be happy to put together a bulk order if enough members are interested in supplying this equipment to their contractors. Also, training for the operators can be provided by CDF at no cost and I can arrange for the training upon your request.

Periodic monitoring of the recording system should be performed by your sale administrators to see that the above standards are being met, particularly on high hazard days. I believe implementing these procedures will go along way in minimizing the possibility of fires on member-owned or controlled lands where hotsaws are being used. Many thanks for your review and helpful comments on this issue.

Sincerely,
NORTHERN CALIFORNIA FIRE ASSOCIATION

G. W. Quigley
Fire Coordinator

GWC:plr
cc: Shasta-Trinity Ranger Unit

Appendix D
CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION
Catalytic Converter Caused Fires

by

PAUL J. BERTAGNA

Battalion Chief

Shasta-Trinity Unit

June 12, 1997

Catalytic converters were first required on most California light-duty vehicles in the 1975 model year.

It was originally thought vehicle exhaust systems equipped with converters would run hotter and, thus, cause more fires. It was also felt that as vehicles aged or leaded gasoline was utilized in lieu of unleaded, converters would "go bad" and cause fires. Neither of the above-mentioned situations appear to be the primary reason for converter caused fires. The belief that converters would cause fires as the vehicles aged or with use of leaded gasoline does not seem to be the case. This Unit has not experienced any fires believed to be caused by a converter malfunction resulting from the age of the vehicle or use of leaded gasoline.

When converters were first installed, a number of vehicles experienced fires originating on the floorboards due to the heat given off by the converters. Heat shields have now been installed and fires rarely occur within the vehicle.

Ongoing incidents have been reported involving individuals driving onto dry grass and immediately causing a fire. This is due to the exhaust system coming into contact with the dry grass. However, non-converter equipped vehicles have also been known to cause fires when driven onto dry vegetation and making direct contact with the exhaust system. Fires caused by converter equipped vehicles have occurred instantaneously once the vehicle has come to a stop on dry grass. In several cases, occupants have exited the vehicle with flames appearing from underneath because the vegetation was already on fire. Whereas, when occupants exited a non-converter equipped vehicle, the smell of smoldering grass was often an indicator that a fire was about to occur. This would often give the occupants time to move the vehicle to a safe parking location and avoid a fire.

Catalytic converter melt down caused by a malfunction within the electronic ignition system is a source of ignition no one anticipated. This malfunction allows raw fuel to go directly into the exhaust system, with the converter becoming a combustion chamber. The converter then melts down and emits hot pieces from the tail pipe. It is estimated the converter melts at around 2400 to 2800 degrees F. It is apparent that age and maintenance of a vehicle have nothing to do with the malfunction. The malfunction is in the electronic ignition system, for which there are no tests to determine possible failure. A cause of electronic ignition malfunction is low voltage in the system. This can be due to a dead or near-dead battery or other problems within the electrical system.

Witnesses describe particles being emitted from the exhaust systems as "fusees being thrown out of the vehicle," or "a steady stream of fire coming out of the exhaust system." One witness saw his own GM converter fail. He reported seeing "sparks flying all over the place" in his rear view mirror.

In 1985, the CDF Shasta-Trinity Unit began a survey to track catalytic converter fires within the Unit. They also obtained further information from other CDF Units, along with USFS areas surrounding the Shasta-Trinity boundaries. From 1985 through the summer of 1996, there have been a total of 29 incidents

related to the meltdown of a catalytic converter. This has resulted in 104 fires burning 737 acres. There may have been additional fires, for which information was not received.

During the 1996 fire season, the Coast Cascade Region kept track of fires believed to have been caused by converters melting down. A total of 10 incidents resulting in 28 fires were reported throughout the region.

Vehicles identified as causing fires note less than 10,000 miles and as much as 100,000 miles. Public agency vehicles including CDF, USFS, and CHP, along with private agencies such as PG&E, have generated fires. These agencies typically have higher maintenance standards than any private citizen.

It would seem if a malfunction is causing the converter to melt down at 2400 to 2800 degrees F, the vehicle would soon stop running. For unknown reasons, this does not seem to be the case. The responsible vehicle has been identified less than 33% of the time. Whenever converter caused fires are suspected in the CDF Shasta-Trinity Unit, an effort is made to locate the responsible vehicle. For the most part, the vehicle has been located near the fires or not at all.

POSSIBLE SIGNS OF CATALYTIC CONVERTER MALFUNCTION:

- Vehicle runs very rough.
- May backfire.
- Vehicle seems to lose power.

Of concern: How far can a vehicle with a malfunctioning converter travel while spreading fire before it will stop?

Based upon the number of fires occurring within the Shasta-Trinity Unit, and the fact that only 33% of the responsible vehicles were located, it appears the malfunction may occur and then correct itself. Oftentimes, the malfunction will allow only one particle to escape the exhaust system causing 1 fire. At other times numerous particles are emitted resulting in multiple fires. At one point, 4 fires were spread over a 10-mile area and another time, 11 fires were spread over a 215-ft. area. The responsible vehicles were never located. In most cases, the fires have been within a one-mile stretch, with an average of 3 fires per incident.

- It should be noted that although there are only three recognizable fires, multiple separat fires could have burned together.

Survey results for the Coast/Cascade Region consisted of ten incidents with 28 separate fires. Four units reported fires caused by catalytic converter breakdowns:

- Shasta-Trinity (4) incidents
- Lassen-Modoc (3) incidents
- Butte (1) incident
- Lake-Napa-Sonoma (5) incidents

A 1984 Dodge Pickup and a 1992 GMC 1T van were identified in 2 of the 10 incidents. (See Chart 1.) There were 4 additional incidents where the converter came into direct contact with vegetation.

Most vehicles are equipped with one catalytic converter. GMC has now installed a second converter in their exhaust system. GMC vehicles have a pellet-type catalyst, which makes detecting them in an origin extremely difficult. Prior to this year, the muffler design on GMC vehicles enabled them to function similarly to a spark arrester. This muffler design may have prevented melted pellets from exiting the exhaust system. All converters are installed prior to the muffler. This undoubtedly restricts some particles from escaping and causing even more fires. GMC's second converter is installed after the muffler. Therefore, when a malfunction occurs, there is nothing to stop the pellets from exiting the exhaust system.

The survey does not reveal an overwhelming number of converter fires within the Region. However, it is the single incident consisting of an overwhelming number of fires which are spread over a large area and occurring at the same time, that will result in a destructive fire.

Can these converter caused fires be reduced or eliminated altogether?

We know vehicles will continue to be equipped with catalytic converters. We also know if people continue to park on dry grass which comes into contact with the converter, a fire will probably occur. However, if the particles were prevented from escaping the exhaust system (similar to a spark arrester) this cause could be eliminated or greatly reduced.

Are all fires related to catalytic converters being accounted for? Are fires being attributed to converters that were caused by other sources?

- Shasta-Trinity Unit survey: The majority of fires attributed to converters have been **confirmed** as converter fires, with the finding of converter pieces in or near the origins.
- Region survey: The majority of fires were assumed to be converter fires, with only 4 of the incidents listed as **confirmed** to be converter caused.

Converter pieces being emitted from the exhaust system of vehicles range from minute in size to pieces measuring 1” x 2”. Pieces have not always been found in origins, but are often located on either side of the fire. The pieces are generally light gray in color. They blend readily with the existing roadside gravel. GM pellets are initially approximately the size of a BB. However, when subjected to extreme heat, they melt or burn down and can be ½ to ¼ of the original size.

IF YOU SUSPECT A FIRE OR FIRES HAVE BEEN CAUSED BY A CONVERTER MELTDOWN AND YOU CANNOT FIND THE CONVERTER PIECES IN THE ORIGIN AREA, WALK THE ROADWAY ON EITHER SIDE OF THE FIRE FOR AT LEAST 100 YDS IN BOTH DIRECTIONS.
Oftentimes, you will find converter pieces scattered in the roadway. You may also locate additional fires that have burned a small spot approximately 2” in diameter.
Vegetation along the roadway is the most limiting factor in how far a converter piece will travel. If the pieces are being emitted by a passenger vehicle, the exhaust system is normally within 18 inches of the roadway. In most areas of the state, grass along the roadway is taller than 18". Tall grass readily stops the converter pieces from traveling a great distance. In these instances, converter pieces are usually found within 5 feet of the roadway’s limit line. Pieces have been found as far as 35 feet from the limit line if there is no grass to stop them.
Exhaust systems on pickups, 4-wheel drives, and motor homes are normally 2 feet or more above the roadway, which would lead you to expect to find the converter pieces farther off the roadway. Converter pieces have been known to cause fires on both sides of the roadway. At times, fires are directly across from each other and, at other times, they are spread out along the roadway. Pellets from a GM product were found 18 inches above the roadbed on an embankment. It seems the pellets are more inclined to bounce when discharged from the exhaust system.

In the survey conducted within the Shasta-Trinity Unit, road grades and curves do not seem to make a difference as to whether the vehicle discharges particles or not. In other exhaust-caused fires, it is often believed the vehicle is working under pressure, or that the driver has accelerated the engine, causing the particles to discharge. In converter-caused fires, acceleration of the engine has nothing to do with the malfunction causing the problem.

Fires have occurred in all types of terrain, including straight, flat uphill/downhill, and curves. The only common denominator: Drivers reported their vehicles as running rough, backfiring, or losing power. In one reported incident, a CHP vehicle caused a series of 3 fires. The officer stated his vehicle seemed to lose power to the point where he pulled to the side of the road and requested a tow.

CATALYTIC CONVERTER PIECES ARE NOT MAGNETIC. THE ONLY WAY TO DETECT THE PIECES IS BY VISUALLY LOCATING THEM. This is oftentimes difficult as they resemble gravel and blend with the surrounding terrain.

IF YOU SUSPECT CONVERTER CAUSED FIRES, USUALLY MORE THAN ONE, LOOK FOR A DISABLED VEHICLE IN CLOSE PROXIMITY OF THE FIRES.

Generally there is no negligence by an individual if the vehicle's converter has caused fires. Drivers often have no idea what the problem is. They may attempt to limp into the nearest service station, unknowingly causing fires along the way. **IF YOU DO LOCATE A SUSPECT VEHICLE, ENSURE THAT THE OWNER HAS THE VEHICLE CHECKED BY A MECHANIC.** You might need to talk to the mechanic yourself and advise that the converter may have melted down.

At times, it is believed the malfunction that caused the meltdown of the converter corrects itself, and may be operating correctly when checked by a mechanic. Correcting the problem does not mean it cannot happen again in the same vehicle. The above-mentioned CHP vehicle had a similar malfunction on 3 separate occasions during the life of the vehicle. However, with each subsequent malfunction, the officer was wiser and requested a tow.

CAUTION: IF YOU LOCATE A SUSPECT VEHICLE AND WISH TO OBSERVE THE DAMAGE TO THE CONVERTER WHEN THE VEHICLE IS IN THE SHOP, DO NOT LOOK DOWN THE EXHAUST PIPE WHILE THE MECHANIC IS ATTEMPTING TO DISCONNECT IT. The cause of the malfunction is raw fuel escaping directly into the exhaust system. Some of this raw fuel may still be in the converter area. When the mechanic uses a torch to loosen the exhaust piping, ignition may occur and shoot a flame out the back end of the exhaust pipe.

As we continue to travel down the roads, we will likely experience fires from converters. At some point, a fire started by a converter may be responsible for destroying thousands of acres, burning homes, and possible deaths. A Public Fire Agency's vehicle could easily be the cause!!!!!

Attachments:

(1) Catalytic Converter Fires - COAST/CASCADE REGION

(2) Catalytic Converter Fires - SHASTA/TRINITY UNIT

Appendix D
Attachment 1

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

COAST/CASCADE REGION
1996

UNIT	Number of Fires per Incident	Make of Vehicle	Distance from First to Last Fire	Origin Distance from Limit Line (Feet)	Cause K/L
SHU	4	Unknown	200 feet	3 - 10	L
	5	Unknown	400 feet	1 - 15	K
	4	Unknown	5.1 miles	1 - 10	L
	6	'92 GMC 1 Ton Van	825 feet	1 - 3	K
BTU	2	'84 Dodge PU	500 feet	1	K
LMU	1	Unknown			L
	1	Unknown		<1	L
	1	Unknown		<1	L
LNU	3	Unknown	20 feet	10	K
	1	Unknown			L

The above fires were the result of meltdown of the catalytic converter. An additional 4 fires were reported (3 LNU and 1 SHU) where the converter came into direct contact with the vegetation.

Appendix D
Attachment 2

SHASTA-TRINITY UNIT

Year	Number of Fires per Incident	Acreage	Make of Vehicle	Distance from First to Last Fire	Origin Distance from Limit Line (Feet)	Cause K/L
1985	6	610	Unknown	2 miles	9 - 14	K
	5	.5	Unknown	300 feet		K
1986	3	spot	'84 Dodge PU	1 mile		K
	3	spots	'85 Dodge PU	.5 mile	6.5 - 11	K
	3	spots	'85 Dodge PU	.3 mile		K
	11*	spots	Unknown	215 feet	10	K
1987	5	1	Unknown	.3 mile	5	K
1988	3	spots	Dodge PU			K
	5	spots	Unknown	100 feet	2 - 5	K
1989	2**	spots	Unknown	100 feet	6	K
	1	spot	Unknown			K
	5	85	Unknown	1 mile	8	K
1990	7	spots	'78 Ford SU	.25 mile	2 - 35	K
1991	1	spot	Unknown			K
1992	4	.5	Unknown	10 miles	2.5 - 4	K
	2	20	Unknown	.2 miles	5	K
1993	2***	spot	'83 Chevy			K
	2	.5	4x4 Unknown	70 feet	5	L
	4	spots	Unknown	200 feet	5	K
	1	2	'76 Gremlin			K

Year	Number of Fires per Incident	Acreage	Make of Vehicle	Distance from First to Last Fire	Origin Distance from Limit Line (Feet)	Cause K/L
1994	5	spots	Unknown	400 feet	8	K
	1	spot	Dolphin Motor Home		5	K
	2	spots	Unknown	50 feet	5	L
1995	1	spot	'91 Ford PU		6	K
	3	1	Unknown	100 feet	5	K
1996	4	1	Unknown	5.1 miles		L
	3	5	Unknown	200 feet		L
	4	1	Unknown	300 feet	15	K
	6	10	'92 GMC 1 Ton Van	825 feet	1-3	K

All of the fires occurred within the CDF Shasta-Trinity Unit unless otherwise noted. *USFS, Lake Almanor District, ***One was within Redding Fire Department and the other was within CDF jurisdiction. Fire Causes K/L, K=Known, L=Logical.

These fires all occurred due to the meltdown of the converter. Fires caused by catalytic converter equipped vehicles which caused fires when in direct contact with the vegetation are not listed.

Appendix E

MEMORANDUM

SUBJECT: FELLER-BUNCHER OPERATION UNDER IFPL'S II & III

TO: DF Distribution

FROM: Doug Coyle, Protection From Fire Director

DATE: September 29, 1992

OREGON DEPARTMENT OF FORESTRY INTERIM GUIDANCE ON OPERATION OF FELLER-BUNCHER MACHINES DURING INDUSTRIAL FIRE PRECAUTION LEVELS II AND III

This interim guidance recognizes that feller-buncher machines are becoming increasingly popular in the timber industry due to their mobility, cost effectiveness and efficiency. This guidance is designed to maximize the opportunity to operate these machines while, at the same time, recognizing that these machines present a risk of fire ignition.

GUIDANCE:

Under Industrial Fire Precaution Level II, feller-buncher machines will be allowed to operate if the below listed standards are met.

Under Industrial Fire Precaution Level III, feller-buncher machines will be allowed to operate until 1:00 p.m. in the afternoon and after 8:00 p.m. in the evening if the below listed standards are met.

STANDARDS:

Districts, on a case by case basis, may waive or modify these standards, based on the hazards, the risks or the types of equipment existing at a specific operation site:

1. The operation must be compliance with all applicable fire prevention, fire tool, water supply and watchman requirements of ORS Chapter 477.
2. The feller-buncher machine must operate in close proximity to a suitably sized and equipped dozer which is immediately available for fire trail construction.
3. The operator of the feller-buncher machine, or other specifically designated person, must visually observe all areas in which the feller-buncher machine has operated at least once every fifteen minutes until the operations' watchman service begins.

DEFINITIONS:

"Close proximity" shall normally mean the dozer is able to travel to the location of the feller-buncher machine in ten minutes or less.

"Feller-buncher" means a self propelled vehicle used to fell and/or buck fallen trees. Such vehicles may or may not be equipped with a device designed to raise and move logs or fallen trees from one location to another.

"Immediately available" means that a qualified operator is on site and that the dozer requires no significant modification, repair, fueling, etc. before being able to respond to a reported fire. Additionally, the dozer and operator must be able to initiate travel to a reported fire within five minutes of detection of the fire.

Appendix F

Industrial Fire Prevention Bulletin Technical Report

SPONTANEOUS COMBUSTION IN DELIMBER RESIDUE PILES

Pete Norkeveck

Protection Specialist, Oregon Department of Forestry

Residue from delimber operations that are subsequently processed through a chipper or tub grinder is highly susceptible to biological soft heating. Many piles of this material were found to be spontaneously combusting in the Klamath/Lake region as well as the Central Oregon area in 1992 to 1991. This accounted for approximately six fires from twelve hot piles.

Prolonged heating by respiration associated with biological decomposition can result in spontaneous combustion. Also known as Ignition by slow thermal explosion, spontaneous combustion can occur in delimber residue piles within a pile temperature range from So to 170 degrees centigrade (140 to 340 degrees Fahrenheit)

Finely ground delimber material often pushed up into large piles by dozers receives strong inoculations of soil bacteria that combines with its natural ambient bacteria level. Continuing cellular respiration from the recently live residue elevates the pile temperature sufficient for accelerated bacterial metabolism.

The pile temperature rises with those metabolic processes. As water vapor is driven from the solid fuels, through hygrolysis, an inward diffusion of air occurs in the dry porous wood. As the cellulose slowly degrades charcoal and combustion gases (pyrolysis products) are produced.

This reaction combined with gaseous oxygen can trigger slow smoldering combustion. Heat migration through ventilated dry channels within piles can direct ignition to the outride of the pile. Favorable wind conditions can then spread fire to surrounding forest fuels causing an escaped wildfire.

The basic elements of creating a spontaneous combustion risk are; 1) processing live coniferous branch and foliage material; 2) delimbing and subsequently grinding or chipping; 3) pushing up large piles of processed material. Time of year, species composition, or longevity of piles we the subjects of further study.

Ignitions from spontaneous combustion can occur within weeks or a few months from the time a pile is created. Piles allowed to stand indefinitely would remain susceptible. Visible signs of self heating in piles are subtle, i.e. evidence of steam vents, warm pile material, pungent incense odor, etc.

Creation of processed delimber “due piles may be classified as an ignition hazard and, needs to be mitigated in a timely fashion. Dispersing pile material to an average depth of less then two feet or utilization of the material is sufficient to minimize the potential of spontaneous combustion. Caution is given not to simply move the problem to another location.

The Oregon Department of Forestry, USDA Forest Service and Weyerhaeuser Corporation are conducting a cooperative investigation into the spontaneous combustion phenomenon. For more information contact Pete Norkeveck, Oregon Department of Forestry, 2600 State Street, Salem, Oregon 97310 or call at (503) 945-7445.

Spontaneous Combustion in Delimber Piles Theories of Basic Physics

Vegetative State - residue that is in some stage of greenness at the time of delimbing and subsequent grinding or chipping will continue respiration for a period of time sufficient to elevate the internal temperatures within a pile. This elevation of temperature could be a catalyst to accelerating the bacterial metabolism.

Spacial Dimension -- most residue piles are generated on site and grow in size until they interfere with processing operations. Sizes similar to traditional slash piles are ideal for self heating processes to occur.

Piles require sufficient size to insulate themselves from outside effects of temperate and moisture ... subsequently this outside layer or pile covering confines the bacterial and oxidation processes. This insulative effect also minimizes ventilation until strong winds or thermal feedback (discussed below) occurs.

Particle Site - normal particle size from delimber operations makes for a better ventilated pile, not as conducive to self heating and a reduced surface to volume ratio in fuel particles ... subsequent tub grinding or chipping increases the surface to volume ratio on the fuel end enhances compaction. Any cooling value from normal ventilation is then minimized and bacterial metabolism is likely to be more active on substrate that has a higher surface to volume ratio.

Soil Bacteria - natural ambient levels of bacteria in woody vegetation may not be sufficient to maintain metabolism to advanced stages. Scraping or pushing piles allows for strong inoculations of soil bacteria which may be distributed throughout the pile. Combined with respiration, this bacterial metabolism or biological decomposition not only would be more aggressive but would persist longer. The rate and period of the bacterial metabolism is believed to be key in triggering hygrolysis and subsequent oxidation.

Hygrolysis - accelerated bacterial metabolism is believed to be responsible for consuming oxygen from fuel particles as well as driving moisture outward into surrounding air spaces. The fuel may have the appearance of being damp or even wet but the particles themselves remain porous, deficient in moisture content and ambient levels of cellular oxygen.

Oxidation/Pyrolysis - during advanced stages of bacterial metabolism ... theorized as being at the point the bacterial metabolism is subsiding, due to higher internal temperatures arid/or oxygen deprivation from consumption, ambient air oxygen will migrate back into the fuel particles. Not being attached or associated with cellular structure or compounds this process oxidizes the cellulose in the fuel particles. Charcoal like compounds and combustion gases are believed to be the products of pyrolysis.

Ignition - theorized as a slow thermal explosion process, ignition results when ambient atmospheric gases come in contact with concentrations of combustion gases being generated from pyrolysis. The oxidized fuel particles may be sufficient to sustain a slow smoldering combustion that could subsequently advance to a spreading fire.

Atmospheric Stability - further study is needed to measure the effects of general weather conditions on the internal self heating processes. In general it is believed that rain, snow or cool temperatures may only delay or inhibit the process. In addition, it is thought that high temperatures after cool periods, especially if winds are present, stimulate the process or trigger ignition.

Thermal Feedback - piles that are believed to have spontaneously ignited have experienced a brief period (1-3 days) of thermal feedback i.e., strong heating by sun. It is believed this thermal feedback may be responsible for two actions occurring within the pile. The strongest theory supports that this causes the pile to increase its internal temperature creating a negative air pressure within which drafts surrounding outside air suddenly into pockets that may be suitable for reaction. A second theory supports that the thermal feedback accelerates the pyrolysis action so quickly that thermal explosion results. There may be a combination of both of these processes at work to cause ignition.

Ferrous Contaminants - metallic burs or shrapnel from chain flails, tub grinders or chippers may be (as yet have not been proven) a catalyst to the oxidation process. Some believe the ferrous composition accelerates the oxidation stage. Other speculation suggests that super heated metallic brands cause an immediate ignition. Residual live fuel moisture is likely to inhibit ignition from a metallic brand. Ferrous contaminants remain an area to be studied.

Spontaneous Combustion in Delimber Piles Intervention Methods

Foliage Dehydration -allow green foliage to cure before secondary grinding or chipping. This may reduce the initial respiration minimizing the stimulus for bacterial metabolism. Grind or chip residue when discoloration in foliage is apparent i.e., red slash appearance.

Avoid Inoculation - store, pile and process residue on hardened surfaces or consolidate piles with machinery and techniques that minimize the amount of soil mixed into the pile.

Avoid Compaction - do not tread residue piles with machinery as this increases the compaction within the pile. Loose piles will better disperse, host through natural ventilation. If ferrous contaminants can accelerate oxidation (theory not as yet proven)…treading piles with tracked machinery would inoculate the pile.

Minimize Dimension - thought to be the most effect treatment...spread piles to an average depth of approximately 24”. It is not known for sure how deep the pile needs to be before self heating occurs. It is believed that the approximate depth of the pile’s insulative layer is about 24", hence the recommendation for pile dimension.

Utilization - spontaneous combustion does not suggest instantaneous ignition. If residue piles were utilized as hog fuel or mulch in a more timely fashion, the process may not have sufficient time or conditions favorable enough to result in ignition. Piles that are occasionally turned or disturbed may be less susceptible. Caution is given to avoid simply moving your ignition hazard to a different location unless it is for purposes of providing better fire protection, improved containment capability and isolation from wildland fuels.

Monitoring - it is important to get the word out to all industrial operators on what the risks are and what to look for. Many operators may have innovative ways to mitigate the risk without adding much expense to their operation. Treating situations after the fact may represent missed opportunities and adds cost to the operation. Proactive mitigation is preferred over enforcement

Enforcement - susceptible self heating piles should be classified as ignition hazards and not merely addition fuel hazards. Utilize federal, state and local laws to achieve timely cleanup when recommendations are disregarded. Most fire liability laws would support that failure to act upon written order and exercise due care in mitigating the hazard would equate to “negligence”.

Appendix G

GLOSSARY OF TERMS

Activity: The specific operation of a piece of equipment such as a chain saw or tractor.

Block: A pulley used in cable logging.

Catalytic Converter: A device usually located between the manifold and muffler designed to clean vehicle exhaust pollutants.

CCR: California Code of Regulations.

CFR: Code of Federal Regulations.

Choker: A piece of cable placed around one end of a log by which to tow or lift it.

Deck: A pile or stack of logs; if stored they form a cold deck, if for loading a (hot) deck.

Duff: Partially decayed leaves, needles, grass or other organic material accumulated on the ground.

Easement: A right afforded a person to make limited use of another's real property.

Feller/Hydro Buncher: Equipment used to harvest trees by mechanical means. The Buncher cuts trees by either use of pinchers or a saw (see hot saw).

Firebreak: Any natural or constructed barrier utilized to segregate, stop and control the spread of fire, or provide a control line from which to work.

Fire Hazard: The flammable materials that may be ignited by the various fire risks or cause fires to increase in intensity or rate of spread.

Fire Risk: A source of ignition of fire hazards.

Fire Season: That portion of the year, generally 6 to 8 months in the summer and fall in California, declared such by the responsible public agency fire administrator. Declaration is based on fuel and weather conditions conducive to the ignition and spread of wildland fires.

Flammable: Combustible and capable of being easily set on fire or kindled.

Fuelbreak: Strip from which forest fuels and woody vegetation have been reduced by thinning, pruning or removal well ahead of time to slow down or stop a wildfire or to provide a control line from which to work.

Hot Saw: Saw on a Feller/Buncher either on a plate or similar in design to a chainsaw. Revolutions of the saw is usually provided by hydraulic pressure at 3000 to 5000 psi.

HSC: Health and Safety Code.

Landing: Any place where round timber is assembled for transport, usually in the woods.

NFPA: National Fire Protection Association.

National Fire Danger Rating System: A scientifically developed system for estimating degree of fire hazard, risk and burning intensity expressed numerically for broad areas.

Operating Area: All the property on which active operations, including transportation, are to be conducted. The area within 100 feet of the traveled surface of roads is generally considered part of the operating area whether or not it is included in rights-of-way or easements.

PRC: Public Resources Code.

Prescribed Burning: Controlled application of fire to wildland fuels, in either their natural or modified state, under conditions of weather, fuel moisture, soil moisture, etc., as to allow the fire to be confined to a predetermined area and at the same time to produce results to meet planned objectives of land management.

Range: A tier of sections six miles wide numbered east or west from a prime meridian running through a Public Land Survey reference point.

Red Flag Fire Alert: A warning system for notification of the public and industry that extreme fire conditions are eminent or in effect.

Right-of-Way: The right to pass over property owned by another party. The path or thoroughfare on which such passage is made.

Section: Normally one square mile containing 640 acres as rayed out in the Public Land Survey.

Slash: Severed limbs and tops remaining after felling or pruning trees or brush.

Snag: A standing dead tree.

Township: A tier of sections six miles wide numbered north or south from a base line running through a Public Land Survey reference point.

UFC: Uniform Fire Code.

Understory: Small trees (seedlings, saplings, pole-sized) growing under a canopy of large, more or less mature trees.

Wildland: Uncultivated land, other than fallow, neglected or maintained for such purposes as wood or range-forage production, wildlife, recreation, protective watershed cover or wilderness.hese devices are to be handled with caution.