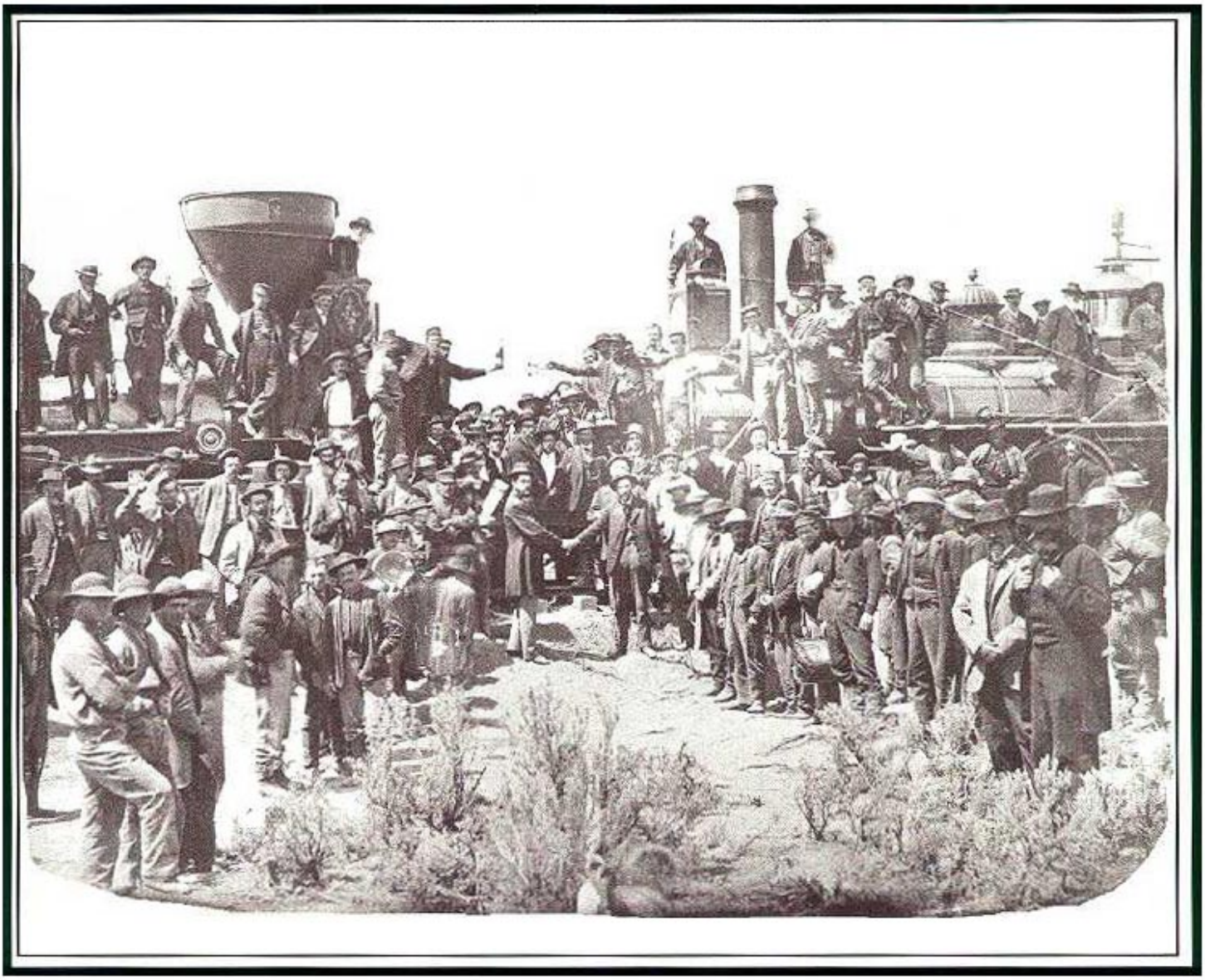
RAILROAD FIRE PREVENTION FIELD GUIDE



RAILROAD FIRE PREVENTION FIELD GUIDE

April 1999

Joan Jennings
Acting State Fire Marshal
Department of Forestry and Fire Protection

Andrea E. Tuttle
Director
Department of Forestry and Fire Protection

Mary D. Nichols
Secretary for Resources
The Resources Agency

Gray Davis
Governor
State of California

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Title: Golden Spike

The joining of the rails at Promontory, May 10, 1869. Shaking hands in center are Chief Engineers Samuel S. Montague of C.P. and Grenville M. Dodge of U.P.

TABLE OF CONTENTS

FORWARD 1

1. INTRODUCTION 2
    1.1 Railroad Transportation Systems 3
    1.2 Issues 4

2. INSPECTION RESPONSIBILITIES 6
    2.1 Company Inspections 6
    2.2 Protection Agency Inspection 6
    2.3 Joint Inspections 7
    2.4 Legal Actions 8
        Administrative *8*
        Civil *9*
        Criminal *9*
        Equity *9*
    2.5 Identification of Item Inspected 9
        Stock Location *9*
        Rolling Stock *10*

3. TRAIN OPERATIONS 12
    3.1 Idling and Acceleration 13
    3.2 Deceleration and Downgrades 13
    3.3 Wheel Slip 13
    3.4 Train Make-up 15
    3.5 Speed Zones 15
    3.6 Detectors 15
    3.7 Block Signals and Train Orders 16
    3.8 Amtrak 17

4. SAFETY 18
    4.1 Rail Operations 18
    4.2 Flag Protection 18
        Blue Flagging *18*
        Torpedoes 19
    4.3 Mechanical Inspections 20
5. EXHAUST SYSTEMS 22
    5.1 Normally Aspirated Diesel Engines 22
        Inspection Procedures *26*
    5.2 Turbocharged Diesel Engines 28
        Inspection Procedures *32*
    5.3 Amtrak 35
    5.4 Steam Locomotives 35

6. BRAKE SYSTEMS 37
6.1 Air Brakes 40
Inspection Procedures *44*
6.2 Dynamic Brakes 45
Inspection Procedures *47*
6.3 Combination Air and Dynamic Braking 47

7. MAINTENANCE OF WAY 49
7.1 Planning 49
7.2 Right of Way Hazard Reduction 50
Mechanical Clearing *50*
Burning *50*
Chemical Treatment *51*
Combination Treatment *51*
Fire Resistant Plants *52*
7.3 Special Problems 52
7.4 Right-of-way Inspections 54
7.5 Maintenance and Emergency Equipment 54
Internal Combustion Equipment *58*
Welding, Cutting and Grinding *60*
Explosives *64*

8. FIRE DETECTION AND SUPPRESSION 65

9. SPEEDER 70

10. APPENDICES 71
A. Glossary of Terms 71
B. Statutes and Regulations 75
State Laws *75*
Health and Safety Code 75
Public Resources Code 77
Title 14, California Code of Regulations, Article 2. Fire Hazard Reduction Standard for Railroad Right-of-Way 83
Federal Regulations *88*
Wildland Fire Prevention (Title 36 Code of Federal Regulations) 88
Operational Safety (Title 49 Code of Federal Regulations) 91
State Regulations *94*
Local Ordinances *95*
Private Regulations 95
Association of American Railroad (AAR) 95
Company Rules 95
Permits and Easements 95
C. Local Directory 96
D. Railroad Section Guide - Order to Abate Fire Hazards Within the Railroad Right-of-Way 98

FOREWORD

This guide contains standards and practices to minimize wildland fires that may be caused by operations and maintenance of railroad transportation systems. These standards and practices are based upon studies and experiences of fire agency and railroad operations 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.

It is expected that all personnel who make inspections of railroad rolling stock or rights-of-way 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 the Guide be given wide distribution at the field level in both the fire agencies and the railroad companies. These personnel should use the Guide, refer to it regularly and observe the principles and practices included herein.

This Guide was developed as a cooperative effort by the Union Pacific Railroad, the Burlington Northern Santa Fe Railroad, the Central Oregon and Pacific Railroad, the California Department of Forestry and Fire Protection, the United States Forest Service, and the Bureau of Land Management.

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

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Respectfully submitted by:

Frank Steele, Battalion Chief
Lassen-Modoc Ranger Unit
California Department of Forestry and Fire Protection

1. INTRODUCTION

The basic objective of all parties involved in the publication and distribution of this Guide is to prevent losses of life, property and natural resources, and disruption of train operations as a result of fires which may be caused by the operation and maintenance of railroad systems.

It is mutually agreed that the most effective means of attaining the above objective is a cooperative approach. There are numerous ways in which this cooperation can be implemented. They include, but certainly are not limited to, joint planning meetings, cross-training sessions, joint inspections, notification of critical fire weather, and fire patrols.

There are a variety of formats for planning meetings. The most effective meetings four routine operations have been annual or semi-annual at the operating unit level, usually a railroad division. All protection agency units should be represented in order to secure uniformity of interpretation and enforcement. Care should be exercised not to overwhelm the company representatives with agency employees.

Company representatives should include maintenance-of-way, train operations and mechanical personnel at both division and corporate levels. Both the company and the protection agency's work plans and inspection programs are to be discussed at these meetings. It is best to limit the agenda for any individual meeting to those topics which can be discussed and resolved in two to three hours.

Contact between agency and company personnel should not be restricted to these planning meetings or an occasional training session or inspection. The people who have been most successful at reducing railroad fire occurrence are those who communicate with each other on a regular basis. They advise each other of observed conditions and practices which may present a problem. Whether violations or not, alternatives should be suggested.

Railroad companies and fire protection agencies have thorough and efficient training programs for their employees. However, much remains to be done in conducting such training with mutual assistance between parties. Agency employees, especially inspectors, need an understanding of railroad operations, mechanical equipment, identification and safety hazards, which railroad employees are most qualified to teach. Railroad employees need to know fire control methods, how to identify fire hazards, and interpretation of laws and regulations.

Joint inspections, although sometimes difficult to arrange and not always feasible, provide excellent on-the-job training. It should be noted they can promote mutual understanding and trust. For safety reasons, mechanical equipment inspections should always be joint.

Fire agency employees can promote a spirit of cooperation and assistance to the railroads by observing and reporting broken or damaged equipment or cargo to the railroad companies.

Most railroad field employees are equipped with two-way radio communication. These radios make it possible to report fires, fire hazards, fire risks or hazardous occurrences to protection agencies. This reciprocates the cooperative effort, which is especially appreciated during critical fire weather.

The railroad companies have responsibilities for inspection of railroad rights-of-way (R/W) and

mechanical equipment. Fire protection agencies have responsibilities for assuring that the railroad companies are in compliance with the law.

The protection agencies' inspection responsibilities are primarily regulatory. They should make sample inspections (spot checks) of rights-of-way, rolling stock and other equipment. Unless a fire has occurred, locomotives and cars should only be inspected in yards or service areas. The purpose is to ensure compliance with regulations and to determine the specific causes of problem areas. The protection agency should always notify the company in writing (LE-38) of its findings, even when the inspection has been conducted jointly with a company representative. Agency inspections will also be made for investigation of the causes of fires that have already occurred.

1.1 Railroad Transportation Systems

The primary purpose of railroad transportation systems is to move heavy or bulky freight from one place to another over land. In addition, certain specialized operations such as Amtrak and some excursion trains haul passengers. A very few, particularly historic or scenic railroads, provide settings for movies and TV programs. In all cases, management's goal is production and profit with safety to cargo, passengers, company personnel and property. With the exception of Amtrak and a few small municipally or district-owned feeder lines, all railroads are privately owned. They must, therefore, show a profit or be part of an integrated company that shows a profit, otherwise they will go out of business or be absorbed by some other company.

The great majority of the trackage and rolling stock in California is owned and operated by two large companies. The remainder is spread among more than a dozen small companies. Some of these are owned by one of the giant corporations but operate under a separate name. Lumber companies own others. Only a few small railroads are truly independent. The large organizations/ corporations who hold ownership of these railroads function similarly to the government agencies with which they interact.

The departments with which fire protection agencies have most frequent contact are maintenance-of-way, mechanical and train operations. Other departments, which must be dealt with occasionally, include claims, traffic, legal, etc. The small companies are much less complex. Most business with them can be transacted through one or two persons.

Line-staff relationships vary from company to company. In some companies, the staff functions at the division level follow those at corporate headquarters. In these cases, roadmasters, trainmasters, claim agents, etc., report to the division superintendent. In other companies division superintendents supervise train operations only. Therefore, protection agency personnel should make special effort to acquaint themselves with the organizational pattern of the particular company(s) with which they must deal.

Railroads are tightly regulated public utilities. There are literally hundreds of federal and state laws, rules and regulations applying to their operations. Many apply directly while others (e.g., air pollution control, environmental protection, etc.) apply indirectly. Most of the direct regulations relate to passenger, employee, cargo or equipment safety. The majority of the indirect regulations are for the protection of the general public and adjoining property. Generally fire laws are regulations which fall in the latter category.

Unfortunately sometimes two or more of these regulations directly conflict with each other, or appear to do so. An example of this is a rule of the Federal Railroad Administration (49CFR218.37) requiring slow-moving trains in areas not controlled by block signals to drop lighted fusees from the train. This appears to be in direct opposition to the fire laws of several states and regulations of the U.S. Forest Service, another federal agency; however, the statute requires compliance with federal, state and local fire laws.

"Pool Agreements" have been entered into by a number of railroad companies to resolve this dilemma, in the interests of time and efficiency. Under the terms of these agreements, trains with distant destinations move smoothly from the tracks of one company to another, often with only a change of train crew.

Pool agreements affect the fire problem in several ways. Some of the railroad companies sending engines into California through these agreements have no shop facilities here. Most agreements limit the maintenance or repair work that will be done by the receiving road. Under existing agreements, little can or will be done to a defective locomotive until it returns to its home road. Also, some of these companies have little or none of their own track in California. In such instances they may not be aware of operations under California laws, particularly those relating to exhaust carbon particles.

Therefore, it is not uncommon for out-of-state equipment to be in violation of California law, thus imposing a legal and financial liability on the receiving road. It is the carrier of faulty equipment, which is responsible for compliance and/or fire damages and suppression costs, <u>not the owner.</u>

1.2 Issues

Courts and legislatures mid nineteenth century first noted the risk of fire damage due to railroad operations. This recognition has led to the adoption of "strict liability" laws in the American legal system.

Numerous states have suited statutes making railroad companies strictly liable, without negligence, for fires set by their operations or rolling stock, or providing that the fire shall be conclusive as to negligence. Such statutes have been held constitutional as reasonable measures for the protection of property and the adjustment of an inevitable risk. California has a statute, Public Resources Code Section 4435, which establishes a rebuttable presumption of negligence and makes the act a misdemeanor.

The reasons for such legal concern were obvious during the days of the wood-fired steam locomotive with no screen on its stack. Each step in the evolution of locomotives (to coal-fired steam, to oil-fired steam and to diesel-electric) brought prophecies ending the fire problems caused by railroads. Unfortunately all of these high hopes were doomed for two reasons.

First, any combustion process produces carbon in some form. Carbon chunks; chips, flakes, etc., are hot enough when ejected to start fires. Second, the early preponderance of fires caused by exhaust obscured the fact that large numbers of fires were originated by other factors inherent in railroad operations, especially cast iron brake shoes.

Our goal, in which we are adamant, is to reduce railroad-caused fires. That it is possible to make significant progress in this direction has been demonstrated in certain protection units and railroad

divisions. One of the primary purposes of this Guide is to make those successful methods available for use elsewhere.

The railroad fire problem is basically composed of two parts: risks and hazards. Risks are the sources of ignition. The two most common of these are exhaust carbon particles and brake shoe fragments. Others include hazard reduction burning escapes, grinding, cutting and welding, smoking, discarded fusees, etc. The primary methods of reducing risks are mechanical engineering, inspection, fire prevention education, rules and regulations.

Hazards are the flammable materials which may be ignited by the various risks. The areas of primary concern in this publication consist mainly of dry vegetation such as grass, leaves, pine needles, tumbleweeds, punky logs, dead brush, etc. Other possible hazards include wooden bridges, snowsheds and trestles, buildings, accumulations of paper or rags, rolling stock, etc. The primary method of reducing hazards is to remove or fireproof them for a sufficient distance from the risks. This may be done by mechanical or physical removal, by burning or by chemical treatment.

2. INSPECTION RESPONSIBILITIES

Railroad fire prevention inspections are made by both the railroad companies and by the fire protection agencies. The reasons for and the timing of these inspections may differ but advantages to both parties can often come from making joint inspections.

2.1 Company Inspections

The responsibility for inspecting their rights-of-way (R/W) and rolling stock for compliance with laws and regulations, maintenance of uninterrupted traffic and avoidance of civil liability rests exclusively with the railroad companies. When equipment owned by one company is being operated by another, the responsibility and liability may be subrogated by contract or agreement. The operating company is the one, with which the protection agency will normally deal and will hold responsible for compliance with the law. It is the responsibility of the management personnel of each company to determine how, when and by whom its inspections will be carried out.

There is no pat answer to the question of how often inspections should be made due to several variables. Each company must determine its own appropriate inspection schedules, which will probably differ between divisions, at least for R/W inspections. Some company rules establish inspection schedules and procedures either more frequent or more intensive than those required by federal or state laws and regulations. At least one company conducts a thorough inspection of the entire train, including the locomotive exhaust system and the complete train air brake system, as soon as possible after each reported fire.

2.2 Protection Agency Inspections

The fire protection agencies are charged with the responsibility of protecting the public from 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 railroad property and equipment in order to prevent wildland fires. Protection agency inspections do not, however, relieve railroad companies of the responsibility of inspecting their own facilities. Public fire protection agencies do have a duty to make known to railroad companies those violations and defects noted during their inspections.

Fire agency inspections are generally of two types: routine and fire emergency. Routine inspections are usually general surveys (by air or rail vehicle) of R/W, or roll-by of air brakes or exhaust systems either at division points or in service areas. The inspector will make every effort to interfere as little as possible with train operations. These may be original inspections or compliance checks following prior notification of violations.

Fire emergency inspections include point of origin and ignition source determination as well as identification of the specific locomotive or car that provided the ignition source. Both types of investigation commonly occur simultaneously, thus requiring the assignment of several inspectors at different locations.

The suspected offending train must be identified and stopped. This requires quick and efficient communications between the fire and train dispatchers. Unless an unusually dangerous fire situation exists, the train should not be stopped on the main line but should be put into the next available siding where it should be held until the inspection is completed. In any event, it should not be stopped where grade crossings will be blocked. The nearest trained and qualified inspector(s) should

be dispatched to the train and the company requested to send for the trainmaster. The inspector should make the inspections thorough but expeditious and should release the train as soon as evidence and statements have been collected. The inspector should also be satisfied that the problem has either been corrected or isolated.

Most fire agency inspections can be adequately conducted by visual inspection. Inspectors should be equipped with such aids as tape measures, notebooks and cameras. For fire cause investigations, they should also have magnifying glasses and magnets. All major violations should be recorded in the field notebook and photographed.

The results of any fire agency inspection should be properly recorded. Each agency has its own forms and procedures for this purpose. Fire-cause investigations will usually be recorded on special forms. Other types of inspections may be recorded on forms, memos, formal letters, etc. One useful form used by CDF and the U.S. Forest Service, and available to other agencies, is the Inspection Report (LE-38 or R5-5100-209). Regardless of the format of the report, a copy should be sent or given to the Railroad Company. Reports should be specific enough for the company to act on them and for the courts to relate them to complaints or other legal actions in the event such actions are filed. <u>They are not to serve as work lists for the company.</u>

Protection agency personnel often have occasion to observe conditions on railroad rolling stock, and to a lesser extent on R/W, that are not violations of fire laws or regulations but which may be dangerous or a violation over which they have no jurisdiction. These should be reported to the company verbally as soon as possible. If they have contributed to a fire, or are likely to, they should also be recorded in writing and photographed.

2.3 Joint Inspections

Joint inspections are for the purpose of acquainting both fire protection agency and railroad personnel with violations and other problems and conditions. They often result in mutual agreement on methods of correction of problems. Joint inspections are not always possible due to time commitments or company or agency policy. They are, however, encouraged to the extent feasible as they provide an excellent opportunity for mutual training, understanding and trust.

Photograph 2-1.
Inspecting a GE Locomotive

Because of the mechanical and physical hazards involved, inspections of locomotive exhaust systems and inspections to determine air brake isolation should always be joint. Company policies vary with regard to who should represent them. Some want a supervisor present. Others want the train crew to represent them. In any event, the agency inspector should not attempt these types of inspections alone.

2.4 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 described briefly here.

Administrative

This 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. If compliance is not obtained, the administrative action becomes a documented history.

Administrative action is initiated by the protection agency and addressed to the operating company. It may take any of a number of forms. The colored inspection tag for locomotives or red tag for other internal combustion engine-driven equipment is affixed to the machine itself. It is both a notice of violation and an order to shut down or isolate the engine and not place it back in service until the violation is corrected. The “Inspection Report” (LE-38 or R5-5100-209) is a notification of the findings of an inspection. It should not be confused with a citation.

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.

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 either the company or the employee who was found committing the act, or both, as the defendant. If the company is named, the only penalty possible is a fine. If an employee is named, the penalty may be either a fine or a jail term or both.

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.

2.5 Identification of Item Inspected

Fire protection agencies have their own systems of identifying locations, usually by section, township and range. They have no specific system of identifying railroad rolling stock. Agency location systems, including place names, generally have no meaning or are confusing to railroad people. It is therefore best for all concerned if the agency personnel identify items and occurrences by the railroad systems' terminology. There are basically two of these: location and rolling stock.

Stock Location

Locations on railroad rights-of-way are best identified by use of the milepost (MP) number. These numbers are indicated on special signs at one-mile intervals along all common carrier railroad R/W. More precise locations between the mileposts are given on different railroads by either pole number, decimal or fraction of a mile. Pole number refers to the telephone poles that parallel most tracks. They are indicated in writing with the MP number followed by a slant (/) followed in turn by the pole number (e.g., 237/20: The 20th pole beyond MP 237). Decimals and fractions are self-explanatory and are indicated by their usual mathematical symbols. Agency inspectors should only use the type of inter-milepost designation used by the particular railroad company being inspected.

Certain special locations can be identified by their names or numbers. These include tunnels, snowshed, bridges, trestles, etc. Most all of these have numbers (e.g., Tunnel 17). The longer or more unique ones are often named (e.g., West Branch Bridge). A properly specific location will also designate which end is being referred to. For this purpose, the end nearest to San Francisco is always "west" to railroad personnel, even if it is north or east geographically.

Place names can be confusing to railroad and protection agency personnel alike if care is not exercised in their use. To railroad people, place names refer to sidings, yards and stations. If the agency people are actually referring to powerhouses, fire stations, campgrounds or something else,

there is no effective communication. In referring to sidings, it is helpful to indicate “east” or “west” switch since many of these sidings are from one to two miles long.

Rolling Stock

A number or a combination of letters and numbers will usually identify trains. However, protection agency personnel are seldom conversant with this system. Still, they can be positively identified by either the lead engine number or any rail car number or both. The time and location seen and the direction of travel (in railroad terminology) should also be given.

Individual locomotives and cars should be identified by number. Additional identifying information is helpful. This might include make and home road of an engine or home road and type (box, flat, gondola, hopper, etc.) of car.

Photograph 2-2.
Truck Trailers on the Rail

Photograph 2-3.
EMD Locomotive

3. TRAIN OPERATIONS

The likelihood of right-of-way (R/W) fires caused by trains can be considerably affected by the ways in which locomotive engineers operate their motive and braking power. It can also be affected by train make-up.

Photograph 3-1.
Engineer's Panel

Photograph 3-2.
Engineer's Panel

3.1 Idling and Acceleration

The time of maximum carbon accumulation in both diesel and steam locomotives is when they are idling or operating at minimum power output.

The time of maximum carbon ejection from a locomotive, assuming no mechanical defects, is when power is applied after a period of idling.

Times and places where locomotives are operated at idle or minimum power include: while parked in yards or sidings, while negotiating downgrades, while decelerating for a stop or for a restricted speed zone.

Other than yard exits, the areas most likely to be plagued with exhaust spark fires are where long downgrades change to level or upgrade track and where changing from level to steep upgrade track.

3.2 Deceleration and Downgrades

This section will discuss ways in which fires can be prevented or increased by the manner of handling brakes. Generally speaking, less right-of-way fires occur when dynamic brakes are used, while the use of air brakes tends to increase risk.

“Stretch braking” is accomplished by keeping the locomotives under power while the air brakes are set on the rest of the train. This requires a light and balanced touch on both the throttle and the brake control valve. It is useful for keeping the slack out of the couplings and thus providing a smooth ride without the jarring that sometimes takes place when cars run together. It can also, cause excessive heating of brake shoes and wheels.

“Bunch braking” happens whenever the braking force is applied at the head end of the train and the rear of the train is allowed to run up toward the head. Dynamic and independent air brakes seldom cause fires. Retainers, however, can easily cause overheating of brake shoes and wheels and consequently, fires.

Many times, especially during combination air and dynamic braking, the air brakes are given less than a full service brake pipe reduction. If there is excess friction or slack in the brake rigging (linkage) on any car in the train, a simple release of this minimum set often will not release the brakes on those cars. Stuck or dragging brakes will result. The way to overcome this problem is to increase brake pipe reduction to, or near to, full service for a few seconds before moving the brake valve handle to the release or run position.

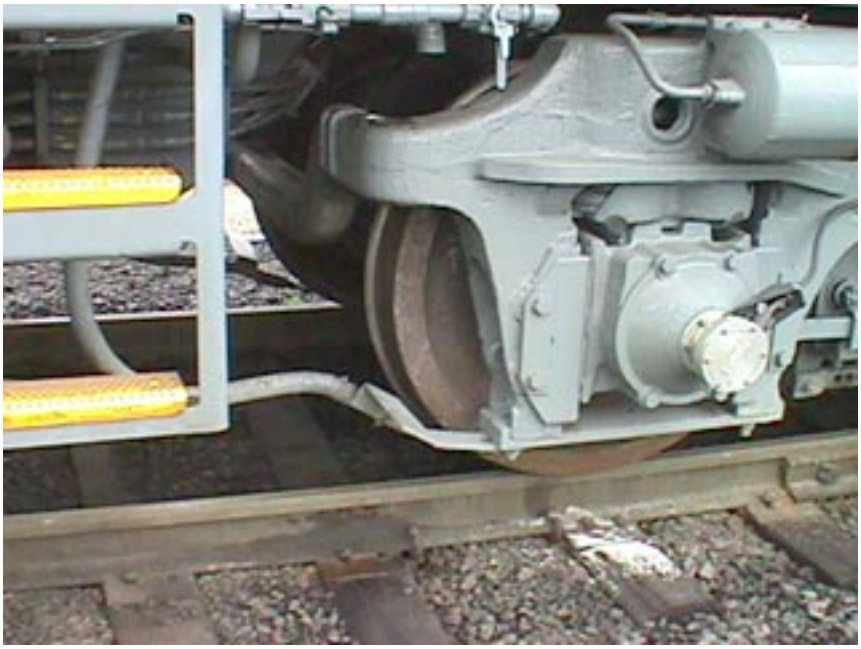
Emergency (maximum) application of air brakes will not normally start fires from brake shoes. Although the shoes on the wheels apply maximum pressure, the train is usually brought to a stop in a short enough time that excessive heat is not built up in the shoes. Of course, if any shoes were badly worn or broken at the time, they would be likely to chip, break or wear through and thus cause fires.

3.3 Wheel Slip

Slippage of wheels against the rail can happen for a number of reasons. These include excessive power applied to locomotive wheels, emergency braking, and retainers, dragging brake shoes, unreleased hand brakes and various malfunctions in the brake system.

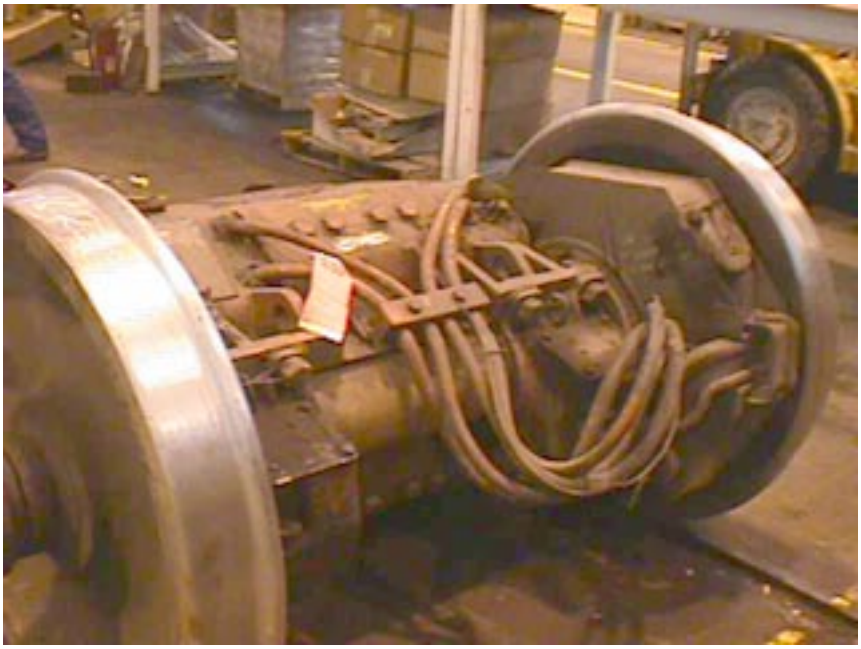
These occurrences produce flakes or chips of metal, which can be found along any railroad right-

of-way. Wheel slip creates flat shavings that sometimes build up on each other and become welded together by the heat of formation. Rail chips caused by flange wear are usually long, slender and pointed with one side quite rough.



Photograph 3-3.
Sand Dispenser for Traction

Although both types of chips can be found which have been blued by heat they do not often cause fires. Also, the momentum of the train does not throw rail chips; but they fall between the rails.



Photograph 3-4.
Traction Motor

Photograph 3-5.
Filling the Train with Sand

3.4 Train Make-up

The way in which a train is made up will determine, to a large extent, what the engineer can or must do with both the throttle and brakes, especially grades and curved tracks.

The handling of long or heavy trains can be enhanced by adding helper engines, either in the middle or at the rear of the train. Helper engines may be either manned or remotely controlled. Helpers assist both under power and while braking, with either air or dynamic brakes.

3.5 Speed Zones

Speed zones are established for a variety of reasons: grades, curvature, populated areas within grade crossings, conditions of road bed, normal stopping points, etc.

Transition zones are between one speed limit and another. When proceeding from a restricted speed zone to a high-speed zone, full power is ordinarily used. As discussed in this chapter, this acceleration will cause blowing any accumulated carbon out of the stack.

When entering a restricted speed zone from a high-speed zone it is commonly necessary to use brakes. If a relatively small speed change is required, it can often be done with dynamic brakes alone. If a large speed reduction is required, air brakes will usually be necessary even if dynamics are also used.

3.6 Detectors

There are two basic types of detectors used by railroads. Most fire agency personnel are familiar with hot box detectors. The majority of them believe increased numbers of detectors would solve most of their right-of-way fire problems. In the first place R/W fires caused by hot boxes, although

common in the past, are quite rare nowadays. The box referred to is the “journal box,” which is no longer used in new construction. It has been replaced by sealed roller bearings. Secondly, the detectors are beamed at a narrow band just wide enough to detect incipient journal or axle heat failure which would lead to a derailment. Although brakes shoes are at approximately this height above the rail, they are usually shielded from the detector by the truck frame. Also, when brake shoes start to fail it is usually at the lower end and out of the detector’s beam.

Photograph 3-6.
Old Style Wheel Bearing (Journal Box Type)

The other type of detector is the dragging equipment detector. This piece of apparatus is intended to protect trains from derailment and structures such as bridges and trestles from damage.

3.7 Block Signals and Train Orders

It should not be assumed that all trains are controlled by block signals. There are more advanced as well as less sophisticated methods of controlling train movement in use. Some of the more advanced systems, e.g., CTC (centralized traffic control), include a supervisory system to control the block signals, whereas normal block signals are automatic in their operation.

Many hundreds of miles of track are still operated under train orders without benefit of block signals. In these areas the train crews are given written orders assigning them blocks of time to occupy certain stretches of track. Special rules are in effect for the safety of all in case the train is stopped, slowed or delayed from its ordered run.

Since some of these areas present communication problems between train crews and dispatchers, agency inspectors should never attempt to stop a train. Use the numbers through dispatch to stop a train and get the location from the train dispatch. Agency personnel must learn the operational procedures for trains in their area and the locations of sidings that can be used.

3.8 Amtrak (National Railroad Passenger Corporation)

Compared with freight trains, Amtrak operates lightweight, short and high-speed trains. The Federal Railroad Administration (FRA) safety rules and Association of American Railroads (AAR) approved equipment are set to much higher standards because of the life safety involved. This indirectly tends to reduce R/W fire setting potential. Offsetting this trend to some degree are two factors unique to Amtrak.

One factor is the fact that passengers are much more sensitive than most freight cargoes to jolting. Therefore, Amtrak engines tend to use more stretch braking than do freight engineers. This means more air in different places.

The other factor tending to increase fire risks from Amtrak is the carbon accumulation in the silencer (muffler) and the difficulty of cleaning the eductor which will be covered in the exhaust section.

4. SAFETY

4.1 Rail Operations

Railroad safety rules are designed to protect railroad workers, not agency inspectors. **THE EQUIPMENT YOU ARE INSPECTING IS NON-FORGIVING.**

Inspections should always be done with a representative of the railroad whenever possible. Face-to-face contact and communications must be made with the railroad employees for your safety. **REMEMBER, ALL RAILS ARE LIVE AND YOU MUST TREAT THEM AS SUCH.**

Inspectors should always wear hard hats, eye and ear protection, coveralls, appropriate footwear, and gloves while performing inspections on railroad equipment. **THE SAFETY RULES OF THE RAILROAD MUST BE ADHERED TO. YOU ARE PROBABLY ON RAILROAD-OWNED PROPERTY AND EQUIPMENT.**

Photograph 4-1.
Blue Flag (No Operation of Train while Displayed)

4.2 Flag Protection

The railroad industry is governed by many agencies, such as the U.S. Department of Transportation, Federal Railroad Administration, Office of Safety. Within Title 49, Code of Federal Regulations, Section 218 - Railroad Operating Practices, there are many sections relating to safety; two partial sections are listed below:

Blue Flagging

Section 218.23 Blue signal display (b) “Blue Signals must be displayed in accordance with Sections 218.25, 218.27 or 218.29 by each craft or group of workmen prior to going on, under, or between rolling equipment and may only be removed by the same craft or group that displayed them.”

Section 218.25 Workmen on a main track (b) “If the rolling equipment to be protected includes one or more locomotives, a blue signal must be attached to the controlling locomotive at a location where it is readily visible to the engineman or operator at the controls of that locomotive.”

Section 218.25 Workmen on a main track (c) “When emergency repair work is to be done on, under or between a locomotive or one or more are coupled to a locomotive, and blue signals are not available, the engineman or operator must be notified and effective measures must be taken to protect the workmen making repairs.”

If your inspection is made when a blue signal is not available, you must establish face-to-face contact and communications with the engineman or operator of the locomotive prior to the inspection and after completing the inspection.

Photograph 4-2.
Torpedo Emergency Signaling Device

Torpedoes

When a train stops on a main track, flag protection against following trains on the same track must be provided as follows: A crew member with flagman’s signals must immediately go back at least the distance prescribed by timetable or other instruction for the territory, place at least two torpedoes on the rail at least 100 feet apart, and display a lighted fusee.

Photograph 4-3.
Chock Block Device (used when train is parked)

4.3 Mechanical Inspections

Most mechanical inspections will be made of either the exhaust or brake systems of railroad rolling equipment or of the maintenance of way equipment.

WHEN INSPECTIONS ARE MADE THAT REQUIRE ASCENDING AND DESCENDING RAILROAD EQUIPMENT, ALWAYS FACE THE EQUIPMENT WHEN MOUNTING AND DISMOUNTING AND USE HANDHOLDS.

Photograph 4-4.
Hands Hold

Locomotives are very large pieces of equipment. Locomotive weight range from 273,080 lbs. for an EMD GP-40 to 415,000 lbs. for a GE C60 AC. Heights for these same units measured from the top rail are approximately 16 feet. Lengths range from 59 to 80 feet, most are over 10 feet in width. Fuel capacity ranges from 3,200 to 5,500 gallons of diesel, lube oil averages 400 gallons per unit. Rated horsepower varies between 3,000 to 6,000 with an average minimum speed of 12 mph to a maximum speed of 70 mph.

Photograph 4-5.
EMD Locomotive

5. EXHAUST SYSTEMS

Exhaust sparks usually carbon chunks or flakes, have long been the single greatest cause of railroad right-of-way (R/W) fires, although in some areas this may not be true.

Photograph 5-1.
Exhaust Stack with Carbon Build-Up

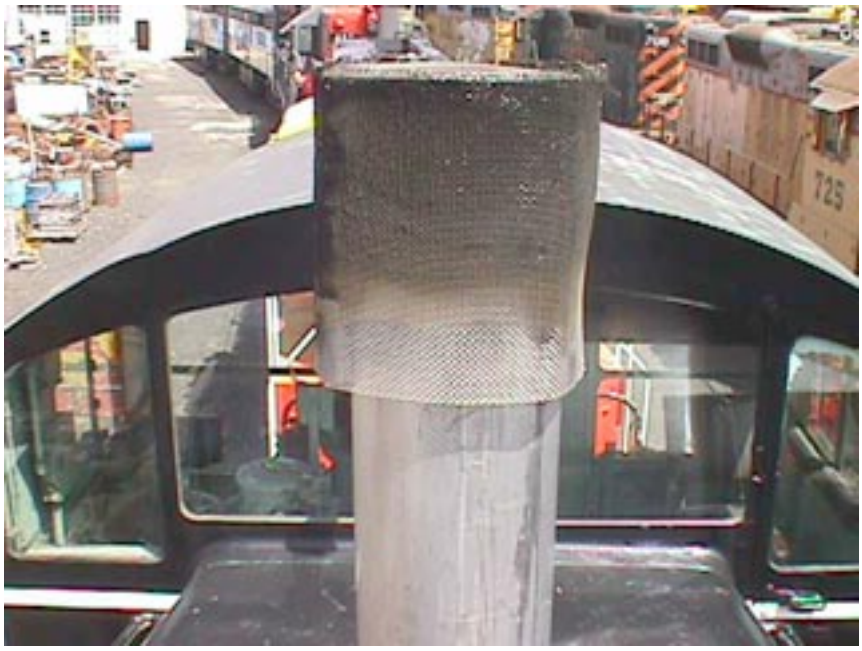
5.1 Normally Aspirated Diesel Engines

On this type of diesel engine the intake air is supercharged by means of a gear-driven blower. The most common of these is the Roots Blower. Crankcase fumes are withdrawn ("aspirated") by a tube connecting the crankcase through an oil separator with the intake side of the blower where a slight vacuum exists. Thus the crankcase fumes pass through the cylinders and if any oil is present in them it is burned along with the fuel oil. The exhaust carbon created in this configuration is generally hard, nonporous and very hot. It cools rapidly in open air but can easily start fires in dry vegetation or other flammable material if it is large enough to maintain a temperature at or above their ignition level for any significant time. Therefore it is important to either trap the particles or break them up into pieces too small to cause a fire problem. Two basic methods have been employed for doing this: screens and spark arresters.

Photograph 5-2.
Roots Blower - EMD

Screens are the oldest and simplest method of preventing the escape of carbon particles. Screens are usually attached to the top of the exhaust stock. They are not, however, sufficiently effective and can cause other problems. If the holes are small enough to stop all dangerous particles they cause excessive backpressure. Screens also tend to clog up and burn out, thus requiring frequent cleaning and replacement. They are no longer used on road engines; their use is now confined to smaller and older yard and switch engines.

Photograph 5-3.
Exhaust Stack with Illegal Screen
(Requires an Approved Spark Arrester)



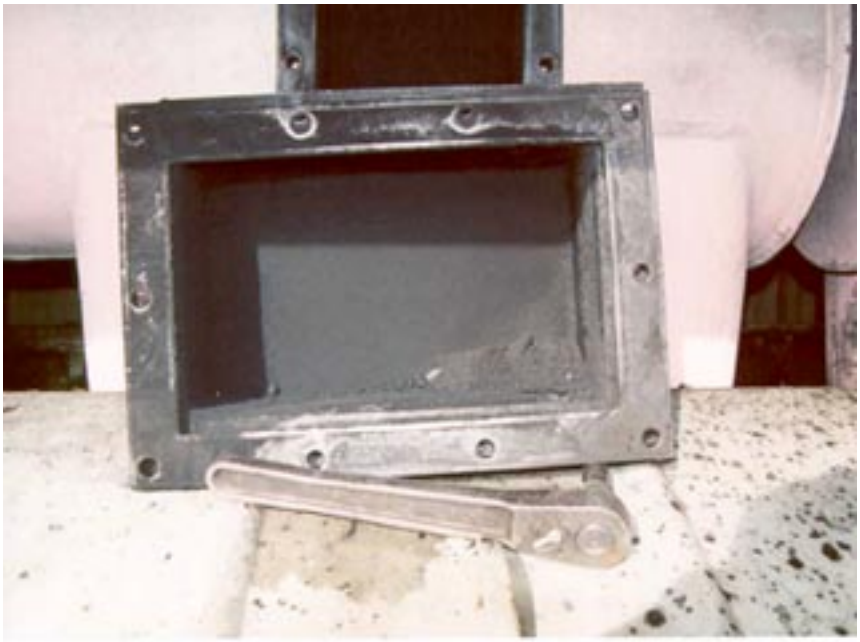
Photograph 5-4.
Illegal Screen (Requires an Approved Spark Arrester)

Photograph 5-5.
Screen Stack (Illegal - Requires an Approved Spark Arrester)

Modern locomotive spark arresters are of the vortex type wherein the exhaust gasses are directed tangentially into a cylindrical chamber at various points along the chamber but expelled at only one point, producing a spiral motion of the gasses in the chamber. There are two variations of this system: the attrition arrester and the retention arrester.

The retention spark arrester depends upon centrifugal force to throw the carbon particles, which are much heavier than the gasses carrying them, against the outer walls of the chamber. From here they are channeled to externally mounted traps which can be emptied by removing a cap on the bottom. It has been found from experience that, unless the engine is in perfect condition, these traps tend to fill up quickly. This destroys the arresting capability of the system and sparks start going out of the stock. Therefore, it is recommended that the traps be emptied not less than every seven days. Some companies do this every five days. In California both attrition and retention spark arresters rated and approved by the U.S. Forest Service are legal unless it can be proved that particles larger than 0.0232 inch in diameter will escape the exhaust system.

Photograph 5-6.
Exhaust Clean-Out Trap on Non-Turbo Engine



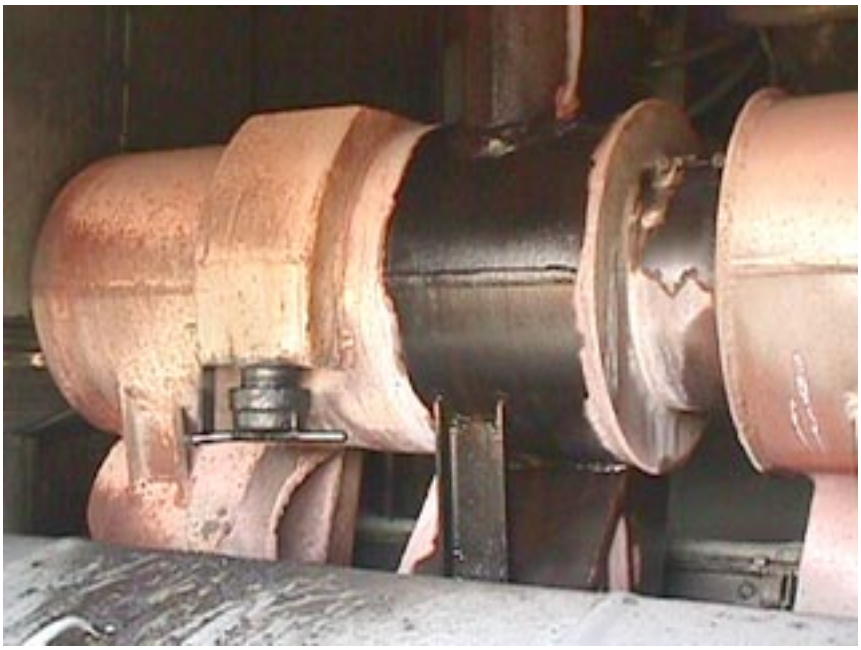
Photograph 5-7.
Clean-Out Trap (Note Carbon Lower-Left Corner)

Inspection Procedures

Inspections of the normally aspirated (non-turbocharged) locomotives will require that the unit be shut down while performing the inspection. Railroad personnel must perform this shutdown. If one

or more of these units is to be inspected in a consist, only one unit needs to be shut down at a time. Inspectors should never start or shut down a locomotive.

Most normally aspirated locomotives are fitted with retention spark arresters. The side doors along the catwalk are opened to gain access to the caps on the carbon traps. Having been shut down, these carbon traps, the arrester and the exhaust manifold will be very hot - **WEAR GLOVES.**



Photograph 5-8.
Cup-Type Carbon Trap

Photograph 5-9.
Cup-Type Carbon Trap (Note Locking Mechanism on Right Side)

Retention trap caps should be removed and replaced by a company employee when possible. The trap caps will often require a tap from a hammer or wrench to start them to unscrew. Before removing the caps, provisions should be made for catching any carbon that may be inside the traps. This may be done with a coffee can or a piece of cardboard. After removing each cap, caked carbon should be freed from the inside. This may be done by tapping the trap with a hammer or by probing inside with a bent metal rod. After emptying the trap, the cap should be replaced snugly, but not excessively tight, and the vibration lock engaged.

5.2 Turbocharged Diesel Engines

On this type of engine supercharging is achieved by a blower that is driven by the exhaust gasses passing by impeller vanes mounted on a common shaft with the blower vanes. There are several makes and models of these but they all operate on the same principle. In most turbo-charged engines, crankcase fumes are not removed by direct suction as in the normally aspirated engines. Instead a venturi principle is used. This is commonly called an eductor. Consequently the carbon particles are like those in normally aspirated engines: hard, nonporous, and very hot. The difference is in their manner of disposal. The particles travel, with the gasses carrying them, through the impeller vanes of the turbocharger.

Photograph 5-10.
Inter Cooler

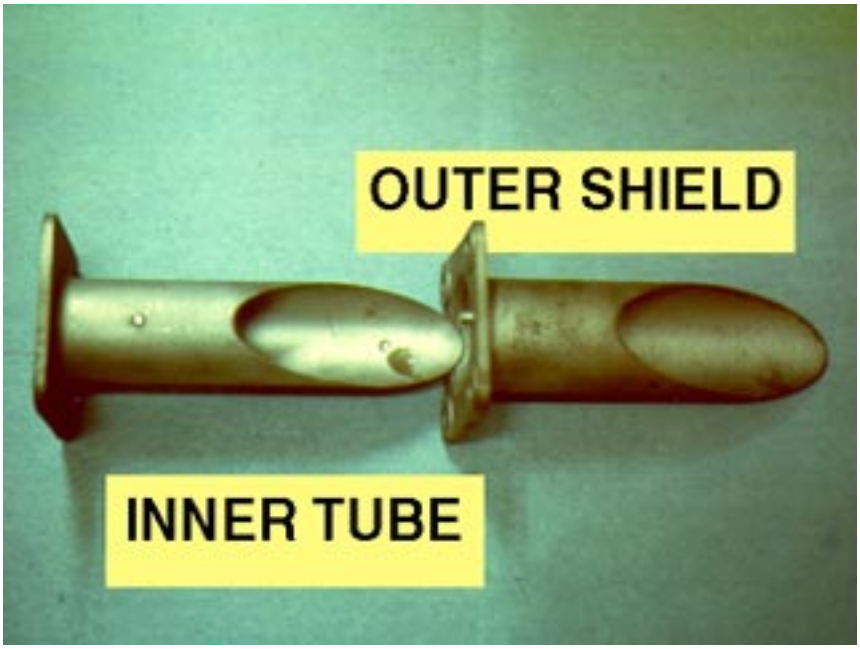
Photograph 5-11.
Turbocharger - GE

These high-carbon steel vanes are mounted close together and rotate at extremely high speed (approximately 20,000 RPM depending on make and model). Experience and limited testing suggest carbon particles are pulverized. This is not a fire risk assuming that all gasses go through the turbo and there are no malfunctions. The more common type of eductors found on larger road engines,

mostly EMD (Electromotive Division of General Motors) and GE (General Electric), use the exhaust gasses after they have passed through the turbocharger to provide the venturi action on a tube connected to the crankcase through an oil separator.

Since oil separators are never 100% effective, a certain amount of crankcase oil is introduced into the exhaust gasses in the upper stack. The average temperature of these gasses under normal load conditions is 1100°F. Therefore, a certain amount of coking takes place in the stack around the rim of the eductor tube where more oxygen is available. With this configuration, most of the cylinder carbon is adequately disposed of by the turbocharger; however, soft and porous carbon is formed and introduced into the exhaust system. This carbon is different than cylinder carbon and in many ways more dangerous from a fire standpoint.

The pores are not void but full of oil. Although this carbon may not be as hot initially as cylinder carbon, it is hot enough to ignite the contained oil as soon as sufficient oxygen is present. Such particles have been observed coming out of the stack apparently cold and bursting into flame within a fraction of a second after alighting on flammable materials. This phenomenon has been verified by research at the U.S. Forest Service Fire Laboratory in Riverside, California. The above-described phenomenon can take place even when everything is operating normally. If any malfunction occurs, such as a clogged oil separator or a blown shaft oil seal on the impeller side of the turbocharger, excessive amounts of oil will be discharged into the hot exhaust gasses in the stack and the carbon build-up situation will be aggravated.



Photograph 5-12.
Eductor Tube

The two most common makes of turbocharged locomotives in use at this time (EMD and GE) have crankcase eductors that work on the same principle. However, they present quite a different appearance and different fire prevention problems. The standard EMD eductor tube is removable

from the outside of the stack, and is thus easily cleaned of carbon or replaced. Its protective shroud is welded into the side of the stack. The shroud commonly becomes coked up the same as the tube itself, but it is much more difficult to clean. Several companies have developed their own special tools for this purpose. Industry and fire protection agencies have agreed on a 30-day or less maintenance cycle, and in some cases a 13 to 15-day cycle.

Photograph 5-13.
Dirty Eductor Tube

Photograph 5-14.
Looking Down Exhaust Stack with Eductor Tube

The GE eductor tube is considerably more difficult to clean. It is welded into the exhaust stack, thereby requiring cleaning from the top of the stack. The angle of the tube, the baffle in the tube and the presence of gratings over the top of the stack combine to make effective access significantly difficult. Again, various companies have developed special tools for this operation.

The mufflers also make it impossible to inspect or clean the eductor tube from the top. The tube must be removed for inspection and cleaning. Some models of EMD freight engines are equipped with exhaust silencers. They can be expected to present the same carbon build-up and inspection problems as do Amtrak locomotives.

Inspection Procedures

Inspections of turbo-charged locomotives do not require the unit to be shut down, **unless the unit is equipped with a muffler**. An exhaust inspection on most turbocharged locomotives requires looking down the stack from the top of the locomotive, because the condition of the eductor is of prime importance. This means climbing on top of the locomotive. Safety rules do not permit railroad personnel, except certain supervisors and mechanics to do this.

The inspector therefore should proceed with **CAUTION.** Most locomotives are fitted with handholds at each end - **USE THEM.** No other means of access to the top of the locomotive should be used. **LOCOMOTIVES ARE OFTEN QUITE DIRTY ON TOP AND EXTREME CARE MUST BE USED WHEN WALKING ON THEM. IF THE TOP OF THE LOCOMOTIVE IS WET, STAY OFF! SIXTEEN FEET TO THE RAIL IS A LONG WAY TO FALL.**

The fewest obstructions are encountered going up the cab end of most locomotives. However, climbing and descending is more difficult. If access is gained from the other end, walking from the end of the unit to the stack should be done over the dynamic brake and engine cooling fans to the stack. Each fan grating should be tested to determine if the grating is loose. Do not step on the bars supporting the cover. These cooling fans may start and stop at any time.

Photograph 5-15.
Top of Locomotive, Exhaust Stack

When on top of the locomotive, personnel must exercise extreme care so that nothing, e.g. pencils, eye glasses, mirrors, cameras, are dropped into the cooling fans or exhaust stack. All unneeded loose items should be left on the ground or secured inside buttoned pocket flaps. Any such foreign object can cause severe damage to the turbocharger. If your foot goes into a cooling fan, you may suffer severe damage.

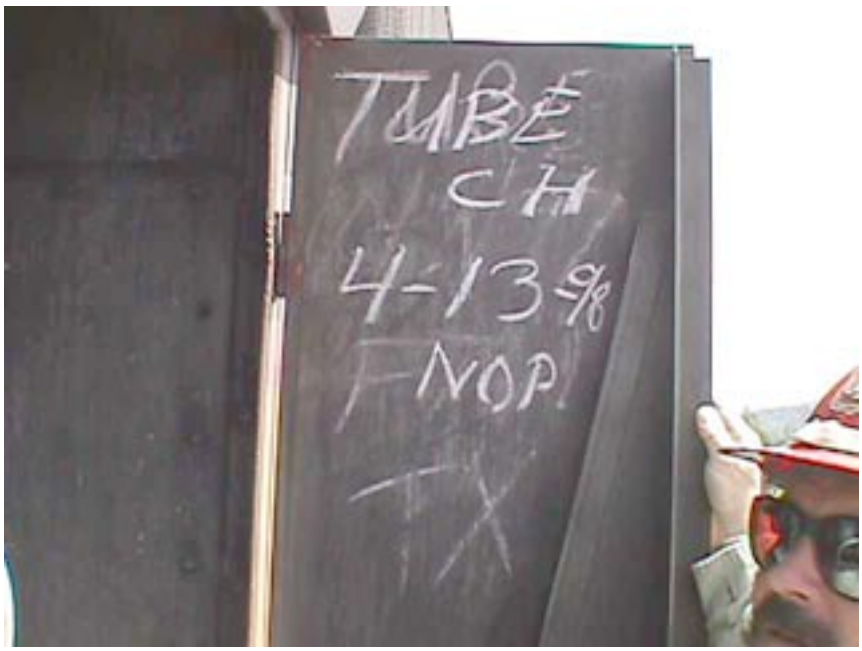
On turbo-charged locomotives that have a muffler, inspection of the eductor is not possible from the top of the unit. The eductor tube is hidden inside of the muffler and must be removed for inspection.

Newer and some retrofitted GE locomotives have been equipped with a coalescer which is intended to replace the eductor tube in the exhaust stack. A sticker that uses a circular symbol with a diagonal line through the eductor symbol may identify some of these locomotives. This sticker may be located on an outer compartment door on the locomotive.

Additionally, due to recent mechanical problems with the coalescer system, some of these coalescer-equipped locomotives have an eductor tube placed into the exhaust outlet. The non-eductor tube sticker may not have been removed from these units and will require a visual inspection of the exhaust outlet.

Recently, some railroad companies have established a practice of dating the eductor tube when it was last serviced by applying a date and location to the interior of the access door where the eductor tube is located. Look at the date, generally a 10 to15-day cleaning cycle is sufficient. Look at the gasket that seals the eductor to observe if the gasket looks new. This may be an indication that the eductor serviced occurred. If in doubt, look down the stack or have the eductor removed for inspection.

Photograph 5-16.
Looking Down Exhaust Stack with Eductor Tube



Photograph 5-17.
Date of Maintenance Marked on Inside of Engine Door

5.3 Amtrak

Amtrak passenger train locomotives are turbocharged diesel electric units. Thus, they present similar exhaust spark problems as discussed above. Because of noise pollution regulations, they are required to be fitted with silencers (mufflers). It has been found that these silencers tend to trap carbon particles until they build up an accumulation. The carbon may break loose and be expelled on the right of way. The silencers also make it impossible to inspect or clean the eductor from the top. The unit must be shut down and the tube removed for inspection and cleaning.

Photograph 5-18.
Disc Brakes

5.4 Steam Locomotives

Steam locomotives, fired by wood or coal were the original railroad fire setters. Fortunately, for fire protection agencies there are very few steam locomotives left. All these were either built for or converted to oil fuel. Their use is usually for tourist attractions and movie making, but they are still capable of starting fires and will be discussed briefly here.

Photograph 5-19.
Steam Locomotive

Carbon is formed in steam locomotives primarily in the boiler tubes and to a lesser extent any place where the exhaust gasses meet an obstruction or change direction. Carbon on the walls of the boiler tubes is not only a potential fire starter but also reduces the efficiency of the boiler by acting as a heat insulator.

It is, therefore important for the operating company to prevent any more than a slight build-up of carbon there. This is done by frequent sanding of the tubes. By this process, sand is introduced into the firebox and carried through the tubes by the strong draft. In the process it scours the sides of the tubes of carbon leaving bare metal. If this is done often enough, e.g. once a day, the carbon particles removed are too small to cause a right-of-way fire problem.

To make doubly sure that carbon sparks will not be emitted from the top of the stack, most railroad companies fit their steam locomotives with a double set of screens. One set is internal between the exhaust end of the tubes and the smokestack. The other set of screens is fitted to the top of the stack. These screens are subject to the same drawbacks as exhaust screens on diesel engines: clogging, backpressure, burning out, etc., however they are the only practical spark arresting system for steam locomotives.

Some people are concerned when they see flames apparently outside of the firebox. There is seldom anything to worry about. Ordinarily the in-draft is so strong that not only the flame but anything else that is loose is immediately drawn inside the firebox. About the only situation in which the firebox presents a wildfire problem is if the locomotive is parked where the right of way has not been cleaned of standing dry grass or litter.

6. BRAKE SYSTEMS

With the advent of composition brake shoes, brake shoe sparks and fragments are much less common as the cause of right-of-way (R/W) fires, unless the shoe is worn out. Much less common, but not unheard of, are explosive arcing of dynamic brake grids and shavings of hot metal from wheels and rails. In the past, it has often been assumed that brake shoe caused fires were confined to down grades and areas where trains were stopping. This is not necessarily so. Various types of malfunctions can cause hot brake shoe chips to fly off on upgrades or level high-speed tracks.

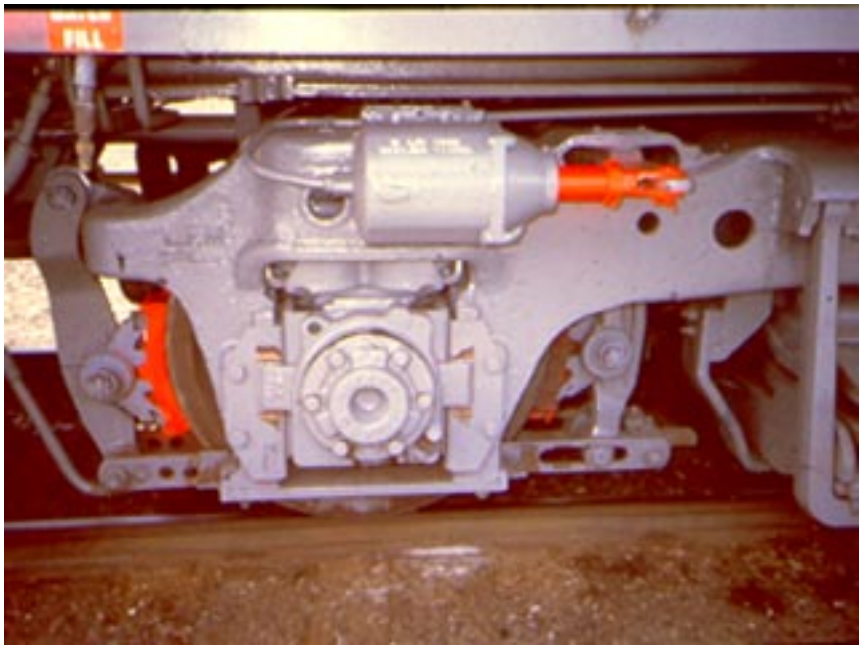
Photograph 6-1.
Switch Engine, Cast Brake Shoes with Wear Indicators

Photograph 6-2.
Composition Shoes

Photograph 6-3.
Switch Engine, Flanged Cast Shoes (has more braking power)

Photograph 6-4.
Cast Brake Shoes (Note Wear Indicators - Center of Shoe)

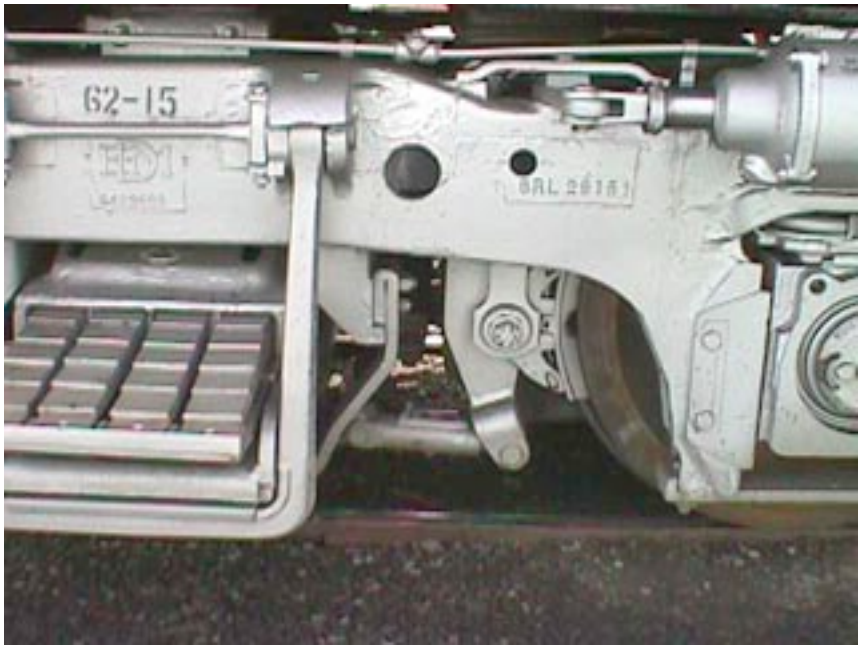
Photograph 6-5.
Worn Brake Shoes (Left: Composition Shoe; Right: Cast Iron)



Photograph 6-6.
Brake System

6.1 Air Brakes

Train air brakes are a combination of mechanical devices operated by compressed air, arranged in a system and controlled manually or pneumatically, by means of which the motion of cars and locomotives is retarded or stopped. The air is supplied by a compressor mounted on the locomotive. It is delivered to the cars through a brake pipe in each locomotive and car, and to the flexible hoses and couplings between them. A series of valves, air reservoirs and pistons transforms changes of pressure in the brake pipe into application or release of pressure by the brake shoes against the wheels.



Photograph 6-7.
Composition Brakes

These changes in brake pipe pressure are normally initiated deliberately by the locomotive engineer but may be initiated from other positions or by malfunctions. A fundamental understanding of train brake systems and how they operate is necessary if we are to be effective in preventing fires from this cause. All railroad rolling stock is equipped with air brakes. Most modern road locomotives are also equipped with dynamic brakes. These two braking systems are often used together. One affects the other in various ways. Therefore, this chapter is divided into three sections, one for each system alone and one for combination use.

Through the automatic brake valve located on the control stand, the locomotive engineer supplies air to the brake pipe in the locomotive and cars. This air charges the auxiliary and emergency air reservoirs of the car brake equipment and the auxiliary reservoirs on the locomotive. Various settings of the automatic brake valve handle then vary the brake pipe pressure to cause the automatic train brakes to apply or release at service or emergency rates. A separate handle on the brake valve allows the engineer to control the air brakes on the locomotive independently of those on the rest of the train if desired. The initial brake pipe pressure depends on company policy and operating conditions. The most common pressure is 90 psi.

By reducing this pressure the engineer causes air to move on each car from the auxiliary or emergency reservoir, or both, to the brake cylinder, forcing the piston out and through a system of rods and levers, causing the brake shoes to rub against the wheels.

Restoring brake pipe pressure to normal reverses the process and releases the brakes.

Locomotive air brakes seldom cause right-of-way fires for two reasons. First, there is less opportunity for a malfunction between the brake valve and the brake shoe. Secondly, all modern road engines are equipped with brake shoes of composition rather than cast iron. So long as they are

replaced before wearing too thin, composition shoes will not shed chips or flakes of hot metal. Passenger cars and new freight cars (those built since 1970) also use composition brake shoes.

Malfunctions can happen at many different places and from various causes, most of which would be invisible or unrecognizable to a fire agency inspector. On the other hand, the results or symptoms are usually visible and should be recognized by the inspector. He/she should also know what must be done to correct the problem or to isolate the offending car from the train brake system. He/she should never attempt to take such action personally, but should merely satisfy him/herself that company employees have corrected the situation.

The most obvious result of an air brake malfunction is smoke being given off by brake shoes dragging against wheels. Another indicator is an extended brake cylinder piston when those on all other cars are retracted (train brakes released) or a retracted piston when the others are extended (brakes set). On some new cars the brake cylinders are mounted on the wheel trucks and are not readily visible from alongside the car.

In any of the above situations, the offending car should be isolated from the train brake system and its own brakes released until the cause of the malfunction can be determined and corrected. So long as only one car (or a very few in a long train) is isolated, the safety of the train for shortage of braking power is not affected. Trains must have 85% effective brakes and no more than three consecutive cars with inoperative brakes. Isolation is accomplished by closing the cutout cock between the brake pipe and the control valve. Brake release is done by pulling or pushing on the release rod which releases the air in the brake cylinder. This can only be done by a railroad employee, never by a fire agency inspector. The brake shoes may not separate from the wheels until the train starts to move but there will be no pressure on them and the piston will retract.

Retaining valves (retainers) control the exhaust of brake cylinder air. In their normal operating position the air is exhausted directly and quickly when the engineer returns brake pipe pressure to normal. Their purpose is to retain a steady pressure or a controlled slow release depending on which position the handle is set. These valves were originally developed as a safety measure, which would allow the engineer to recharge the air system without losing all braking action on the train. This was quite necessary to avoid runaways by heavy trains on long downgrades. Modern dynamic brakes have largely taken over the function of retainers, which are seldom used in normal operation now. Retainers are still required to be installed on all railroad rolling stock as a back-up safety system. Since retainers create prolonged brake shoe pressure on the wheels, they cause overheating and sparking. Agency inspectors should, therefore, report any they observe in other than normal position.

Photograph 6-8.
ABD, Retainer and Brake Cylinder

Photograph 6-9.
Retainer Valve

The various items referred to above - brake cylinder and piston, cut-out cock, control valve, release rod, retainers - are located in different places on different types of cars. This is particularly true of specialty cars, e.g., automobile cars, hopper cars, tank cars, etc. Anyone who is expected to inspect railroad rolling stock should make it a point to learn the configuration of as many types of cars as possible.

FRA rules require testing of train air brake systems at various times and places. Most operating companies conduct additional and/or more detailed tests. These air brake tests are done to ensure train safety rather than for fire prevention purposes. They do, however, affect fire prevention because they assure that, at least at the time and place where the test is made, the brakes are operating properly, i.e., there are no dragging or excessively worn brake shoes that could throw fire-causing sparks.

A complete test is made at each initial terminal where a train is made up. The test includes setting and releasing air, checking brake pipe leakage and visual inspection of brake equipment on each car. A similar inspection must be made at intervals of not more than 500 miles, where interchange from one company's tracks to those of another company takes place and where cars are added to or deleted from the train. All these tests must be recorded on FRA Form F-6180-48, a copy of which is to be kept in the cab of the control locomotive until the train arrives at its final terminal (49CFR232.10-232.19).

Most Amtrak cars (those built since about 1970) do not use brake shoes. They are equipped, instead, with disc brakes. Fortunately they are all composition brake shoes and rarely spark unless worn.

Inspection Procedures

Airbrake inspections are of three types. The first is the FRA required safety inspection done by company employees. The other two are the roll-by and isolation verification. The roll-by may be done by either company or agency personnel. A fire agency inspector will conduct the isolation verification, usually after a fire has occurred and the train has been stopped.

A roll-by brake inspection is made while the train is moving, preferably at a slow or moderate speed. It is a visual inspection to determine whether or not there are dragging brake shoes, extended brake cylinder pistons, loose or hanging rigging, etc. One person cannot effectively accomplish this kind of inspection. The brake cylinders will never all be on the same side of the train. It is usually difficult to see the shoes on the far side well enough. Therefore, one or more inspectors should be on each side of the train.

Inspectors should not stand too close to the train for two reasons. The first is safety. Loose or protruding items are much more dangerous close to the train. The second is efficiency. It is much easier to observe a moving object if it is not too close. A safe practical distance from the near rail for a roll-by brake inspection must be maintained. **REMEMBER, ALL RAILS MUST BE TREATED AS LIVE - PAY ATTENTION TO YOUR SURROUNDINGS.**

Photograph 6-10.
Incoming Train

During a roll-by or other inspections of rolling stock, inspectors should be alert for conditions which, though not immediate fire risks, are indicators that fire or other problems are imminent. Such things as cracked or chipped wheels, flat wheels (usually heard as thumping sounds), built-up wheel shavings, dragging equipment, etc., should be noted on the LE-38 and reported to the company as soon as possible.

An inspection to verify that a car(s) with defective air brakes has been isolated from the brake pipe requires that the inspector know how this is done and what things should look like after it is done. A company employee will do the actual isolation, either in the presence of an inspector or before the inspector arrives. The inspector must ensure that the branch pipe cutout cock handle is closed and the air released from the brake cylinder and the brake shoes are not dragging on the wheels. All this, except the position of the branch pipe cutout cock handle, can be done without getting under the car. The inspector should get no further under the car than is absolutely necessary to observe the cut-out cock and should stay as short a time as possible. If the inspector finds that he/she is on the wrong side of the car, or needs to observe both sides, **the inspector should go around the end of the train or over a car fitted with climbing rods, NEVER BETWEEN CARS.**

6.2 Dynamic Brakes

Dynamic braking is a system which transforms the mechanical energy of turning locomotive wheels into electrical energy in the traction motors operating as generators and then into heat energy in the resister grids where it is finally dissipated to the atmosphere. The effect is similar to that of a motor vehicle decelerating on compression.

Since dynamic brakes only act to retard the rotation of locomotive wheels, not car wheels, they concentrate the braking force at the head of the train and behind helper or RCE-1 units if present. In

this respect they are like the independent locomotive air brakes. That is, they tend to take the slack out of the couplings and cause the cars to bunch up behind the locomotive. This is known as “bunch braking.” It is the opposite of “stretch braking” wherein the cars are strung out as far as possible. Both types of braking are normal and are used legitimately in the proper situation but can cause real problems if used at the wrong time and place. Therefore, dynamic brakes cannot be automatically considered to be the answer to all brake shoe fire problems.

When the engineer switches from power to dynamic brake operation at the control stand, he/she first reduces the diesel engine to idle and then actuates a series of electrical contacts that break the circuit between the main generator and the armatures of the traction motors. He/she then closes the circuit between the traction motors and the grids and closes the circuit to the motors of the grid cooling fans. The main generator continues supplying the field coils of the traction motors but this requires very little power. An appreciable time, a minimum of 10 seconds, is required to avoid electrical damage throughout the system.

Dynamic brakes provide some retarding force any time the locomotive is moving (armatures of traction motors rotating) but this force is much less at very low or very high speeds than it is at designed speed. Designed speed varies slightly for various makes and models but generally falls between 20 and 25 mph. As a general rule, dynamics are about one-third as effective at 70 mph as they are at designed speed. Effectiveness of standard dynamics decreases on a straight line from designed speed to zero speed. Most newer locomotives are equipped with “extended range” dynamic brakes which maintain near their maximum effectiveness down to between six and ten mph before dropping off rapidly to zero. In any event dynamics, though useful for slowing a train and reducing the use of air, are not capable of bringing a train to final stop. Air must be used for this.

Various malfunctions may cause dynamic brakes to lose some or all of their effectiveness. Short circuits can happen because of foreign objects or connectors loosened by vibration. One or more of the relays or electrical controls may stick. Any of these occurrences will probably necessitate a switch to air brakes with the attendant risk of brake shoe sparks.

The most serious type of malfunction of dynamic brakes from a fire prevention standpoint is explosive arcing of the grids, which can shower molten metal for 100 feet or more. It will most often be caused by failure or seizure of a blower fan motor. Dynamic brake grids are essentially nothing more than gigantic toaster grids. The difference is that they operate at 600 volts and up to 740 amperes, or 444 kilowatts. The heat generated cannot be dissipated without a large volume of air being blown across the grids continuously while they are operating. In fact, the high-pitched whine of the fan blades is one way to tell that dynamic brakes are in use. If anything stops the fans, overheating and possible arcing of the grids can take place rapidly.

Photograph 6-11.
Cooling Grid (Do Not Walk On)

There is no effective method for making a standing test of dynamic brakes. Ordinarily an engineer will run the controls through the dynamic braking cycle before starting a run to find out if the controls and relays are operating. They make a distinct sound as they open and close, but the engine or train must be in motion before any current will register on the meters.

Inspection Procedures

Dynamic brakes cannot be effectively inspected in the sense that exhaust systems and air brakes can. The locomotive engineer has certain tests that he/she can make in the yard. Basically the fire agency inspector is limited to listening for the whine of the grid cooling fans while the train is in motion. Or he/she may ask questions of the engineer when the train is stopped. On rare occasions the inspector may be called upon to inspect a set of blown out grids. These are easy to identify from the distorted metal projecting through the protective grating. **In any case, agency personnel should remember that dynamic brakes OPERATE AT 600 VOLTS AND ARE DANGEROUS TO GET CLOSE TO.**

6.3 Combination Air and Dynamic Braking

A skillful engineer seldom relies on either air or dynamic brakes alone to control the train. Of course a failure of one system may force him/her to use the other. It is not particularly unusual to rely on air because of failure of dynamics. Failure of the air brake system is more likely to cause either a train separation or a locking up of all the air brakes on the entire train, possibly causing a derailment. In any case, a reliance on dynamic brakes with no air brakes available never happens.

Several situations dictate the use of both systems together in order to properly control the train and also to prevent brake shoe caused fires. Others merely represent good train handling practice.

When the train is moving faster than 25 mph or slower than 20 mph (6-10 mph with extended range dynamics) it is difficult to achieve the desired control with dynamics alone. In the higher speed ranges it may also be dangerous. Therefore, combination braking is usually called for.

Sometimes a train will be too heavy to be controlled with dynamics alone. Depending on locomotive design characteristics, operating speed and grade, a set of dynamic brakes will hold back on a downgrade between 80% and 100% of the load that the same locomotive will pull upgrade. Trainmasters are not supposed to overload trains. They are human however, and mistakes have been made. In this event the engineer will have to supplement dynamics with air.

Except for switching, car pick-up and some short-haul operations, trains are rarely operated with a single locomotive. A group of two or more locomotives is called a “consist.” The dynamic brakes on all locomotives in a consist are operated as a unit. The weight of the train and the grades to be negotiated determine the size of the consist. If one or more of the locomotives in the consist loses its dynamic brakes the remaining units will probably not be enough to control the train without supplementing with air.

Other situations calling for simultaneous use of dynamic and air brakes have to do with “stretch” and “bunch” braking. They may also involve judicious use of the throttle. The purpose is to control the amount of slack in the couplings between the cars. This has important effects on power needs in starting a train to move, negotiating humps or hogbacks and sags or dips as well as in avoiding damage to cargo and rolling stock by jerky operation.

7. MAINTENANCE OF WAY

The primary method of reducing hazards is to remove them for a minimum distance of 10 feet from the rail. The most dangerous right-of-way (R/W) fire hazards are: partially decomposed wood, slash, duff, dry grass, etc. found within the R/W. Studies of the location of fire starts indicate that a minimum width of treatment of 25 feet from the near rail should be adhered to (see Title 14, California Code of Regulations).

Right-of-way hazard reduction is not susceptible to a simplistic approach such as clearing to mineral soil for 50 feet from the outside rail for the entire length of the R/W. This approach is not only prohibitively expensive, and in some situations a physical impossibility, it is also unnecessary and unsightly. It may additionally be environmentally damaging because of unusually erodible soil, rare and endangered plants, etc.

7.1 Planning

Effective fire prevention cannot be accomplished by simply removing all flammables for a specified distance from the rail no matter which method or combination of methods are used. Neither can it be paid for, nor is it even necessary. How then are the decisions to be made regarding what to do as well as how, when and where to do it?

The obvious answer is through problem analysis and planning. Since no one person or organization is regularly in possession of all pertinent data and expertise needed for this process, and since the implementation of solutions may be the responsibility of different departments, this analysis and planning should be a cooperative effort. It is basically a company responsibility. For efficiency and continuity, one person should be put in charge.

The individual spearheading the prevention effort should not attempt to do it alone nor should he/she be expected to. He/she should have full access to, and be able to depend upon, personnel in the maintenance-of-way, mechanical and operations departments. He/she should also seek, and be given, data and suggestions from both fire prevention and fire suppression personnel of the protection agencies.

In order to determine the nature and extent of the problem it is necessary to know the locations and specific cause of right-of-way fires. It is also helpful to know the nature of the fuels ignited, e.g. ties, vegetation, structures, rolling stock, etc. Locations are needed not only by railroad milepost but also by distance from the near rail and which side of the rail. Specific causes may point to a mechanical or operational problem.

Analysis of this data, and all other available and pertinent data, will reveal which sections of the right-of-way are most susceptible to fires. It will also determine how wide the treatment should be at various locations and the method, or combination of methods, which will produce the needed treatment at least cost and highest efficiency.

Timing and scheduling of the work as required in Title 14, Article 2, is part of the planning process. The mutually agreed upon hazard reduction plan should be completed by spring with the work commencing as outlined within the plan.

7.2 Right-of-Way Hazard Reduction

There are three basic methods of reducing R/W fire hazards: mechanical clearing (physical removal), burning and chemical treatment. A subsection of this chapter will be devoted to each. A fourth subsection will deal with various combinations of the three basic methods and the times and places where combination treatment is most productive.

Mechanical Clearing

The most common method of railroad R/W hazard reduction is mechanical clearing, i.e., physical removal of the flammable vegetation and debris. This is sometimes done over an entire area from the edge of the ballast to the edge of the R/W or other desired width, and is sufficient positive fire prevention measure since nothing is left but bare soil. It is also considerably expensive, especially if done with inefficient machinery (e.g., bulldozer or grader), and can be environmentally damaging since it exposes the soil to both wind and water erosion.

A more common use of mechanical clearing is to construct a firebreak at the outer edge of the area to be treated. This is not considered an effective measure unless the area between the firebreak and the ballast is also treated in some way. Firebreaks should never be left open-ended. They should always be tied into some other fire barrier, i.e., the right-of-way itself, a road or highway, a river, etc.

Railroad companies commonly construct and maintain their fire breaks with bulldozers. For initial construction the bulldozer is probably, in most situations, the most suitable machine. Motor graders and discs will do as good a job, or better, at a fraction of the time and cost, except in steep terrain.

In most cases bulldozers are inferior to graders or discs for maintenance of firebreaks because they are likely to increase soil erosion. The angle of the blade on a motor grader can be reversed on successive passes so the previous berm is pulled back across the firebreak, thus requiring a shallower bite.

A particularly vulnerable spot for the starting of R/W fires is the accumulation of flammable debris which typically occurs in low spots, e.g., draws, culvert heads and drainage ditches. These areas are seldom accessible to heavy machinery causing handwork to be slow and inefficient.

Burning

In many situations burning is one way of getting rid of R/W fire hazards. Achieving the desired results safely is not easy nor is it simple. Regardless of the amount of knowledge and experience one might gain in the field of fire safety and prevention, new information is continuously being made available.

California requires permits for any open burning during fire season. In Southern California, burning permits are required year-round. The permit is normally issued by the fire protection agency having local jurisdiction. Most fire protection agencies will not issue permits for broadcast burning as is done for R/W hazard reduction without an on-site inspection. The terms and conditions of the permits are the minimums necessary to reasonably ensure safety to adjoining property, as well as compliance with fire laws and ordinances. They do not ensure success nor relieve the permittee of liability in case of escape.

Right-of-way burning should only be done in accordance with a prescription drawn up to achieve a specific purpose, taking into account the specific fuels, terrain, existing weather conditions and manpower and equipment available. Adequate control lines must be constructed in advance and sufficient personnel and equipment must be on hand to prevent an escape. These are generalities only, and must be made more precise and specific for any actual job.

Ignition devices commonly used in R/W burning include fusees, drip torches and pneumatic and power flame-throwers. Fusees and drip torches are very portable and easy to use on high banks or rough terrain.

Environmental concerns are more of a factor in burning operations than they are in mechanical clearing operations. Here the items of primary importance are air and water pollution. Soil erosion, which is the primary concern in mechanical clearing, is of minor or secondary concern in burning since the roots are usually left to hold the soil. Also, if the burning is done properly, the larger plants will remain. Open burning is regulated by fire laws and air pollution control laws. Many such laws state that open burning is prohibited unless the responsible fire protection agency certifies the material to be burned is a fire hazard.

Water pollution from R/W burning is not as likely to happen nor as easily determined as air pollution. However, if water quality control or fish and game agencies have good reason to believe the project will dump ash and lye in injurious amounts into streams or reservoirs, they may intervene. Such intervention may take the form of additional restrictions.

Chemical Treatment

Chemical treatment of fire hazards involves the application, usually in the form of a spray, of herbicides and/or fire retardant. Both federal and state law closely regulates this type of activity. These laws require most effective chemicals to be applied by a licensed or certified applicator.

The most common type of chemical treatment of railroad rights-of-way is with a non-selective soil-applied herbicide applied to the ballast and towpath and to enough additional width to comply with FRA (Federal Railroad Administration) regulations. In most cases, unless hindered by adverse weather or other outside factors, this provides excellent fire prevention protection within the width covered.

Right-of-way chemical treatment is usually applied from specially equipped rail cars or from hyrailer trucks. These units are owned by the contractors and move from one railroad or division to another. This is an economically efficient arrangement.

In a few cases, chemicals are applied by railroad-owned equipment operated by company personnel. In certain other cases where particularly wide applications are necessary, they are done by helicopter. These situations provide more flexibility in timing and thus usually produce excellent results.

Combination Treatment

Any one of the above right-of-way fire hazard reduction methods is seldom sufficient alone. A combination of any two or all three is usually called for.

Mechanical clearing is most useful for initial clearing of heavy fuels, such as old logs, and for construction and maintenance of firebreaks. Chemical treatment is most useful for maintenance of clearings already established. However, it can create flash-fuel problems if used as the first treatment. Burning can be used for either initial or maintenance treatment but is normally unsafe without a mechanically cleared firebreak.

Certain fire hazards cannot be treated by removal, burning or herbicides. These might include, in addition to ties and wooden trestles and snowshed, vegetation such as moss and grass growing on rock cliffs or cut-banks, rare or endangered plant species and short stretches or widths of R/W where the other methods are precluded for any reason. In these situations, fire retardant chemicals should be employed, either alone or in combination with the other methods.

Fire Resistant Plants

Another approach to R/W fire hazard reduction would be the substitution of fire resistant plants for the native vegetation. Some research has been done in this field by the U.S. Forest Service Pacific Southwest Forest and Range Experiment Station, the Los Angeles County Arboretum, and others. Most of this work has been directed toward landscaping for structures located in hazardous fire areas rather than large scale of R/W plantings. However, some limited success has been achieved which might be applied to R/W.

7.3 Special Problems

Certain items, conditions or locations present fire prevention problems that are unusual in type or degree. These items deserve special attention.

One such item is used ties. It has been estimated that the average age of a good quality tie when it is replaced is 30 years. If it was originally treated, most of the treatment chemical has been leached out. It may be starting to rot. In some cases, if the tie is badly cracked and splintery, it is an excellent fuel bed for an exhaust or brake shoe spark to fall into and start a fire unless it is removed from the right-of-way.

Photograph 7-1.
Rail Corner Hold Down

Photograph 7-2.
Cement Ties

Another special fire hazard is wooden structures. These include buildings, trestles, snowsheds, tunnel linings, ties, etc. Except for ties, these seldom catch fire, but when they do, they create intense heat and usually cause a wildfire. The likelihood of such structures catching fire will be markedly reduced if strict compliance with clearance laws is observed.

Wood chips deposited on the right-of-way have, in the past, created severe fire problems. With the advent of car netting, the accumulation of this hazardous fuel has been sharply reduced. On certain stretches of rails, chip accumulation will probably never be completely prevented. If allowed to build up between the rails, the chips can be just as dangerous in the winter as in summer but in a different way. When the chips become soaked with rain or snowmelt, they conduct electricity, shorting out block signals and switch controls.

7.4 Right-of-Way Inspections

Fire prevention inspections of right-of-way are made to determine the nature and extent of fire hazards present and the effectiveness of measures taken to abate them. This, of course, requires an understanding of what constitutes a fire hazard and what it takes to eliminate it. Depending on the purpose of the inspections and time available, such inspections may be made from the air, from a hyrailer, or by foot.

Aerial inspection, either from helicopter or from light fixed-wing aircraft, is the quickest way to make a general survey of conditions over a large segment of right-of-way. On the ground details cannot be identified in this way, especially under tree canopies. On the other hand, questionable areas can be spotted and noted for ground checking. Considerable ground inspection time can be saved by an advance aerial survey. Since most R/W requiring this type of inspections are in mountainous terrain, only pilots skilled in this type of flying should be used. The pilot and the observer should participate in a thorough advanced briefing so that neither will have their attention distracted unnecessarily while in the air.

A much more comprehensive R/W inspection can be made from a hyrailer. This method is good for relatively quick and reasonable thorough inspection of a moderately long piece of R/W (25 to 100 miles). Although much more detail can be seen this way than from the air, there are some drawbacks. Normal travel speed requires a scanning type of observation. Questionable items noted require stopping, backing up or alighting to verify. This is not always possible because of the need to clear the rails for trains. Also certain areas are difficult, if not impossible to observe from the vehicle. These would include high cut banks, steep fill banks, deep draws, etc.

By far the most intensive inspection can be made on foot. Because of the time involved, this method can only be used for spot checks of critical areas, usually one to five miles in length. The areas to be inspected may have been identified from one of the two other inspection methods, from fire spot maps or because of a specific fire. This method allows not only close visual inspection of the rails, ties, ballast and towpath, but also of conditions farther out and not visible from the air or the hyrailer. The walking inspector must be particularly alert for the approach of trains or other rail vehicles. They are not always as easy to see or hear as might be expected, especially in canyons or from the far side of tunnels. One should never enter a tunnel or start across a trestle without assurance that he/she can get safely to one end or the other before being trapped by a train.

7.5 Maintenance and Emergency Equipment

Another source of fire risk is the maintenance and emergency equipment used by railroad companies. Such equipment may be used either for routine maintenance of right-of-way, rails, rolling stock, or for clearing derailments and other calamities in order to restore rail traffic. Included are the

various internal combustion engine-driven machines, welders, cutters, grinders, etc. The use and operation of such equipment is subject to most of the same laws, regulations and fire-safe practices as are locomotives and other components of trains, plus some additional ones.

Photograph 7-3.
Mechanical Spike Driver

Photograph 7-4.
Track Replacement Equipment Work Gang

Photograph 7-5.
Replacing Rail with Pettibone Crane

Photograph 7-6.
Tie Sweeper

Photograph 7-7.
Rail Placement Device

Photograph 7-8.
Tie Replacement Equipment

Photograph 7-9.
Hyrailer (Rail Capable) Dump Truck

Internal Combustion Powered Equipment

This category includes all on-track equipment and off-track equipment. Any such equipment, except licensed highway vehicles, must be equipped with an effective spark arrester.

In addition, if the equipment is to be operated at a fixed location, a clearing of flammable material must be made around it for a minimum distance of ten (10) feet. Certain firefighting tools must be readily available, also. Hand-portable power equipment such as chain saws, post hole diggers, tampers, etc., is exempt from the clearing requirement. However, fire extinguisher and/or shovel must be maintained within 25 feet of the operation of portable gasoline powered equipment.

Though not specifically covered by law or regulation, in most jurisdictions refueling, especially with gasoline, is a hazardous operation. It should only be done with the engine stopped and in an area cleared of flammables for at least ten (10) feet in all directions. Hand held equipment should be moved away from the refueling site prior to restarting.

Photograph 7-10.
Gas-Powered Rail Cutter

Photograph 7-11.
Gas-Powered Impact Wrench

Photograph 7-12.
Gas-Powered Impact Wrench in Use

Welding, Cutting and Grinding

Permit requirements for these types of work vary between jurisdictions. It will be necessary for railroad supervisors conducting them to learn the local requirements and comply with them.

Whether permits are required or not, clearings of ten (10) feet or more and readily available firefighting tools will be required. Most companies have water tank cars available. It is good practice to have one of these either at the site or at the nearest siding whenever any of these operations take place during fire season. Another fire-safe practice is to leave a watch person on the scene for a minimum of one (1) hour after cessation of the work.

Photograph 7-13.
Side View of Water Car

Photograph 7-14.
Rail Fire Car with Working Gang

Photograph 7-15.
Pneumatic Rail Cutter

Photograph 7-16.
Cutting Rail (Note Spark Guard and Backpump)

Photograph 7-17.
Cutting Rail

Photograph 7-18.
Pneumatic Drill

Photograph 7-19.
Pneumatic Drill with Hot Shavings

Explosives

Some fire agencies require blasting permits in addition to the explosive permits.

8. FIRE DETECTION AND SUPPRESSION

When all prevention efforts and activities fail, fires occur. The task at hand then becomes that of keeping the losses to a minimum. Responsibility for this rests jointly with the railroad companies and the fire protection agencies. It involves quick detection and reporting of fire starts followed by fast and effective suppression activity.

Fire protection agencies have detection systems including fixed lookouts and aerial patrols. They also rely on citizen reports. Unfortunately, many portions of railroad right-of-way are hidden from lookouts and from most citizens. This usually means fires on them will not be detected until large enough to put up high smoke columns. Aerial detection is not constant in any one area. Therefore, it is important that the companies augment the fire detection system. This can be, and commonly is, done in several ways. Detection can actually start before a wildfire, i.e., through observation and reporting of sparking exhausts or brake shoes.

Photograph 8-1.
Shoefly

One source of fire reports is train crews. These may be on the train starting the fire or any member of the crew of a following train or a passing train. Another source might be section gangs or other work crews. In most companies, all these personnel are under orders to observe and report by radio or telephone any abnormal occurrence related to rolling stock. It then remains for the company dispatchers or agents to relay the information to the fire dispatchers.

In some cases, the fire dispatchers will have already intercepted the message on their scanner radio monitors. Another source of company fire detection reports is hyrailer patrols. These may be timed to follow 10-15 minutes behind trains. They may only be activated during fire season and usually only during daylight hours. They may have a one or two-person crew which is provided with a radio and limited firefighting tools. Unless they discover a fire while it is still very small they will

usually need help in suppressing it. Such patrols are quite costly, and they are, therefore, seldom put behind every train during an entire 6-8 month fire season. Some companies activate them based on "very high" and "extreme" ratings or specified burning indexes of the National Fire Danger Rating system obtained from the protection agencies. Other companies activate the patrols only on Red Flag Alert or Warning also obtained from the protection agencies. A few automatically patrol behind every train during fire season.

When fires do occur on railroad property or R/W, the company has a legal responsibility to report them to the protection agency and to do all in its power to suppress the fire. If the fire involves rolling stock, the company also has the duty to inform firefighters regarding the nature of the cargo involved in or exposed to the fire. The most positive source of this information is the conductor's bills of lading.

Certain firefighting equipment is required, and normally present, on railroad equipment and work locations. Each locomotive is equipped with a dry powder fire extinguisher mounted in the cab or in the engine compartment. Since any fire in a diesel electric locomotive will involve either petroleum products or electricity or both, firefighters should not apply water. Section, track, bridge and other work crews are required to have, in addition to their regular work tools, firefighting tools and equipment. These must be readily available at the work site and reserved solely for firefighting purposes.

Photograph 8-2.
Fire Box – Firefighting Tools

Company-owned bulldozers and in certain areas motor graders are excellent wildland firefighting machines. The companies should always make them available to work under the supervision of the agency incident commander on any fire near the railroad.

Several railroad companies provide water tank cars exclusively for fire protection purposes during

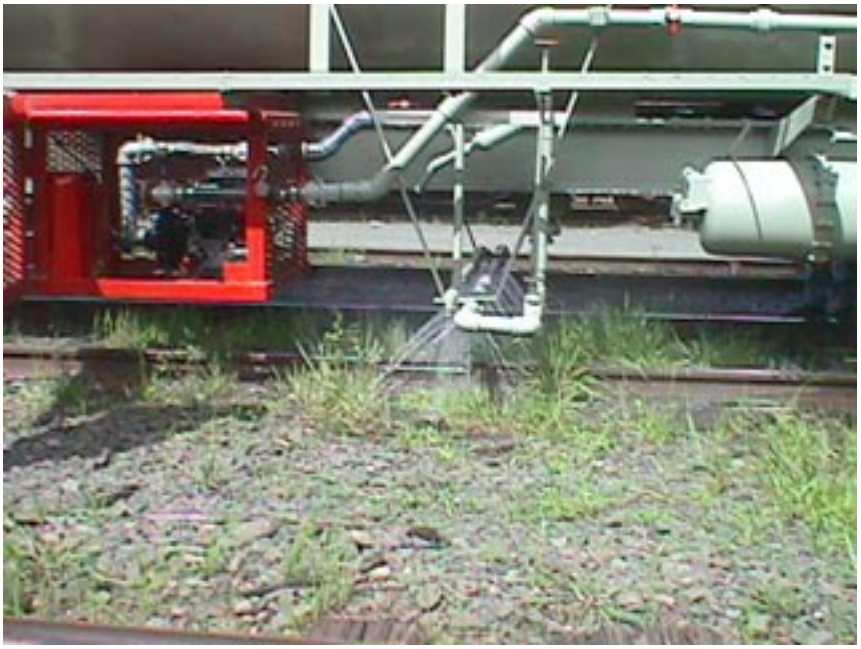
fire season. These large water sources (8,000-12,000 gallons each) can be of great help to fire suppression forces. To be fully effective, they must be capable of being moved to the scene of a fire quickly and left there, or nearby, as long as needed. This often presents some problems. It may not be economically practical to have a locomotive and crew on standby where the cars are parked.

Also R/W fires seldom occur at sidings, thus a tank car at the fire will usually tie up a mainline track. In spite of these problems, such tank cars have proven of great value to firefighters many times. It is important for fire agency personnel to check firefighting water tank cars at the beginning of each fire season to see that they are equipped with pumps, fire hose (minimum 200 feet) and nozzles. The outlets should also be checked for size and threads compatible with fire agency equipment. If found not compatible, suitable adapters should be provided on the cars.

One company has developed a unique water car that attaches to the rear of each train operated during fire season. This car is equipped with spray nozzles that can sprinkle the entire R/W for approximately 20 feet each side of centerline. The nozzles can be activated either by the brake pipe reduction, which applies the train air brakes, or manually by the conductor. Effectiveness of fire detection and suppression is largely dependent on adequate communications. Between railroad companies and fire agencies, these are normally accomplished by commercial telephone. Many fire agencies augment telephone communications by including railroad frequencies on the radio scanning monitors. These frequencies are used to keep in touch with neighboring fire and police agencies.

Photograph 8-3.
Water Car with Spray Bars

Photograph 8-4.
Water Car Spraying Water



Photograph 8-5.
Spray Bars

If the railroads were to install radio monitors on fire frequencies at certain locations and in the vehicles of certain supervisors (e.g., division engineers, trainmasters, and roadmasters), the cross monitoring would allow direct radio communications during emergencies.

Each company or agency employee would talk on their frequency and listen on the other. This would result in a considerable increase in efficiency as long as proper radio traffic discipline was observed. Railroad companies, in addition to radio, cell phones and commercial telephone, may have private phone systems for internal communications. Often these can be patched in to commercial telephones allowing fire dispatchers to talk to various company employees with one call and the use of several extensions.

9. SPEEDERS

The official name of this vehicle is a Railway Motorcar. It is known as a “speeder”, “jitney”, “rail car”, ”track car” and “putt-putt” (for the noise the first one-cylinder motor made).

The motorcar was used for inspection and light maintenance of track and signals. It weighs from 800 lbs. and up. The lighter cars have handles that pull out from the back so that it may be picked up like a wheelbarrow and moved on and off the track at a grade crossing. The heavier cars have hydraulic turntables that allow them to do the same. They are powered by a two-cylinder, 18-hp engine and are capable of speeds as high as 45 mph on well maintained rail; however, the normal cruising speed is 20 mph. A two-speed transmission drives the rear axle with a motorcycle type chain. There is a friction brake lever that is pushed to apply the brake shoes on the outside of each wheel. The wheels and brakes are insulated so they will not activate signals and crossing gates like a train would.

Between 1980 and 1985 the railroads began dispensing with motorcars. They have replaced them with pick-up trucks adapted to run on rails, called “hyrailers”. Rail fans purchased the motorcars at auctions. The first organized clubs were formed in 1990 to restore, preserve and display the vehicle on planned, legal excursions. Members belong to the North American Railcar Owners Association, and are insured, licensed and regulated by that organization.

Motorcars used by enthusiasts are modified for safety reasons. They are required to have spark arresters, fire extinguishers, first aid kits, and a rear facing red light that is activated when the brakes are applied. Children under the age of 18 are required to wear bicycle style helmets. The federal law regarding the use of drugs and alcohol on or about railroad property is strictly enforced and prohibited.

Appendix A

GLOSSARY OF TERMS

AAR: Association of American Railroads. Sets standards for size, quality and performance of rolling stock and components used in interchange service.

AB Control Valve (including ABD, ABDW, etc.): Device mounted on each car to convert changes in brake pipe pressure to application or release of brakes.

Alternator: A form of generator that produces alternating current electricity.

Ampere: Unit of electric current. One volt applied across one ohm of resistance will produce one ampere of current. (Roughly analogous to gpm flow in a fire hose.)

Automatic Brake Valve: The device by which the locomotive engineer controls the pressure in the brake pipe and thus the application or release of the air brakes on the train.

Auxiliary Reservoir: An air storage tank located on each locomotive and car to supply air to the brake cylinder in response to operation of the AB valve. This occurs upon reduction of brake pipe pressure. On freight cars, the auxiliary and emergency reservoirs are housed in the two halves of a single tank.

Ballast: The bed of rock, cinders or slag that supports the ties on which the rails are mounted.

Battalion Chief: The senior officer in charge of a program or a geographical area with fire equipment and personnel.

Block Signal: A device for safely controlling the movement of trains by means of colored lights; red, green and yellow.

Brake Cylinder: A device mounted on each locomotive and car in which compressed air from the auxiliary or emergency reservoir acts on a piston which transmits the force to the brake shoes through the brake rigging.

Brake Cylinder Release Valve: A device for quickly releasing the air from a brake cylinder without affecting the rest of the brake system on the car.

Brake Head: A holder attached to or a part of the brake beam that carries the detachable brake shoe.

Brake Pipe: The system of piping extending the entire length of each locomotive and car, including hose and hose couplings, for the passage of air to control the air brakes.

Brake Shoe: A replaceable friction element secured to the brake head that is pressed against the wheel to produce retarding force. Two general types of brake shoe friction elements are used: *Composition High Friction and Cast /Iron Low Friction*.

Bunch Braking: A term used to describe the deceleration of a train by allowing the train to run in against the engine.

Caboose Valve: A device located on the caboose for applying air brakes on the train.

Carrier: A transportation company who carries products for hire. A receptacle or vessel for carrying objects.

Consist: A group of locomotives operating together as a unit and controlled from a single control stand.

Control Stand: The column upon which the throttle, brake and other controls and gauges are mounted within easy reach of the locomotive engineer.

Control Unit: The unit from which the engineer operates the locomotive consist or consists under his/her control, usually the lead unit.

Diesel Electric Locomotive: A locomotive in which power developed by a diesel engine is delivered through a generator or alternator to the traction motors on the axles.

Drawbar Forces: Longitudinal forces at the couplers between cars and/or engines that may be either tension (draft) or compression (buff), depending on the handling of the train at the time.

Duff: Dead leaves, needles or grass accumulated on the ground.

Dynamic Brake Interlock (DBI): A device installed on an engine automatically preventing the locomotive air brakes from applying when the automatic air brakes are set on the train during dynamic braking operation.

Dynamic Braking: An electrical means used to convert some of the power developed by the momentum of a moving engine into an effective retarding force. Electric circuits are set up which change the traction motors into generators. Since it takes power to rotate a generator, this action retards the speed of the train. The energy generated by the traction motors is fed to the resistor grids and dissipated as heat.

Emergency Application: A rapid, heavy exhausting of air from the brake pipe which results in maximum brake shoe pressure on the wheels of all cars and locomotives.

Emergency Reservoir: An air storage tank located on each car to supply air (in addition to that from the auxiliary reservoir) to the brake cylinder in response to operation of the AB valve upon emergency application. On freight cars, the auxiliary and emergency reservoirs are housed in the two halves of a single tank.

Engine: Often used interchangeably with "locomotive." Properly refers only to the diesel or steam primary source of mechanical energy.

Federal Railroad Administration (FRA): An agency of the U.S. Department of Transportation charged with overseeing and regulating matters relating to rail transportation and safety. Assumes most of the responsibilities of the Interstate Commerce Commission (ICC) insofar as railroads are concerned.

Fire Apparatus Engineer: A driver and operator of fire apparatus; a fire protection or fire prevention person qualified by credentials.

Fire Captain: A person in charge of a basic fire-fighting organizational unit consisting of firefighters and apparatus – company officer level and above.

Fire Hazard: The flammable materials that may be ignited by the various fire risks.

Fire Prevention: That part of the science of fire protection that deals with preventing the outbreak of fires by eliminating fire hazards through inspections, education, and investigation programs.

Fire Risk: A source of ignition of fire hazards.

Flange Lubricator: A track mounted device, used in areas of high curvature, to apply grease or oil to wheel flanges as they pass by in order to reduce track and flange wear.

Generator: A machine for converting rotational mechanical energy into electrical energy. The term applies to either the main generator of a locomotive when operating under motive power or to the traction motors when operating on dynamic brakes.

Grid: An electrical resistor capable of dissipating quantities of electrical energy as heat.

Helper: A manned locomotive, usually placed toward the rear of a train, to assist in the movement of the train.

Hot Box Detector: A trackside device that monitors the axle bearing temperatures of a passing train to detect incipient journal failures and thus prevent derailments.

Hyrailer: A single vehicle that can travel on the rails as well as the highway.

Independent Brake Valve: A valve that provides control of the locomotive air brakes regardless of the automatic brake valve handle position.

Main Reservoir: An air tank on the locomotive for storing and cooling compressed air.

Motor: A machine for converting electrical energy into mechanical energy.

Ohm: Unit of resistance to flow of electric current. One ohm of resistance requires one volt of energy to push one ampere of current across it. (Roughly analogous to friction loss in a fire hose.)

Rail Master: A railroad employee who is in charge of a rail line or a geographical area with rails for all maintenance of way.

RCE-1 Unit: A locomotive or consist separated from the lead consist and remotely controlled from the control unit.

Reduction (of the brake pipe): A decrease in brake pipe pressure at a rate and of an amount sufficient to cause a train brake application to be initiated or increased.

Release Rod: A small rod situated at the side sill of a car for the purpose of releasing the air brakes on that car by activating the brake cylinder release valve.

Retaining Valve (Retainer): A spring-loaded check valve or a restricting exhaust choke in series with the brake cylinder exhaust located on each car which, when turned to an operating position, will maintain a retarding force on car brakes on a descending grade while the brake pipe is being recharged.

Right-of-Way: The strip of land of varying width on which the tracks and other operating installations are placed and over which the operating company has some degree of control, by either deed, easement or special use permit.

Running Release: Release of automatic brake service application while the train is in motion.

Service Application: Exhausting the brake pipe at a service (normal, not emergency) rate to apply the train brakes.

Service Rate: The rate, slower than emergency, at which the brake pipe pressure is reduced by the engineer using the automatic brake valve to cause the control valve at each car to vent air from the auxiliary reservoir to the brake cylinder.

Siding: A section of track parallel to the main line track, with track switches at each end, on which a train or other rolling stock may be placed in order to open the mainline for passage of traffic.

Slash: Severed limbs and tops remaining after felling or pruning trees or brush.

Speeder: Railway Motorcar; small, 18 hp, 4 person car was used for maintenance.

Split Reduction: A brake pipe reduction less than the fully desired reduction followed by further light reductions until the desired total reduction is reached. Makes for a smooth slowdown or stop.

Stretch Braking: The deceleration of a train by application of the automatic brake while the locomotive is still working in reduced power.

Torpedo: An emergency impact-detonated signaling device that is placed on a rail to alert stationary and incoming trains that are on the same track. These devices are to be handled with caution.

Towpath: A narrow strip of the right-of-way adjacent to each side of the ballast that is normally kept clean enough for personnel to walk on.

Traction Motor: A device that converts electrical energy into mechanical energy which turns the locomotive wheels. It is mounted directly on each driving axle between the wheels of an engine truck.

Train Master: A railroad employee who is in charge of a locomotive or a system of many trains, responsible for all trains operating in jurisdictional area.

Truck: The system of frame, springs, plate, journals, wheels and axles that supports one end of a car or locomotive. Freight car trucks have two axles. Passenger car and locomotive trucks may have two or three axles.

Volt: Unit of electric energy force. One volt is required to push one ampere of current across one ohm of resistance. (Roughly analogous to psi of pressure in a fire hose.)

Watt: Unit of electric power equal to a current flow of one ampere under one volt of pressure; 746 watts equal one horsepower; 1,000 watts equal 1 kilowatt.

Appendix B

STATUTES AND REGULATIONS

There are several hundred laws and regulations applicable to railroad operations. Many of these are very long. Some treat several subjects. Most do not relate to wildland fire prevention. This appendix has been designed to present only those laws and regulations, or portions thereof, which pertain to wildland fire prevention and operational safety. As such this appendix should be used only as a quick field reference. For full current text, meaning and proper context of laws and regulations, reference should be made to the applicable code books.

I. STATE LAWS

HEALTH AND SAFETY CODE (HSC)

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.

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 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) is 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:

- 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.
- 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.
- Remove that portion of any tree which extends within 10 feet of the outlet of any chimney or stovepipe.
- Maintain any tree adjacent to or overhanging any building free of dead or dying wood.
- Maintain the roof of any structure free of leaves, needles, or other dead vegetative growth.
- 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.

- 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 4296.5

(a) Any person or corporation operating a railroad on forest, brush, or grass covered land shall, if ordered by the director or the agency having primary responsibility for fire protection of the area, destroy, remove, or modify so as not to be flammable any vegetation or other flammable material defined by regulation of the director to be a fire hazard on the railroad right-of-way. The director shall adopt regulations establishing fire prevention hazard reduction standards for broad geographic areas by fuel type, slope, and potential for ignition from hot or flaming exhaust, carbon particles, hot metal, burning signal devices, burning tobacco, and other similar potential sources of ignition.

(b) The order to destroy, remove, or modify vegetation or other flammable material shall specify the location of the hazard to be destroyed, removed, or modified within the right-of-way, the width of the hazard which shall not exceed the width of the right-of-way, and the time within which compliance with the order is required.

(c) The director or the agency having primary responsibility for fire protection of the area shall allow a reasonable period of time for compliance with an order to destroy, remove, or modify vegetation or other flammable material.

Section 4413

"Zone A" includes Mono, Inyo, San Bernadino, 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:

- 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.

- 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 Departments of Agriculture or of the Interior and in strict accordance with the terms of the permit:

- At any time in Zone A.
- 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.

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:

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

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.

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.

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.

As used in this section:

- "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.
- "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 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:

- He leaves some person in attendance.
- 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 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.

TITLE 14, CALIFORNIA CODE OF REGULATIONS

Article 2. Fire Hazard Reduction Standard for Railroad Right-of-Way

Section 1290. Application.

The provisions of this Article shall apply within railroad rights-of-way on forest, brush, and grass covered land throughout the state, annually commencing and ending on the dates set forth in 14 California Code of Regulations 1253 by geographic areas.

NOTE. Authority cited: Sections 4201-4204, Public Resources Code. Reference: Sections 4201-4204, Public Resources Code.

History

1. New section filed 1-22-88; operative 2-21-98 (Register 88, No. 6).

2. Renumbering article 7 to article 2 filed 5-30-91; operative 5-30-91 pursuant to Government Code section 11346.2(d) (Register 91, No. 27).

Section 1291. Fire Protection Agreements.

Nothing contained in these regulations shall preempt any order or agreement in effect on the date of adoption of these regulations between an agency responsible for fire protection and an operator, so long as that order or agreement is not in conflict with the regulations contained in this article and is equivalent to or more restrictive than these regulations.

NOTE: Authority cited: Section 4296.5, Public Resources Code. Reference: Section 4296.5. Public Resources Code.

History

1. New section flied 1-22-88; operative 2-21-98 (Register 88, No. 6).

Section 1292. Definitions.

The following definitions shall apply to this article unless the context clearly requires otherwise:

(a) "Agency Having Primary Responsibility for Fire Protection" means any public agency of the federal, state, county, city, city and county, or district government which is the primary agency responsible directly or through contract for fire prevention and suppression on lands within the jurisdiction of that agency.

(b) "Authorized Agent" means any employee of an agency having primary responsibility for fire protection who is authorized to enforce the state's Forest and Fire Laws.

(c) "Distance" shall in all cases herein mean horizontal distance and not slope distance.

(d) "Fire Hazard" means a condition resulting from a combination of factors of case of ignition, heat yield, and rate of fire spread as influenced by particular vegetation and other flammable materials, weather and slope.

(e) "Flammable Material" shall include, but is not limited to, chips; sawdust; coal; leaves; needles; duff and other dead and desiccated vegetation and ties which are rotten on exposed surfaces or excessively

splintered to the extent they will readily ignite and propagate fire.

"Flammable Material" shall not include:

(1) wooden poles or towers and crossarms supporting switching circuits or other electrical power or communication conductors not subject to PRC 4292 or 4293;
(2) wooden ties except as provided above;
(3) wooden components of trestles, tunnels, and other structures;
(4) living trees, shrubs, and brush, provided that any dead and desiccated portions are removed so that such living trees, shrubs and brush are not easily ignited or able to propagate fire.

(f) "Forest-, Brush-, and Grass-Covered Land" means lands covered wholly or in part by timber (trees), brush (shrubs), grass (including grain) or other natural vegetation. Cultivated agricultural lands planted to crops other than grain are not included.

(g) "Operator" means the person or entity responsible for maintenance of the railroad right-of-way.

(h) "Order" means a written mandate issued by an authorized agent of a public agency having primary responsibility for fire prevention hazard reduction of the area to destroy, remove or modify any vegetation or other flammable material in order to reduce or eliminate an existing fire hazard on the railroad right-of-way, pursuant to this Article.

(i) "Railroad-Caused Fire" means those preventable fires resulting from operations upon railroad rights-of-way. May not include unpreventable fires such as caused by wrecks, bombs or natural causes (i.e. lightning).

(j) "Right-of-Way" means the strip of land, outside of yard limits, owned or controlled by the person or entity operating the railroad for a distance not exceeding 100 feet or to the property boundary measured at right angles to the axis of the rail at any given location. The distance shall be measured from the outermost rail on both sides of the mainline or mainlines, on sidings, and also includes intervening strips between sidings and mainlines.

(k) "Towpath" means a narrow strip of right-of-way adjacent to each side of ballast which is commonly referred to as the walkway and is normally kept clear for personnel safety and is not less than six feet from outside rail to outer edge.

NOTE: Authority cited: Section 4296.5, Public Resources Code. Reference: Section 4296.5, Public Resources Code.

History

1. New section filed 1-22-88; operative 2-21-88 (Register 88, No. 6).

Section 1293. Minimum Standards.

Railroad rights-of-way shall be maintained in accordance with the following minimum fire hazard reduction standards:

(a) Area within ten (10) feet of outside rail, including ballast and towpath. The area must be kept clear of flammable material that by its physical arrangement or its accumulation is likely to contribute to the propagation of railroad-caused fires.

(b) Area within twenty-five (25) feet of outside of rail, including ballast and towpath. The minimum 10

foot standard will be extended to 25 feet if such an area has experienced one (1) or more preventable railroad caused fire(s) in the previous five (5) years. An identified fire start area shall be maintained free of accumulation up to 25 feet as specified for 1/4 mile linear distance on either side of the fire start area and along both sides of the rail track.

(c) Culverts (Conduits) located on right-of-way. Inlet and outlet portals of culverts located within a distance of 25 feet from an outside rail must be kept clear of flammable material for a distance not less than five (5) feet.

(d) Tunnel portals. These areas must be kept clear of all flammable materials, not an integral part of such tunnel portals, for a minimum distance of 30-feet.

NOTE: Authority cited: Section 4296.5, Public Resources Code. Reference. Section 4296.5, Public Resources Code.

History

1. New section filed 1-22-88, operative 2-21-89 (Register 88, No, 6).

Section 1294. Compliance Order.

When an inspection by an authorized agent reveals noncompliance of these minimum standards, an order shall be issued detailing abatement requirements as provided in Section 1295.

NOTE: Authority cited: Section 4296.5, Public Resources Code. Reference: -Section 4296.5, Public Resources Code.

Section 1295. Order Format

An order to destroy, remove or modify vegetation or other flammable material, pursuant to P.R.C. 4296.5 shall be made substantially in the following format:

(Name, Address and Telephone Number of Director's Agent or Agency having Primary responsibility for Fire Protection)

(Name and Address of Railroad Operator)

You are hereby ordered, pursuant to the provision of Section 4296.5 of the California Public Resources Code and in accordance with the provisions of Section 1290 through 1294 of Tide 14, California Administrative Code, to abate (clearly describe the vegetation and/or other flammable materials to be abated. Describe so that the area is clearly defined by width, which side of track or both and location by milepost and/or other identifiable landmark or physical feature). Said hazard abatement is to be completed on or before _____. Failure to comply with the provision of this order is misdemeanor as provided by Section 4021 of the California Public Resources Code.

Signature of Authorized Agent or Representative: _____

Title: _____

Date: _____

NOTE: Authority cited: Section 4296.5, Public Resources Code. Reference: Section 4296.5, Public Resources Code.

History

1. New section filed 1-22-88; operative 2-21 -88 (Register 88, No. 6).

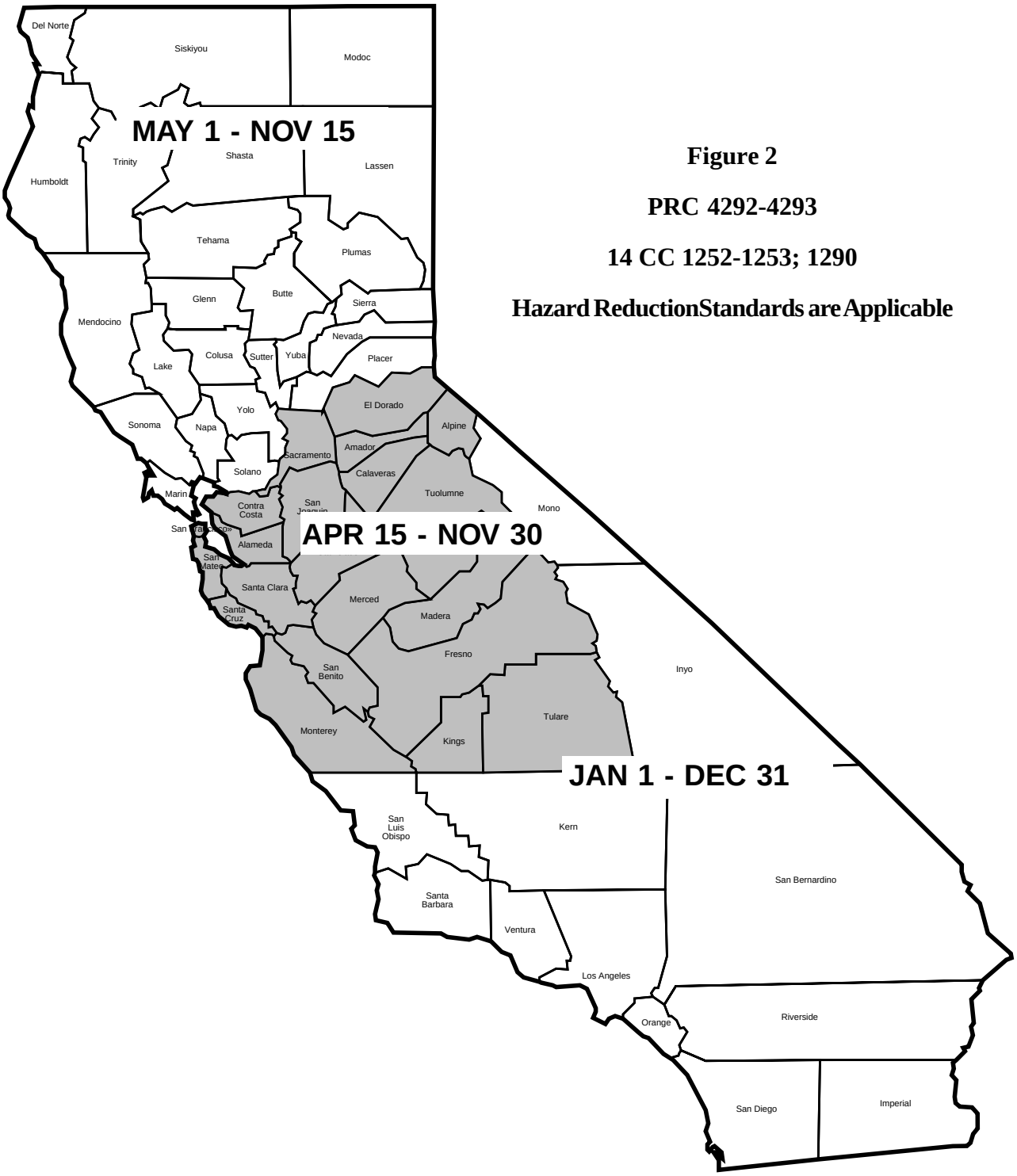


Figure 2

PRC 4292-4293

14 CC 1252-1253; 1290

Hazard Reduction Standards are Applicable

II. FEDERAL REGULATIONS

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

Section 261.1 - Scope.

The prohibitions in this part apply, except as otherwise provided, when:

- An act or omission occurs in the National Forest System or on a Forest development road or trail.
- An act or omission affects, threatens, or endangers property of the United States administered by the Forest Service.
- 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. ...

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:

- Carelessly or negligently throwing or placing any ignited substance or other substance that may cause a fire.
- Firing any tracer bullet or incendiary ammunition.
- Causing timber, trees, slash, brush or grass to burn except as authorized by permit.
- Leaving a fire without completely extinguishing it.
- Allowing a fire to escape from control.

- 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.

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. ...

Section 261.52 - Fire.

When provided by an order, the following are prohibited:

- Building, maintaining, attending or using a fire, campfire, or stove fire.
- Using an explosive.
- Smoking.
- 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 materials.
- Going into or being upon an area.
- Possessing, discharging or using any kind of firework or other pyrotechnic device.
- Entering an area without any firefighting tool prescribed by the order.
- Operating an internal combustion engine.
- Welding, or operating an acetylene or other torch with open flame.
- 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) appropriate Society of Automotive Engineers (SAE) recommended practices J335(b) and J350(a).
- 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 of 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 5100-1a; 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.

TITLE 49 CODE OF FEDERAL REGULATIONS (49 CFR)

Section 213.37 - Vegetation.

Vegetation on railroad property which is on or immediately adjacent to roadbed shall be controlled so that it does not—

(a) Become a fire hazard to track-carrying structures;
(b) Obstruct visibility of railroad signs and signals;
(1) Along the right-of-way, and (2) At highway-rail crossings; (This paragraph (b) (2) is applicable September 21, 1999.)
(c) Interfere with railroad employees performing normal trackside duties;
(d) Prevent proper functioning of signal and communication lines; or
(e) Prevent railroad employees from visually inspecting moving equipment from their normal duty stations.

Section 218.37 - Flag protection.

(a) After August 1, 1977, each railroad must have in effect an operating rule which complies with the requirements set forth below:

Except as provided in subparagraph (a) (2) of this section, flag protection shall be provided—

(i) When a train is moving on the main track at less than one-half the maximum authorized speed (including slow order limits) in that territory, flag protection against following trains on the same track must be provided by a crew member by dropping off single lighted fusees at intervals that do not exceed the burning time of the fusee.
(ii) When a train is moving on the main track at more than one-half the maximum authorized speed (including slow order limits) in that territory under circumstances in which it may be overtaken, crew members responsible for providing protection will take into consideration the grade, curvature of track, weather conditions, sight distance and relative speed of his train to following trains and will be governed accordingly in the use of fusees. ...

Section 230.203 – Trip or daily inspection.

Each locomotive unit when used in road service (including beltline, transfer or work-train service) shall be inspected at least once every 24 hours, except locomotive units operated on through runs exceeding 24 hours, may be inspected at the next crew change point immediately beyond the point at which the 24-hour period expires.

Section 230.204 - General precautions.

It must be known before each trip that the brakes are in safe and suitable condition for service; that the air compressor or compressors are in condition to provide an ample supply of air for the service in which the locomotive is put; that the devices for regulating all pressures are properly performing their functions; that the brake valves work properly in all positions; and that the water has been drained from the air-brake system.

Section 232.10 - General rules; locomotives.

Air brake and hand brake equipment on locomotives including tender must be inspected and maintained in accordance with the requirements of the Locomotive Inspection and United States Safety Appliance Acts and related orders and regulations of the Federal Railroad Administrator (FRA).

It must be known that air brake equipment on locomotives is in a safe and suitable condition for service.

Foundation brake rigging, and safety supports, where used, must be maintained in a safe and suitable condition for service. Levers, rods, brake beams, hangars and pins must be of ample strength and must not bind or foul in any way that will affect proper operation of brakes. All pins must be properly applied and secured in place with suitable locking devices. Brake shoes must be properly applied and kept approximately in line with treads of wheels or other braking surfaces.

Enginemen when taking charge of locomotives must know that the brakes are in operative condition.

Section 232.11 - Train air brake system tests.

Supervisors are jointly responsible with inspectors, enginemen and trainmen for condition of air brake and air signal equipment on motive power and cars to the extent that it is possible to detect defective equipment by required air tests.

Communicating signal system on passenger equipment trains must be tested and known to be in a suitable condition for service before leaving terminal.

Each train must have the air brakes in effective operating condition, and at no time shall the number and location of operative air brakes be less than permitted by Federal requirements. When piston travel is in excess of 10 inches, the air brakes cannot be considered in effective operating condition.

Condensation must be blown from the pipe from which air is taken before connecting yard line or motive power to train.

Section 232.12 - Initial terminal road train air-brake tests.

Except for run-through and unit run-through trains covered under Section 232.19, each train must be inspected and tested as specified in this section at points—

- Where the train is originally made up (initial terminal);
- Where train consist is changed, other than by adding or removing a solid block of cars, and the train brake system remains charged; and
- Where the train is received in interchange.

Each carrier shall designate additional inspection points not more than 500 miles apart where intermediate inspection will be made to determine that—

- Brake pipe pressure leakage does not exceed 5 pounds per minute;

- Brakes apply on each car in response to a 20-pound service brake pipe pressure reduction; and
- Brake rigging is properly secured and does not bind or foul.

Train air brake system must be charged to required air pressure, angle cocks and cutout cocks must be properly positioned, air hose must be properly coupled and must be in condition for service. An examination must be made for leaks and necessary repairs made to reduce leakage to a minimum. Retaining valves and retaining valve pipes must be inspected and known to be in condition for service. If train is to be operated in electro-pneumatic brake operation, brake circuit cables must be properly connected.

- After the airbrake system on a freight train is charged to within 15 pounds of the setting of the feed valve on the locomotive, but to not less than 60 pounds, as indicated by an accurate gauge at rear end of train, and on a passenger train when charged to not less than 70 pounds, and upon receiving the signal to apply brakes for test, a 15-pound brake pipe service reduction must be made in automatic brake operations, the brake valve lapped, and the number of pounds of brake pipe leakage per minute noted as indicated by brake pipe gauge, after which brake pipe reduction must be increased to full service. Inspection of the train brakes must be made to determine that angle cocks are properly positioned, that the brakes are applied on each car, that piston travel is correct, that brake rigging does not bind or foul, and that all parts of the brake equipment are properly secured. When this inspection has been completed, the release signal must be given and brakes released and each brake inspected to see that all have released.
- Brake pipe leakage must not exceed 5 pounds per minute.
- At initial terminal piston travel of body-mounted brake cylinders which is less than 7 inches or more than 9 inches must be adjusted to nominally 7 inches.

Section 232.13 - Road train and intermediate terminal train air brake tests.

Passenger trains: Before motive power is detached or angle cocks are closed on a passenger train operated in either automatic or electro-pneumatic brake operation, except when closing angle cocks for cutting off one or more cars from the rear end of train, automatic air brake must be applied. After recoupling, brake system must be recharged to required air pressure and before proceeding and upon receipt of proper request or signal, application and release tests of brakes on rear car must be made from locomotive in automatic brake operation. If train is to be operated in electro-pneumatic brake operation, this test must also be made in electro-pneumatic brake operation before proceeding. Inspector or trainman must determine if brakes on rear car of train properly apply and release.

(a) Freight trains: Before motive power is detached or angle cocks are closed on a freight train, brakes must be applied with not less than a 20 pound brake pipe reduction. After recoupling and angle cocks are opened, it must be known that brake pipe air pressure is being properly restored as indicated by the caboose gauge and that brakes on rear car are released. In the absence of a caboose gauge, air brake test must be made as prescribed by that portion of paragraph (a) of this section pertaining to automatic brake operation.

(b) At a point other than initial terminal where locomotive or caboose is changed, or where one or more consecutive cars are cut off from rear end or head end of train with consist otherwise remaining intact, after train brake system is charged to within 15 pounds of feed valve setting on locomotive but not less than 60 pounds as indicated at rear of freight train, and on a passenger train to at least 70 pounds, a 20 pound brake pipe reduction must be made and it must be determined that brakes on rear car apply and release properly.

Before proceeding it must be known that brake pipe pressure as indicated at rear of freight train is being restored.

At a point other than a terminal where one or more cars ore added to a train, and after the train brake system is charged to not less than 60 pounds as indicated by a gauge at the rear of freight train and on a passenger train to not less than 70 pounds, tests of air brakes must be made to determine that brake pipe leakage does not exceed five (5) pounds per minute as indicated in the brake pipe gauge after a 15-pound brake pipe reduction. After the leakage test is completed, brake pipe reduction must be increased to full service, and it must be known that the brakes on each of these cars and on the rear car of train apply and release. Cars added to train which have not been inspected in accordance with Section 232.12(c)-(j) must be so inspected and tested at next terminal where facilities are available for such attention.

Section 232.19 - Air brake tests on run-through and unit run-through trains.

Each run-through train shall be inspected and tested as prescribed by Section 232.12(c)-(j)—

- Where the train is originally made up (initial terminal);
- Where train consist is changed other than by adding or removing a solid block of cars and train brake system remains charged; and
- At intermediate inspection points not more than 500 miles apart, subject to the requirements of paragraph (f) of this section.

Each carrier shall record the inspections and tests made under Section 232.12(c)-(j) as required by this section at the time they are performed by completing Form FRA F-6180-48 in duplicate. This form shall be signed by the supervisor or other carrier employee responsible for the inspections and tests. One copy of the form shall be kept in the cab of the locomotive until the train arrives at its final terminal, and one copy shall be retained for 3 months at the terminal where the inspections and tests are made.

At locations where the crew of one carrier takes over control and operation of a run-through train or unit run-through train from the crew of another carrier, the receiving carrier shall inspect and test the train to determine that:

- The cab of the locomotive contains a Form FRA F-6180-48 completed as required by paragraph (h) of this section;
- Brake pipe leakage does not exceed 5 pounds per minute; and
- Brakes apply and release on the rear car from a 20-pound service brake pipe pressure reduction.

If the cab of the locomotive does not contain a completed Form FRA F-6180-48, the train must be inspected and tested as prescribed by Section 232.12(c)-(j) before it proceeds.

III. STATE REGULATIONS

PUBLIC UTILITIES COMMISSION (PUC) - General Order 118 (GO118)

It is ordered by the Public Utilities Commission of the State of California that each railroad corporation operating in the State of California shall file its standards for the construction, reconstruction and for the subsequent maintenance of walkways adjacent to its tracks as hereinafter required.

IV. LOCAL ORDINANCES

It is not uncommon for counties, cities and special districts to have five ordinances that affect railroad operations. They are too numerous and varied to allow their listing here. It is therefore important for railroad and protection agency employees alike to learn the provisions of these ordinances and to comply with them.

V. PRIVATE REGULATIONS

ASSOCIATION OF AMERICAN RAILROAD (AAR)

The AAR publishes a 446 page "Field Manual of the AAR Interchange Rules" and an "Office Manual." These are too lengthy to be reproduced here and most of them have little or no bearing on fire prevention. However, some of these rules, particularly those relating to air brakes and brake equipment relate indirectly to fire prevention. Regulatory as well as operating personnel should be familiar with these rules.

COMPANY RULES

Both the FRA and the PUC implement many of their orders and regulations by requiring each operating company to establish and enforce company rules in certain fields. In addition each company has many rules of its own. These are to be found in various rule books and time tables. Few of them relate directly to fire prevention but a good many relate indirectly.

VI. PERMITS AND EASEMENTS

Most railroad operations are conducted on deeded rights-of-way. Some of these were obtained by land grant and others by purchase. There are, however, significant lengths of railroad right-of-way that are not deeded but which are occupied pursuant to some sort of easement or special use permit with title to the land remaining in someone else's hands. The title holder is most often, but not always, some branch of government.

These permits and easements almost always contain conditions and stipulations many of which relate to fire prevention. Often they have been in effect so long that they have been forgotten. It is important to review them periodically.

Appendix C

LOCAL DIRECTORY

I. RAILROAD COMPANIES Name

Notification Address

Phones: Business _____ Emergency _____

Company Officer (Gen. Mgr., Div. Supt., etc.)

Maintenance-of-Way Superv. (Div. Eng., etc.)

Operations Superv. (Div. Trainmaster, etc.)

Mechanical Superv. (Supt. Locomotives, etc.)

Name

Notification Address

Phones: Business _____ Emergency_____

Company Officer (Gen. Mgr., Div. Supt., etc.) Maintenance-of-Way Superv. (Div. Eng., etc.)

Operations Superv. (Div. Trainmaster, etc.)

Mechanical Superv. (Supt. Locomotives, etc.)

Name

Notification Address

Phones: Business _____ Emergency_____

Company Officer (Gen. Mgr., Div. Supt., etc.)

Maintenance-of-Way Superv. (Div. Eng., etc.)

Operations Superv. (Div. Trainmaster, etc.)

Mechanical Superv. (Supt. Locomotives, etc.)

II. PROTECTION AGENCIES

A. Name _____ Unit_____

Address_____

Phones: Business _____ Emergency_____

Administrator_____ Title_____

Fire Officer_____ Title_____

Fire Prevention Officer_____ Title_____

B. Name _____ Unit_____

Address_____

Phones: Business _____ Emergency_____

Administrator_____ Title_____

Fire Officer_____ Title_____

Fire Prevention Officer_____ Title_____

C. Name _____ Unit_____

Address_____

Phones: Business _____ Emergency_____

Administrator_____ Title_____

Fire Officer_____ Title_____

Fire Prevention Officer_____ Title_____

III. SPECIAL NOTES

Appendix D

RAILROAD SECTION GUIDE ORDER TO ABATE FIRE HAZARDS WITHIN THE RAILROAD RIGHT-OF-WAY

PREAMBLE:

This Pamphlet is Designed to assist those in the State of California who are charged with the responsibility of enforcing laws and regulations applicable to railroads that traverse SRA land in the State.

The INTENDED USERS of the guide are:

- All Field Battalion Chiefs
- All Fire Prevention Bureau Personnel
- USFS Fire Prevention Personnel who enforce State Law on Private Lands within the National Forest Boundaries.
- Railroad Personnel

LAWS & CODES THAT APPLY:

Public Resources Code (PRC) 4296.5 empowers the CDF Director to adopt regulations establishing FIRE PREVENTION HAZARD REDUCTION STANDARDS that any Railroad Corporation or person owning a Railroad in this state must abide by.

The resulting regulations that PRC 4296.5 empowers the CDF Director to formulate these regulations are found in the California Code of Regulations (CCR's), Title 14; Article 2; Sections 1290 through 1295. They basically require Railroads to:

- Clear an area from each outside rail outward to 10 feet free from flammable vegetation on both sides of the towpath (tracks). [See Figure 1] (All distances are horizontal, not slope F.S. 3-12-99)

  SPECIAL NOTE: The above stipulation applies to all Railroads that traverse SRA—UNLESS/UNTIL— A preventable fire has resulted from the operation of the Railroad. Railroad operations includes but is not limited to trains, Railcars, Locomotives, Rail Speeders, Railroad repair crew activity, Mechanical repair equipment operations and any other activity associated with the operation of Railroads.
- Clear an area from each outside rail outward to 25 feet free from flammable vegetation on both sides of the towpath (tracks) and for a distance of one quarter (1/4) mile uptrack and one quarter (1/4) mile downtrack at the site of each identified Railroad operation caused/preventable fire start that has occurred within the previous five (5) years. [See Figure 2] (All distances are horizontal, not slope F.S. 3-12-99)
- Clear all culvert openings within 25 feet of the outside rails on both sides of the towpath in order to make them free of flammable vegetation for a distance of 5 feet radius around each culvert opening.
- Clear all tunnel portals free of flammable materials that are not part of the tunnel supports for minimum distance of 30 feet.
- LETTER OF ADVICE:

This sample letter can be used prior to the time of year when herbicidal treatment is normally applied and/or other means of treatment can normally be expected to be done. All treatments must be done prior to the seasonal vegetative dieback period when vegetation can be ignited and fire can be expected to spread into the wildland.

The letter of advice is discretionary, and can be used only if needed/necessary.

- COMPLIANCE ORDERS:

  This order must be used when an inspection has been made that reveals NON-COMPLIANCE of these regulations. (CCR Sections 1294 & 1295)

  The format found in 1295CCR must be used when issuing an order to abate fire hazard within railroad right-of-way.

Public Resources Code Section 4296.5

(a) Any person or corporation operating a railroad on forest, brush, or grass covered land shall, if ordered by the director or the agency having primary responsibility for fire protection of the area, destroy, remove, or modify so as not to be flammable any vegetation or other flammable material defined by regulation of the director to be a fire hazard on the railroad right-of-way. The director shall adopt regulations establishing fire prevention hazard reduction standards for broad geographic areas by fuel type, slope, and potential for ignition from hot or flaming exhaust, carbon particles, hot metal, burning signal devices, burning tobacco, and other similar potential sources of ignition.

(b) The order to destroy, remove, or modify vegetation or other flammable material shall specify the location of the hazard to be destroyed, removed, or modified within the right-of-way, the width of the hazard which shall not exceed the width of the right-of-way, and the time within which compliance with the order is required.

(c) The director or the agency having primary responsibility for fire protection of the area shall allow a reasonable period of time for compliance with an order to destroy, remove, or modify vegetation or other flammable material.

It is a Misdemeanor to violate the provisions of the Regulations. for Citations use Section 4021 in the PRC with supporting Sections of PRC 4296.5 and California Code of Regulations (CCR) 1293.

Title 14. Natural Resources
Division 1.5. Department of Forestry and Fire Protection
Chapter 7. Fire Protection
Subchapter 3. Fire Hazard
Article 2. Fire Hazard Reduction Standard for Railroad Right-of-Way

Section 1295. Order Format

An order to destroy, remove or modify vegetation or other flammable material, pursuant to P.R.C. 4296.5 shall be made substantially in the following format: Name, Address and Telephone Number of Director's Agent or Agency having Primary responsibility for Fire Protection.

ORDER TO ABATE FIRE HAZARDS WITHIN RAILROAD RIGHT-OF-WAY

(Name and Address of Railroad Operator)

You are hereby ordered, pursuant to the provision of Section 4296.5 of the California Public Resources Code and in accordance with the provisions of Title 14 of the California Code of Regulations Section 1290 through 1294, to abate (clearly describe the vegetation and/or other flammable material to be abated).

Describe so that the area is clearly defined by width, which side of track or both and location by mile post and/or other identifiable landmark or physical feature.

Said hazard abatement is to be completed on or before_____.

Failure to comply with the provision of this order is a misdemeanor as provider by Section 4021 of the California Public Resources Code.

Signature of Authorized Agent or Representative: _____

Title: _____

Date: _____

At: _____

SAMPLE LETTER OF ADVICE

Siskiyou Ranger Unit
1809 Fairlane Rd.
Yreka,CA 96097

Date:

Railroad X
Attn:
409 Locomotive Dr.
Train Station, CA 12345

In addition to the established ten (10) feet requirement of vegetative and flammable material requirements on both sides of all railroad tracks that traverse State Responsibility Lands within this State, you are hereby advised to the provisions of 4296.5 of the California Public Resources Code and in accordance with the California Code of Regulations, that within the previous five (5) years, your railroad was responsible for causing _____ number of preventable fires along its right-of-way.

Each of these fire locations will require twenty-five (25) feet free from flammable accumulation on both sides of the tracks as measured from the nearest rail and on the horizontal (not slope distance) and for a distance of one-quarter mile in each direction from each fire location. This clearance must be attained prior to _____19_____. [Reference 1293(b) CCR]

Attached you will find a map(s) locating each of these fires that have occurred within the previous five (5) years.

You have numerous choices at your disposal by which to attain these clearances:

1. Removal by hand held tools and equipment.
2. Removal by mechanized equipment.
3. Removal by burning with applicable permits.
4. Curtailment of growth and prevention of emergence via the use of herbicides.

If you decide to use herbicides, you must obtain the necessary permits from the county that they are applied in (usually via the county Ag. Dept. & with various applicable control agencies), we are submitting this information now so that you can attain the required clearance by _____19____.

DISCLAIMER:

The CDF nor its undersigned agent has meant to imply, suggest, demand or otherwise recommend the use of herbicides over other means of removal of flammable, or potentially flammable, vegetation or debris along said right-of-way. Neither does the undersigned agent nor CDF itself act as anything but a lay person with regards to herbicides. If the Railroad Operator elects to use herbicides to obtain said clearances, he/she must first seek out the jurisdictional agencies empowered with approval authority to grant the use of said herbicides prior to there use. (Co. Ag. and Health Dept., Fish & Game, other allied Agencies.) CDF nor the undersigned agent will be responsible for the use herbicides, whether or not they are properly applied and with or without the necessary permits and approval processes.

If you have any questions relative to this letter of advice or wish to schedule a meeting to have it more fully explained in person, please advise the undersigned.

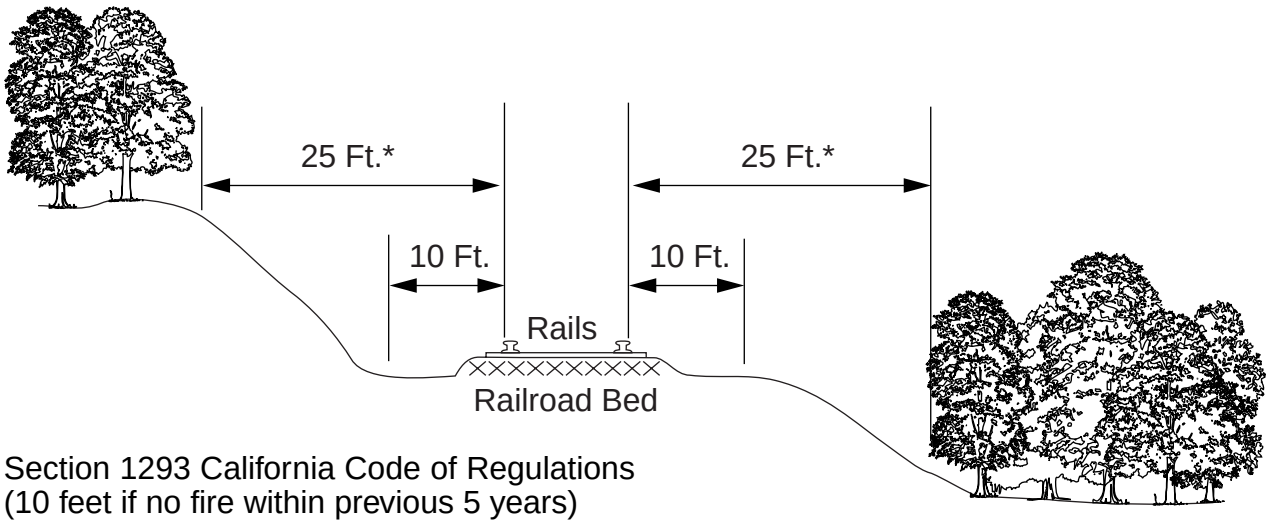
The attached map and regulations may require additional on-site explanations, the undersigned is agreeable to scheduling an on-site inspection of areas shown to avoid confusion.

Signature of Authorized Agent of the Director: _____

Title: _____

Date: _____

At_____, California



Section 1293 California Code of Regulations
(10 feet if no fire within previous 5 years)

*Section 1293(b) California Code of Regulations
(extended to 25 feet if a fire occurred in previous 5 years)

*(All distances are measured horizontal from outside rail F.S. 3-12-99)

Figure 1.
Clearances from Outside Rail

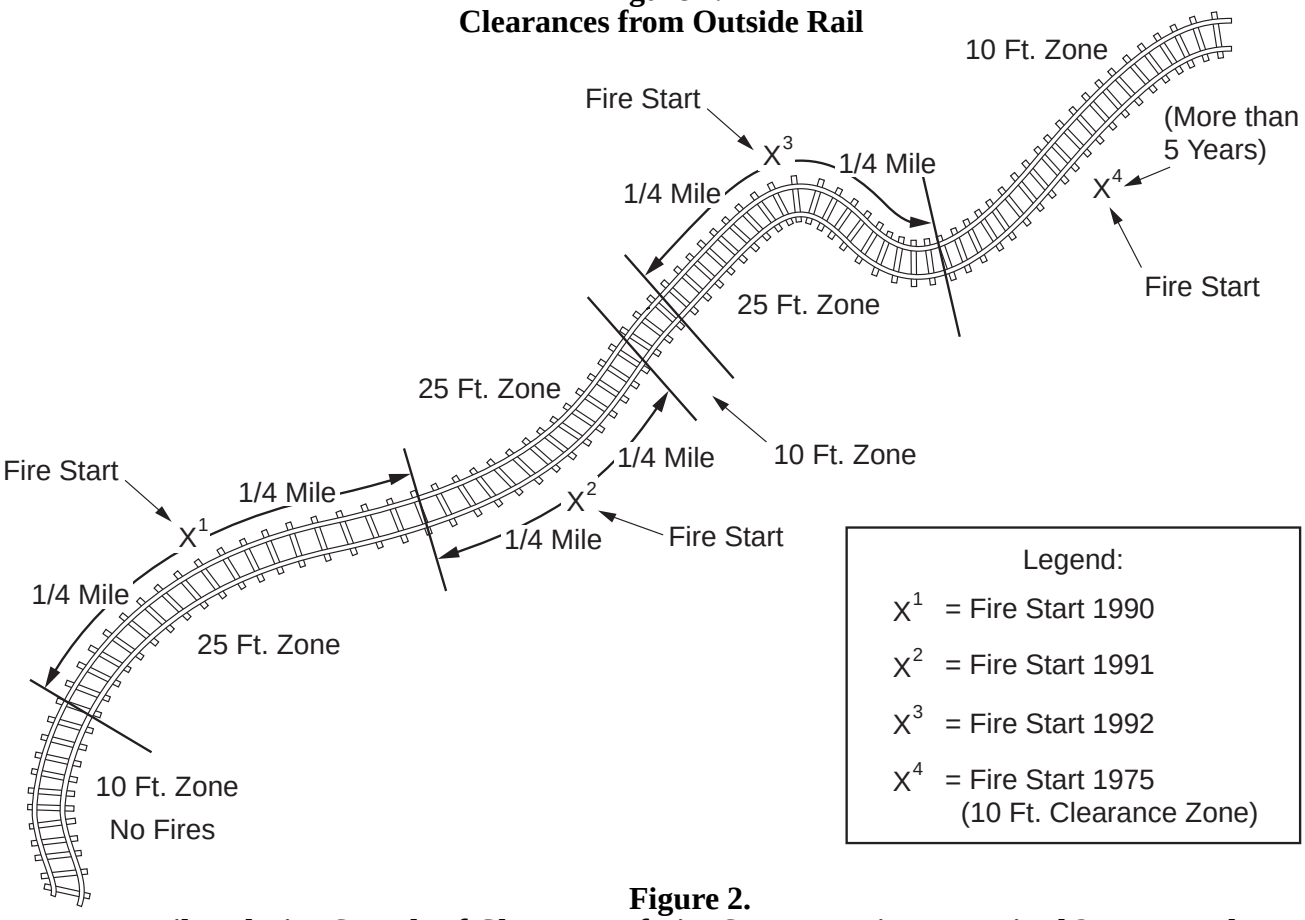


Figure 2.
Railroad Line Sample of Clearance of Fire Start Locations Required 25 Feet Both Sides of Outside Rail (for a distance of 1/4 mile F.S. 3-12-99)