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NFPA 295 Wildfire Control 1985

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

Statement on NFPA Procedures

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

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NFPA 295

Standard for

Wildfire Control

1985 Edition

This edition of NFPA 295, *Standard for Wildfire Control*, was prepared by the Technical Committee on Forest, and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 12-15, 1984 in San Diego, California. It was issued by the Standards Council on December 7, 1984, with an effective date of December 27, 1984, and supersedes all previous editions.

The 1985 edition of this standard has been approved by the American National Standards Institute.

Origin and Development of NFPA 295

This complete rewrite of NFPA 295 was prepared by the Committee on Forest. This edition replaces the previous edition (1978) and succeeds editions which bore the titles: *Wildfire Control and Environmental Improvement* (1972); *Forest, Grass and Brush Fire Control* (1965); *Community Organization and Equipment for Fighting Forest, Grass and Brush Fires* (1956); and the original NFPA 295, *Community Forest Fire Equipment*, adopted by NFPA in 1934.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or any document developed by the Committee on which the member serves.

Contents

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates explanatory material on that paragraph in Appendix A.

Information on referenced publications can be found in Appendix C.

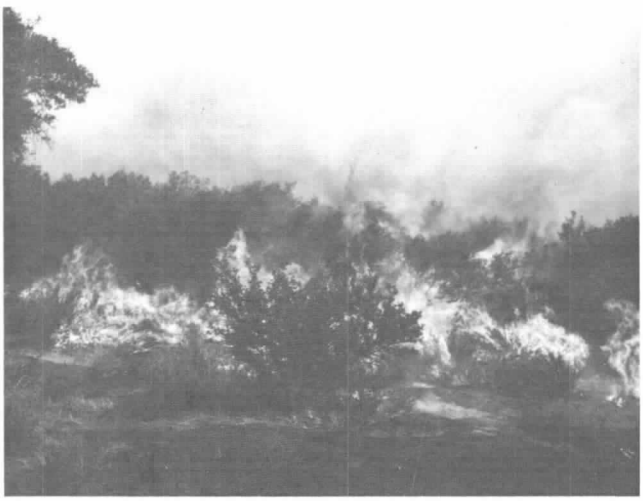


Figure 1 Wildfire.

Chapter 1 Introduction

1-1 Scope. This standard presents fundamental information to fire departments in the control of wildfire burning in natural and other vegetative fuels. It includes necessary and useful information on safe procedures and practices, department organization and management, and equipment and apparatus, as well as other topics which are essential for the safe and successful control of wildfires.

1-2* Purpose. The purpose of this standard is to identify organizational practices and management policies and to specify requirements on safe procedures, equipment and apparatus to ensure the successful control of wildfires.

1-3 Definitions. For the purposes of this standard the following terms have the meanings shown below:

Apparatus. Motor-driven vehicles specially designed or modified for fire fighting or other emergency service; or a collective group of such vehicles, such as pumpers or engines, tankers, ladder trucks, rescue squads, etc.

Brush. Shrubs and scrub vegetation or other growth heavier than grass, but not full tree size.

Company. An organized group of fire fighters under the leadership of a company officer or other designated official. Companies are often assigned to specific apparatus or stations. Also see Crew.

Company Officer. The officer in charge of a fire department company or station or any other position of comparable responsibility in the department.

Control. When an adequate line has been established completely around the perimeter of the fire and it no longer has a potential for additional destruction or for escaping under the existing weather conditions. The fire has reached the phase in which mop-up and patrol are the only activities required to extinguish the fire. "Control" is also used as an inclusive term for any and all actions taken to halt, confine, and totally extinguish a fire, including detection, mobilization, size-up, attack, mop-up, and patrol.

Crew. An organized group of fire fighters under the leadership of a crew leader or other designated official. Also see Company.

Crew Leader. A supervisory person in charge of a group of fire fighters and responsible for their leadership, performance, safety, and welfare for the duration of their assignment; sometimes called a crew foreman, crew boss, or crew supervisor.

Fire Boss. The person responsible for all suppression and service activities on a wildfire. Primary responsibilities are to develop control plans, and organize and direct the fire suppression organization in such manner that the fire is completely and efficiently controlled. The fire boss may carry out all responsibilities alone or assign prescribed line and staff duties to subordinates. Also see Incident Commander.

Forest Fire. Any uncontrolled, unwanted fire in a forested area.

Grass Fire. Any uncontrolled, unwanted fire involving dried grass.

Incident Commander. The individual responsible for the management of all operations of an emergency incident. Also see Fire Boss.

Prevention. That part of fire protection activities designed to prevent ignition of unwanted fires and to minimize loss if fire does occur. Such activities, including public education, personal contact, law enforcement, engineering, and reduction of fuel hazards, are directed at reducing or eliminating the number of fires that start.

Rural. Any area wherein residences and other developments are scattered and intermingled with forest, range, or farmland and native vegetation or cultivated crops.

Wildfire. An unplanned and unwanted fire requiring suppression action; an uncontrolled fire, usually spreading through vegetative fuels but often threatening structures.

Chapter 2 Organization and Management

2-1* Organization.

2-1.1 Purpose. The fire department shall be organized to perform fire prevention and control in order to protect life and property from fire. Other services demanded of the fire department, because the fire department force is available and has specialized training, shall be undertaken only to the extent that they do not interfere with the department's basic purpose and that they are activities justifiably related to it.

2-1.2 Goal. The fire department's goals shall be to protect life and property; to minimize fire losses through fire prevention; to take quick, aggressive initial action to prevent the small fire from becoming large; and to control the large fire as soon as possible with the minimum cost.

2-2* Command.

2-2.1 Fire Chief. The fire department shall have a fire chief who shall be in overall command at all times.

2-2.2 Incident Commander. On every fire or emergency incident, one and only one individual must be recognized as incident commander or fire boss.

2-2.2.1 When the department responds to a fire or other emergency, the first officer to arrive shall assume command of the incident until specifically relieved by someone with higher authority.

2-2.3* Succession. A formal chain of command or succession shall be established and it shall clearly state the sequence in which all members succeed to command responsibility. This is necessary to ensure clear lines of authority and continuity of command, leadership, and operations due to death, injury, disability or absence of the chief, officers, or other individuals.

2-2.4 Company Officers. Each fire company or crew shall operate under the command of a designated officer, crew leader, fire boss, or incident commander. Each company shall have enough officers to provide a leader to command the company at the time of any response.

2-3 Responsibilities.

2-3.1 Fire Chief. The fire chief shall be responsible for the administration, management, and operation of the fire department. Duties specifically include:

(a) Be the principal spokesperson for and represent the fire department before the public and the governing legal authority.

(b) Establish the operational procedures of the department through the issuance of regulations and orders.

(c) Direct operations at a fire or emergency incident.

(d) Ensure that the department is adequately trained and staffed.

(e) Ensure that a training plan is developed and implemented and that all members are knowledgeable in the basic measures for attaining fast, safe, and effective fire suppression.

(f) Prepare a departmental budget.

(g) Be familiar with all laws and ordinances that apply to the operation of the fire department.

(h) Investigate all fires for cause, origin, and circumstances.

(i) Ensure compliance by the department with all sections of this standard, and all applicable local laws and ordinances.

(j) Development and implementation of a fire prevention program for the entire year.

(k) Responsibility for the safety and welfare of all fire department members engaged in departmental operations.

2-3.2 Officers. Company officers or crew leaders shall have the following duties and responsibilities.

(a) To ensure the safety and welfare of their company or crew members.

(b) To act as leader of a crew of individuals.

(c) To respond to alarms to which the unit is assigned and to direct operations of the units.

(d) To have sufficient knowledge of fire strategy to be able, in the absence of a chief officer, to make a proper "size-up" or appraisal of the emergency and assume initial command until formally relieved.

(e) To be familiar with the area protected by the department.

(f) To ensure the care, maintenance, and fire readiness of assigned apparatus and equipment.

2-3.3 Members. All fire department members shall be responsible for the following:

(a) Be familiar with all rules and regulations governing the operation of the fire department.

(b) To keep themselves in good physical condition in accordance with the fire department's established fitness standards.

(c) Be familiar with and knowledgeable of the entire area protected by the department.

(d) Be knowledgeable in the methods of fire control, the safe use of tools and fire fighting equipment, and in the procedures for safe and effective response to alarms.

(e) Be familiar with the fire laws and regulations of the local jurisdiction and state or province.

(f) To operate through established lines of responsibility and authority.

(g) To respond to alarms when notified.

(h) To protect themselves and others in the hazardous task of fire fighting through compliance with all safety standards, regulations, and procedures.

2-4* Emergency Response and Notification. Members shall be trained to achieve safe and effective response to alarms.

2-4.1 When a fire or emergency occurs, members of the fire department shall be immediately notified so they can respond with apparatus and equipment.

2-4.2 Provisions shall be made for immediate notification of fire department members. This may be accomplished through activation of a siren, use of radio pagers or alert monitors, or a telephone chain.

2-5* Fire Control Plan.

2-5.1 Plan Required. A written fire control plan shall be prepared. A plan in outline form is acceptable. The plan shall be revised and updated annually, or sooner if required by changing conditions.

2-5.2 Elements. The plan shall contain the following information as a minimum:

(a) Fire department organization and personnel roster with contact information.

(b) A listing of cooperating agencies and contacting procedures.

(c) Additional available resources of manpower, equipment, supplies, and facilities and contacting or ordering procedures.

(d) Up-to-date map of protection area, including: boundaries, roads and other means of access; heliports, airports, water sources, special hazards; and dangerous fire risks.

(e) Mutual aid agreements.

2-6 Mutual Aid. Whenever possible, mutual aid or automatic aid agreements with adjacent fire departments or other agencies shall be negotiated and implemented. Such agreements shall include provisions to ensure clearly established command authorities and responsibilities.

2-7* Fire Prevention Program.

2-7.1 Plan Required. Since a primary objective of the fire department is to prevent fires, a fire prevention plan shall be developed and implemented each year.

2-7.2 Elements. As a minimum the fire prevention plan shall contain an analysis of fire causes, special fire hazards and risks, and proposed measures to reduce fire occurrence and decrease fire damage. It shall also include provisions for cooperative efforts with all other neighboring fire protection agencies.

2-8* Headquarters Building. A headquarters building shall be selected to house apparatus and equipment and serve as a communications center for fire and other emergencies.

Chapter 3 Safety and Training

3-1 Safety.

3-1.1* Personnel. The safety and welfare of personnel shall be the first and foremost consideration in all fire suppression or other emergency operations amd decisions.

3-1.2* Protective Clothing. The fire chief shall require that protective clothing be worn by all fire department personnel while engaged in any fire fighting activity.

3-1.2.1 As a minimum, fire fighters engaged in wildfire control shall have and use a safety hard hat or fire helmet equipped with chin strap, leather boots at least 6 in. (15.24 cm) high, goggles, and gloves. Synthetic polyester clothing, tennis shoes, sneakers, or low-quarter shoes shall not be worn on the fire line. Fire department members shall wear cotton or wool clothing with cuffless trousers and long-sleeved shirts or lightweight flame resistant clothing, specially designed for wildfire fire fighting. Individual states or provinces may have more restrictive personnel protective clothing requirements. To ensure compliance with such regulations, the fire department shall check with its state or provincial occupational safety and health agency.

3-1.2.2 Power saw operators shall wear protective power saw chaps and ear protection in addition to the protective clothing listed above.

3-1.3* Physical Examination. Prospective members of the fire department shall undergo and pass a physical examination before admission to the department as an active member. The medical examiner shall certify the applicant's physical ability to perform fire fighting duties.

3-1.4* First Aid. Injured fire fighters shall be given first aid treatment promptly. Injured and sick fire fighters shall be transported immediately to a physician or hospital and not permitted to stay on a fire except in cases of very minor injuries or ailments.

3-1.4.1 Fire department members shall be trained and certified in first aid and cardiopulmonary resuscitation (CPR).

3-1.4.2 First Aid Kits. First aid kits for fireline use shall be readily available on all emergency responses. Supplies for the treatment of burns shall be included in the kits. First aid kits shall also be available for dispatch at any locations where suppression tools are stored.

3-1.5 Fire Apparatus.

3-1.5.1 All apparatus shall be equipped with seat belts and chock blocks. All personnel shall use seat belts whenever the vehicle is in motion. Chock blocks shall be set at the rear wheels whenever the vehicle is parked.

3-1.5.2 All apparatus with tailboards, running boards, etc., for use by personnel shall be equipped with safety belts for each fire fighter. All personnel who ride on the exterior of the apparatus shall use the safety belts whenever the vehicle is in motion.

3-1.5.3 Personnel shall not jump on or from a moving vehicle.

3-1.5.4 A signal person shall be used whenever a vehicle is being moved in reverse.

3-1.5.5 Fire department members shall be fully trained and completely familiar with the apparatus to which they are assigned.

3-1.5.6 Vehicles on the fireline shall be parked so they face in the direction of the escape route.

3-1.5.7 Fire apparatus shall be driven and operated only by trained and qualified personnel. Apparatus shall be driven in a safe and sane manner. All applicable laws and departmental regulations regarding the response of emergency vehicles shall be obeyed.

3-1.6 Tractors and Bulldozers.

3-1.6.1 Fire fighters shall not work directly above or below tractors or bulldozers where they may slide beneath the machine or be struck by rolling material.

3-1.6.2 Fire fighters shall not approach a tractor or bulldozer until it has stopped and the operator has signaled it is safe to approach.

3-1.6.3 Fire fighters shall avoid being immediately in front of or in back of a tractor or bulldozer in operation.

3-1.6.4 Fire fighters shall not get on or off moving equipment.

3-1.6.5 Fire fighters shall not sit or bed down near a tractor or bulldozer.

3-1.6.6 Tractors and bulldozers shall be operated only by trained, experienced operators.

3-1.6.7 Fire fighters shall not ride on tractors or bulldozers.

3-1.7 Power Saws.

3-1.7.1 Power saws shall be operated only by trained, experienced personnel.

3-1.7.2 Power saw operators shall wear safety hard hats, protective chaps, ear and eye protection, and gloves.

3-1.7.3 The motor shall be stopped whenever a power saw is to be carried more than 10 ft (3.0 m).

3-1.7.4 The motor shall be stopped for all cleaning, adjustments, and repairs.

3-1.7.5 The motor shall be stopped and the exhaust allowed to cool prior to refueling. Refueling shall be done on bare ground and spilled fuel wiped off the motor. The saw shall not be started within 10 ft (3.0 m) of the refueling area.

3-1.7.6 Whenever using a power saw, there shall be nearby either a portable fire extinguisher, or a backpack pump filled with water, or a shovel for extinguishing fires that may be started by the power saw.

3-1.8 Hand Tools.

3-1.8.1 All hand tools shall be maintained in good condition, with tight handles, properly sharpened, and all sharp edges guarded or sheathed when not in use.

3-1.8.2 Hand tools shall not be carried on the shoulder. Hand tools shall be carried by the balance point on the downhill side with the cutting edge away from the body. A distance of at least 6 ft (2.0 m) shall be maintained between individuals when carrying hand tools. When using tools, a distance of at least 10 ft (3.0 m) shall be maintained between individuals. Except in an emergency, fire fighters shall not run while carrying hand tools.

Figure 2 A fire crew building a fire line. Note the safety helmets, canteens, and the spacing between crew members.

3-1.9* Aircraft. If the fire department has occasion to work with fire fighting aircraft, members shall be trained in safety procedures regarding fixed-wing and rotary-wing aircraft.

3-2* Training. To ensure safety and effectiveness, every fire department member shall receive basic wildland fire training prior to responding to a wildland fire.

3-2.1 The content and length of the training program shall be determined by the fire chief. As a minimum, the content shall include courses in fireline safety, fire behavior, and suppression methods.

Chapter 4 Equipment and Apparatus

4-1 Equipment.

4-1.1* Hand Tools.

4-1.1.1 The organization shall have sufficient hand tools for wildland fire control.

4-1.1.2 The organization shall consult with available local wildland fire protection agencies for advice on selection of tools and equipment.

4-1.1.3 All hand tools shall be for use in emergencies only and shall be distinctly marked.

4-1.1.4 When not in use, tools shall be properly stored in a clean, dry location.

4-1.2* Power Saws.

4-1.2.1 Power saws shall be carefully maintained and serviced in accordance with manufacturer's recommendations. Manufacturer's operating and safety instructions shall be followed.

4-1.2.2 Power saws shall be equipped with approved, adequate spark arrestors.

4-1.3 Fire Hose. Fire hose shall be maintained in good condition and cared for properly. It shall not be used for other than fire fighting unless such use is approved by the fire chief.

4-1.3.1 Provisions shall be made for fire hose storage in a clean, dry location.

4-1.3.2 After each use, fire hose shall be drained, cleaned, and dried before being placed in storage or back in service.

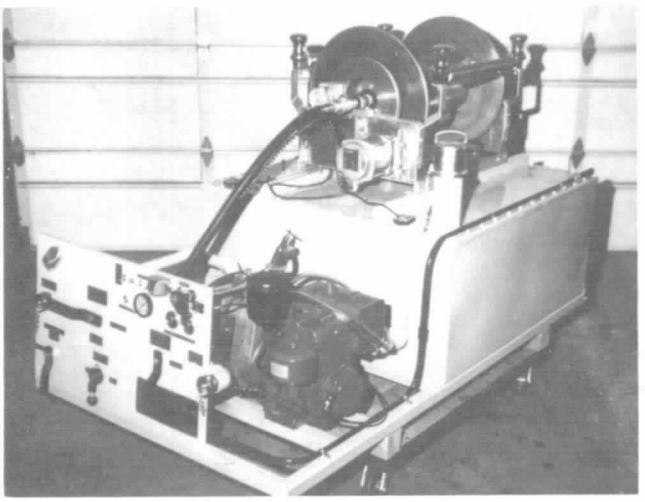
4-1.3.3 Fire hose shall be systematically and periodically inspected and shall be carefully pressure tested at least once a year.

4-2 Apparatus.

4-2.1 All department fire apparatus shall be equipped and maintained in a fire-ready state and first-class condition at all times. After every run, apparatus shall be returned to a fire-ready state as quickly as possible.

4-2.2 Apparatus shall be maintained and serviced according to manufacturer's recommendations and specifications.

4-2.3* All tractors or bulldozers shall have protective canopies, winches, and adequate lights for night operations, and if not turbocharged, shall be equipped with approved, effective spark arrestors.



Figures 3, 4 and 5 Apparatus used in wildfire suppression exist in a variety of configurations. The top photograph pictures a fire engine specifically designed for wildfire suppression. It includes an integral 300 gpm pump and a 500 gal water tank. The center photograph depicts a unit that was converted for wildfire suppression from a surplus military vehicle. The bottom photograph is a slip-on unit, including fire pump and water tank, designed to be placed on a 12,000 lb GVW truck whenever it is needed.

Chapter 5 General

5-1* Chemicals. Chemicals shall not be used without a thorough knowledge of the particular precautions to be followed and the hazards of each chemical being used. The fire department shall comply with all applicable laws, ordinances, and regulations concerning the use of chemicals.

5-2* Communications.

5-2.1 Emergency Telephone. An emergency telephone number shall be established for receiving reports of fires or other emergencies. This emergency telephone number shall be widely publicized in the response area and published in the local telephone directory.

5-2.2 Alerting System. The fire department shall have an alerting system by which it can summon personnel at any time of the day or night.

5-3 Fire Reporting and Investigation.

5-3.1* Fire Reporting. A fire report shall be completed and filed on every fire or false alarm responded to by the fire department.

5-3.2* Fire Investigation. Every fire responded to by the fire department shall be investigated for fire cause as soon as possible and an investigation report shall be completed and filed.

5-3.3 Requirements. The fire department shall contact its state forester, state fire marshal, or other equivalent officer to determine required fire reporting and investigation procedures and report contents.

Appendix A

This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.

A-1-2 The current text is designed to help the thousands of small community organizations existing in the rural and forested areas of North America. Many of these communities are exposed to the dangers of a large fire involving many acres of natural fuels, such as forest, grass, or brush. To effectively prepare for such emergencies, the responsive fire protection organizations and individuals must be informed of the most recent and useful wildland fire control techniques, equipment, training, and operations.

Additional information on large equipment, heavy power tools, specialized wildfire fire fighting equipment, and techniques is available in other publications. The standard includes a list of mandatory requirements which must be met if the volunteer groups are to be safe and effective in the prevention and suppression of wildfires.

It is suggested that fire organizations consider the adoption of this standard through a vote by the fire department members or by citizens of the protected area using a format similar to the following:

The_____Fire Department of
(Name)

the _____ of _____
(County, Town, City, Province, etc.)

accepts the mandatory requirements of NFPA 295 as a working charter, providing reasonable guidance to reduce, as far as practicable, hazards to life and property from fire.

Legal counsel shall be consulted to explain how the adoption of this standard affects the department and its members.

In many rural and wildland areas, forest, grass, crop, and brush fires are a continual problem. These fires, if not controlled, can endanger human life and cause serious damage to property, natural resources and the environment. Careful evaluation of wildfires in the United States and Canada for many years has shown that fire damage can be prevented or minimized if such fires are aggressively attacked by trained fire fighters in the early stages of fire development.

A-2-1 Organization and Management. In order to provide fire prevention and control and to protect life and property from wildfire, a community should establish the following:

An officially designated formal organization headed by a fire chief or fire warden charged with the responsibility of preventing and controlling fires. The chief is in charge of the entire departmental operation. The chief should be appointed by the governing body, if one exists, or elected by the membership on the basis of merit and ability. The chief may be a paid professional, part-time paid, or volunteer.

A well-organized, equipped, and trained fire company or crew which will operate under the authority of the fire chief, fire warden, or subordinate officer.

Most small wildfires can be handled by a well-trained squad or company of two to five fire fighters if attacked quickly. Large or rapidly spreading fires require more fire fighters, more equipment, expert supervision and extensive radio and telephone communications.

Three or four small companies or squads of five or six fire fighters, with leaders, may be grouped together under the command of a crew leader or company officer. This leader may be one of several crew leaders commanding similar groups and all personnel under his command, and others concerned, should know who the crew leader is and the scope of the leader's authority. The crews or companies may be assigned to action on only a designated portion of the main fire. This designated portion of the fire is commonly called a sector or division.

A-2-2 Command. The first responsible authority - ranger, warden, company officer or crew leader - or other officer who arrives at the emergency, is the Incident Commander or Fire Boss until someone with higher authority specifically assumes command. Whenever a new Incident Commander assumes command, all officers, crew leaders, and others on the incident should be notified immediately. The Incident Commander or Fire Boss is responsible for planning and directing the fire control efforts; assembling crews or fire companies and telling them where and how to work; making the best use of personnel; arranging for communications, rest periods, and relief crews; making the best use of equipment and tools; obtaining supplies; and ensuring that the fire is completely extinguished before the last crews are released from the scene. In other words, the Incident Commander or Fire Boss is responsible for all activities and operations at an emergency incident. He may delegate more and more responsibility to assistants as the organization needed grows, but he is always the final authority and bears total responsibility.

A-2-2.3 Succession. A fire department needs a successional order established to ensure someone remains in charge at all times and to ensure that all members know who that individual is. This creates a constant continuity of responsibility and authority no matter who is absent at what time. A typical fire department succession may be established as follows: Chief, to Assistant Chief, to Senior

Captain, to Second Senior Captain, to Lieutenant, to Second Senior Lieutenant, etc.

A-2-4 Response and Notification. Members of the fire control organization must be immediately notified of an emergency so they can respond with the required apparatus and equipment. Members should be familiar with the entire area protected by the organization. Upon arrival at the emergency scene, members should report to the Fire Chief or other officer in charge.

Training should be provided to ensure the safe and effective response to alarms. This training should include the following topics: laws and regulations governing emergency vehicle response; vehicle operation; vehicle maintenance and trouble shooting; and defensive driving.

A-2-5 Fire Control Plan. Written fire control mobilization plans are important even if prepared only in outline form. They should list all preplanned decisions and attack plans and outline other information needed for planned action. Such Fire Control Plans allow a subordinate to take emergency action in the absence of the Fire Chief or other key individuals. Copies of the plans with necessary maps should be distributed to key fire officers. Fire control plans must be updated at least annually, and any other time when required by changing conditions.

A. Fire Department Organizational Chart
   1. Line of Succession — Names — how to contact
   2. Personnel Roster — Names — how to contact

B. Cooperating Agencies — Names — how to contact

C. Resources
   1. Reserve personnel — how to contact.
   2. List of available equipment — type, locations, how to contact and procure.
   3. List of available supplies and suppliers — types, locations, how to contact and procure.
   4. List of other available facilities — types, locations, who to contact.

D. Map of Protected Area. Include such items as:
   1. Boundary of protected area and adjacent jurisdictions.
   2. Roads and other means of access; heliports and airports.
   3. Locations of manpower, equipment, and facilities resources.
   4. Water sources.
   5. Areas of concern.
      a. Hazards — areas of hazardous fuels.
      b. High risk ignition sources; dumps, sawmills, logging operations, recreation areas, etc.

E. Fire Weather Information
   1. Source of information.
   2. Methods of notifying the public.

F. Pre-Attack Plans

A-2-7 Fire Prevention. A major responsibility of every fire protection organization is to keep the community informed of the methods and need for sound fire prevention. Prevention of wildfire is a continual job. Fire is an ever-present danger, and, to be effective, fire prevention must be constantly practiced. Fire prevention is often said to be the most important function of a fire protection organization.

A fire prevention program must include plans for the entire year. The program should analyze the common causes of fire, identify significant fire hazards and risks existing in the protection area, and proposes measures to reduce the occurrence of fire and fire damages.

Sample Fire Prevention Plan

A. Basis of Plan
   1. Fire occurrence map
   2. Fire statistics
   3. Fire risk map (may be overlays)
   4. Industrial operations map
   5. Hazard map

B. Prevention Objectives

C. Summary of Problems and Actions to Be Taken

D. Prevention Contact Plan

E. Public Education

F. Reduction of Physical Hazards

G. Sign-Posting Plan

H. Prevention Training

Weather plays an important role in the occurrence, frequency, and severity of wildland fires; therefore, the community should be kept informed of the current fire danger rating. Many fire departments use large signs or other devices to indicate this rating. Additional information on fire danger rating determination can be found in Appendix B.

Public Education. People in the community can be informed of fire prevention practices through leaflets, posters, booklets, and similar items distributed by the fire protection organizations. Newspapers, radio and television stations will also often support year-round fire prevention campaigns, particularly with respect to wildfires. Young children can be taught conservation and fire prevention principles in the primary school grades or through periodic instruction by fire department members. In the prevention plan, the specific methods to be used to contact the public should be outlined. Specific individuals should be assigned to accomplish the contacts and the groups and organizations to be contacted should be listed.

A-2-8 Fire Stations. A building should be selected to house fire apparatus and equipment. Initially this may be

a private structure, but plans should be made to develop an adequate public fire station. The station should provide heated garaging for vehicles, proper storage for equipment and hose, and space for meetings and training. It may also serve as a communications center for emergencies.

A-3-1.1 Personnel. Fire fighting requires fast action, sustained effort, and greater energy than most other work. Fire fighting is always hazardous and potentially dangerous. In the United States, fire fighting has one of the highest accident rates of any occupation. Wildfire control can be particularly hazardous unless the necessary safety procedures and principles are constantly practiced and obeyed. Most accidents can be prevented by careful procedures and training before emergencies. The safety and welfare of the entire fire fighting organization are the responsibility of the incident commander. Each person in authority is likewise responsible for the safety of the personnel under his direction.

A-3-1.2 Protective Clothing. A safety hard hat with chin strap must be worn on the fireline. A standard fire fighter's helmet may be worn as an alternative. Hard hats greatly reduce the number of serious injuries. Lightweight "bump" hats are unacceptable as they do not provide adequate protection in wildfire control.

Footwear should be leather lace-up boots. It is recommended that boots be without steel toes except for those used by chain saw operators. The boots should have slip-resistant soles, such as a hard rubber lug-type or tractor tread. This allows for maximum traction and prevents melting when exposed to normal fireline conditions. Soles should not be made of composition rubber or plastic, which have low melting points. This does not preclude the use of boots with smooth, hard rubber soles or those with a well-defined tread. However, the disadvantage of these soles is their tendency to slip on smooth rock, logs, dry grass, and pine needle surfaces which are often encountered on wildfires. The height of boot tops should be a minimum of 6 in. (15.2 cm), with at least 8 in. (20.3 cm) or greater preferred. Low-quarter boots or shoes should not be worn as they do not provide ankle support or keep out sparks and dirt. "Pull-on" type boots, such as structural fire fighting rubber boots, "cowboy boots," or engineering boots are not recommended because they do not provide adequate ankle support, do not keep out sparks and dirt, and are loose-fitting and may cause blisters.

If available, flame-resistant clothing specially designed for wildfire fighting should be worn. If flame-resistant clothing is not available, fire fighters should wear loose, cuffless trousers and shirts made of cotton or wool. Loose-fitting clothing reduces chafing and affords more protection against burns caused by radiant heat. Long-sleeved shirts with neck-buttoning collars should be worn to protect the arms and neck from heat, burns, scratches, and insects.

Structural fire fighting protective clothing, such as turn-outs or "bunker" coats, should not be worn in wildfire fire fighting. The extra weight and lack of breathability create increased stress on the fire fighter, significantly increase the probability of heat exhaustion or heat stroke, and decrease fire fighter production levels.

Gloves should be worn to protect hands and make hand work easier. Fire fighters should have goggles for eye protection when encountering excessively smoky or dusty environments.

Figure 6 This fire fighter is properly attired in state-of-the-art protective safety clothing for wildfire suppression. Note the shirt, trousers, and face shroud of fire-resistant material, the gloves, safety hard hat, goggles, lug-type work boots and fire shelter.

A-3-1.3 Physical Examination. Members of the fire department must be in good physical condition. Fire control operations often demand long hours of vigorous activity. Wildfires in particular require much climbing, carrying, and use of tools and equipment in uneven terrain, often for several days and nights. Persons unable to pass rigid physical examination may be used within their abilities in nonfireline activities such as dispatching or other capacities.

Anyone selected as an active member of the fire department should undergo a physical examination by a physician. The fire department may establish standards for physical examinations and for physical fitness. These standards may be used for physical evaluation through testing procedures as well as guidance for physicians evaluating members. The US federal wildfire control agencies and a number of states use a "step test" for evaluating the physical condition of new and experienced personnel. Information on the "step test" may be obtained from respective state foresters' offices or the US Forest Service (see Appendix C).

Medical files should be established to maintain a history of accidents or disabilities that the fire fighter receives in service. One of the first acts of the newly formed fire control organization should be to establish its membership requirements in accordance with the ap-

plicable provisions of state or provincial legislation. This would include provisions for worker's compensation or other insurance for fire fighters. Requirements for professional fire fighters are included in NFPA 1001, *Fire Fighter Professional Qualifications*.

A-3-1.4 First Aid. All fire department members must be trained and certified in first aid and cardiopulmonary resuscitation (CPR). As a minimum, the training shall consist of the American Red Cross's 21-hour standard first aid course and the American Heart Association's 9-hour cardio-pulmonary resuscitation (CPR) course, or equivalent medically certified courses. It is highly recommended that fire department members be trained and certified beyond these basic courses to the more advanced Emergency Medical Technician (EMT) level.

A-3-1.9 Aircraft Safety — Fixed-Wing Aircraft. The use of fire retardants dropped from aircraft is a modern, sophisticated attack tool in wildfire control. It is likely that members of fire departments may become involved in the use of air tankers; therefore, they must be cognizant of the safety rules regarding air tanker operations.

Ground forces should be warned when drops will be made in their area. Often the air tanker pilot will make a dry run or high pass over the portion of the fire where he plans to drop. This usually indicates the drop will be made within one to three minutes. If drops have already been made in the area, there usually will be no dry runs.

Fire fighters should inform their supervisor of any conditions that may be hazardous to aircraft. These hazards include: power or telephone lines, poles, and towers; aerial cables; antennae; other aircraft in the area; and snags hidden in the smoke.

Personnel can be injured or even killed by the impact of retardant drops. An airdrop can throw a person against rocks, trees, or other objects and be dangerous because of blowing or falling objects. As an example of the power of retardant drops, a low drop of 25 to 40 ft (7.5 m to 12.0 m) totally destroyed a Bureau of Land Management fire engine and seriously injured two men when 150 gallons of retardant were dropped from a C-119 at a speed of 180 mph.

Figure 7 An air tanker makes a drop of fire retardant on a wildfire. If a drop is coming towards you as in this photograph, take cover and follow the safety procedures — you are going to be hit by the drop.

If unable to retreat to a safe place when an airdrop is imminent, follow these safety procedures:

(a) Lie face down with head toward oncoming aircraft and hard hat in place. If possible, grab something solid and get behind it to prevent being carried or rolled about by the drop. Spread feet apart for better body stability and to assist digging in.

(b) Hold tools firmly out to the side and away from the body. Flying tools or equipment can cause injury.

(c) Do not run unless escape is assured. Never stand up in the path of an air drop.

(d) Stay away from large old trees, and snags. Tops, limbs, or entire trees may break and fall, causing injury.

After the retardant drop has been made, there is a follow-up advantage on the fire. However, these factors must be considered after the drop:

(a) Most retardants are slippery; therefore, be careful of footing and wipe off all hand tools, especially the handles.

(b) Heavy application of retardant on surfaced roads can be hazardous and should be washed down as soon as possible.

(c) Retardant should be washed from equipment and structures as soon as possible to prevent damage to finishes.

(d) Retardant may also damage agricultural or ornamental vegetation and actions should be taken to minimize such damage.

Rotary-Wing Aircraft (Helicoptors). The use of helicoptors has become a key part of wildfire protection; however, as with any other piece of fire fighting equipment, there are definite rules for safety when using or operating around a helicoptor. The following safety procedures apply to helicoptor operations:

Figure 8 The use of helicopters has become a common occurrence in wildfire suppression. This helicopter is being used to make water drops on a wildfire.

Approach and Departure.

(a) Get the pilot's attention and permission before approaching the helicoptor.

(b) Always approach in full view of the pilot. Never approach from the rear of the helicoptor.

(c) Always approach or depart in a crouched position. Gusts of wind can cause the rotor blades to drop dangerously low to the ground.

(d) Safety helmets must be held securely to prevent their being blown away or blown up into the rotors by the rotor blast.

(e) Never approach or depart a helicoptor from ground which is upslope from the main rotor. Rotors are almost invisible when turning at high speed or under poor lighting conditions.

(f) Keep clear of the main and tail rotors at all times. Do not walk to the rear of the helicoptor when entering or exiting.

(g) Carry all long-handled tools in such a manner that the handles will not be inadvertently raised into the rotor path.

Working Around Heliports.

(a) Stay at least 100 ft (30 m) away from helicoptors at all times unless you have a specific job that requires otherwise. Your presence can cause confusion and disrupt the pilot's concentration.

(b) Do not face a landing helicoptor unless wearing goggles.

(c) Do not remain in an area that is consistently under the flight path of any helicoptor.

(d) Do not smoke within 50 ft (15 m) of any helicoptor or fueling area.

In-flight Safety.

(a) Do not smoke in the helicoptor.

(b) Use the seatbelt and keep it secured until the pilot instructs you to leave the helicoptor.

(c) Ensure that all loose gear and helmets, maps, papers, etc., are securely held to prevent their being blown about the helicoptor or out the windows.

(d) Do not let any gear get in the way of the pilot or his controls.

(e) Never throw anything out of a helicoptor.

(f) Do not talk to the pilot unless necessary, particularly during takeoff and landing.

(g) Be alert for hazards such as other aircraft and especially telephone and power lines.

(h) Never slam the doors of a helicoptor. The doors do not have spring-loaded locks, so the handles must be physically turned to secure the door.

A-3-2 Training. All personnel should receive frequent training in first aid, fireline safety, fire behavior, and techniques and methods of wildfire suppression. This should include periodic hands-on training with hand tools and equipment, as well as crew and fireline organization. Crew leaders and company officers need special training in fire control tactics to assure their competence when directing fire suppression operations. It is recommended that cooperative training with other wildfire control organizations be conducted. Federal, state, and provincial forest fire officers have technical training material and are usually available to assist.

Many states and provinces have established programs through which fire fighters can receive training in structural fire fighting. Special training in wildfire tactics and techniques can be obtained from state, provincial, or federal wildfire protection agencies, which frequently conduct special fire schools, seminars, and other forms of instruction. A number of publications dealing with wildfire control are available from state forester's offices or the National Audio-Visual Center (see Appendix C).

A-4-1.1 Hand Tools. Fire departments should have sufficient hand tools to equip a crew of at least ten fire fighters. These tools should be for emergencies only, and should be distinctly marked to guard against their use for other purposes. Some communities distribute such equipment among their fire wardens, who are responsible for the maintenance, safekeeping, and availability of the tools. Organized fire fighting crews usually store tools at a central location. This allows fire fighters to pick up equipment at a known location enroute to a fire.

Tools needed will vary by sections of the country, due to differences in fuels, soil, and topography. All equipment selected for fire control work should be dependable, properly maintained, and used for the type of work for which it was designed. Many national standards and specifications are available to help fire department organizations to purchase the proper equipment. Assistance in selecting appropriate tools can be obtained from federal, state, or provincial wildfire fighting agencies.

A-4-1.2 Power Saws. It is not necessary that fire control organizations own power saws; they are frequently available from woods operators, the same operators that communities may often rely on for additional fire fighting manpower.

Information on power saws can be secured from the manufacturers as well as from operators who have used the various makes and types. Because fire suppression may require carrying saws long distances over rough terrain, an important consideration is weight. Saws must be equipped with adequate, effective spark arrestors to minimize the possibility of igniting nearby fuels by hot exhaust particles.

A-4-2.3 Tractors and Bulldozers. Tractors and bulldozers are costly compared to hand tools or the majority of power tools used in line construction and mop-up work. Most fire departments will not find it economical to own tractors or bulldozers but should make a careful evaluation to determine use possibilities under existing conditions of terrain, fuels, and rates of fire spread. Heavy tractor equipment is frequently available from construction and logging operators, whose names and telephone numbers should be included in the fire plan. Any tractors or bulldozers used for wildfire suppression should be equipped with protective canopies, winches, and adequate lights for operating at night. Unless turbocharged, bulldozers or tractors should also be equipped with approved and effective spark arrestors.

A-5-1 Chemicals. Chemicals have been used in wildland fire control generally in five ways: as an additive to water to wet fuels more efficiently through reduction of water surface tension; as a fire retardant to supplement

Figure 9 Bulldozers are a valuable tool for wildfire suppression. This one is properly equipped with protective canopy, lights, brush guards, and a winch.

Figure 10 Fire line plows are often used in suitable terrain to build fire lines along the flanks and rear of a wildfire.

or reinforce the extinguishing action of water in direct application and in advance of a fire, to create or reinforce natural or constructed barriers; as an aid in the prevention and control of fires by reducing flammable vegetation, such as eliminating or reducing grass and brush on fuel breaks and along rights-of-way; as foam producers for water expansion systems; and as friction reducers to reduce friction loss on extended hose lays.

Additional information on the fire fighting use of chemicals, especially fire retardants, is available in the 1977 NFPA publication, *Chemicals for Forest Fire Fighting*.

A-5-2 Communications. A communication system by which fires and emergencies may be reported to the fire organization is essential. There must be telephone communications to some central location which serves as a dispatch center. An emergency telephone number, widely publicized in the response area and published in the local telephone directory, must be established. It is essential that all persons in the community and surrounding area be notified of how and where to report a fire or other emergency. It is also essential that the fire department have an alerting system by which its personnel can be summoned at any time of the day or night. There are a number of ways to do this, including radio-activated pagers and monitors, sirens, and telephone chain systems. It is also recommended that the department establish a "duty roster" to ensure availability of sufficient numbers of fire fighters at all times.

Communication between officers, apparatus, and the dispatch center is also important. This is usually accomplished through the use of 2-way radios. Citizen band radios are often used.

Figure 11 Communications are essential to any fire suppression organization. The design of a communications system is dictated by the organization's needs. The photograph above shows a very sophisticated communications and dispatch center used by a large wildfire protection organization (California).

Additional detailed information on this topic can be found in the NFPA publication *Telecommunications Systems - Principles and Practices for Rural and Forestry Fire Services*, No. FSP-41, Standard Book No. 87765-056-1.

A-5-3.1 Fire Reporting. The reporting of fires is an important function of the fire department. Fire reports provide a realistic and factual basis for fire prevention planning, support for funding requests, and aid in organizational development. They also may be significant documents in insurance claim adjustment cases. A report must be completed on every fire or false alarm responded to by the fire department. It is important to compile each fire report as soon as possible after the fire while the pertinent information is fresh in the mind of the reporting officer.

The National Wildfire Coordinating Group (NWCG) has established a standard information content for wildfire reporting. This standardized content is now used by all U.S. federal wildfire control agencies and many states. The standardized report information requirements are included in Appendix B.

A-5-3.2 Fire Investigation. The effectiveness of future fire prevention efforts may depend on the thoroughness of fire investigation; therefore, every fire should be investigated for cause as soon as possible. Investigation can

be performed simultaneously with the fire suppression operation. Crew members must be trained to protect the fire's area of origin and to protect any evidence at the fire scene. It is important that the fire's area of origin be as undisturbed as possible and that anything that might be evidence not be moved unless absolutely necessary to prevent it from being destroyed.

All fire fighters have responsibilities in fire investigation. When responding to a fire they should note anyone or anything that could relate to the starting of the fire; they should observe vehicles in the fire area and those moving away from it; they should record license numbers, vehicle descriptions, personal descriptions, number of people, and locations or directions of travel.

At the fire scene fire fighters should be alert for evidence on how the fire started and who started it. They should preserve and protect any evidence found, recording the time and place where each item was located. It may be necessary to assign one of the crew members to this task while the rest of the crew takes suppression action. All information obtained should be recorded, including the names of witnesses or anyone else contacted, and summaries of any conversations with them. If an official investigator arrives, he should receive full cooperation from all fire fighters and all obtained information turned over to him.

Appendix B

This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.

Fire Danger Rating

I. Introduction.

Fire danger rating systems measure and evaluate the numerous weather and other factors which influence the flammability of forest fuels. While they have been developed over the years for large forest protection and management agencies, they can be equally helpful to fire departments in both planning and operational roles. If you are faced with the problem of estimating potential fire business on a day-to-day basis for forest, grass, or brushland fuels, fire danger rating can help your department to be more effective.

Fire danger rating is based upon daily measurements of weather-related values made at special weather stations distributed throughout the forest area. These measurements are translated into indices which estimate current fire occurrence and fire behavior potential for the variety of fuel conditions present. When weather forecast data are added, reliable predictions of fire danger for one or two days can be made. In most rural areas, this information is available to local fire departments or weather agencies (see Section V).

II. History of Fire Danger Rating.

In the early days in North America, forest fires posed a constant threat to both forest workers and to settlers trying to carve a farm from the forest. During hot, dry periods fire was an enemy that had to be fought wherever it was encountered, using volunteers and whatever tools were at hand. As time went on, the wisdom of some sort of organization and planning for forest fire control became evident, and forest fire control agencies were set up under trained foresters.

These early foresters noticed that the moisture content of forest fuels, such as needles, twigs and other dead material on the forest floor, changed from day to day, and that both fire occurrence and behavior were closely related to this moisture content. They concluded that if they could measure fuel moisture daily, they would have some warning of how serious a fire day might be: some relative idea of how many fires to expect, how quickly they might spread and how difficult they might be to control. Early attempts at measuring fuel moisture included such crude devices as a gunny sack filled with moss suspended on a simple balance. The lighter the bag of moss the lower the moisure content and hence the more severe the fire day. Later, wooden fuel moisture sticks, which could be calibrated to provide a more uniform measurement, were substituted.

Forest fire researchers took note of these early attempts at fire danger rating and recognized the potential of putting such measurement on a scientific basis. More or less independently in the mid 1920s, researchers in both the United States and Canada began studies of relationships between weather, fuel moisture, and fire, and each country developed, over the years, a comprehensive system of danger rating based on relatively simple daily weather measurements and wetting and drying formulae to express the flammability of typical forest fuels.

Both systems have now reached a high level of sophistication and accuracy and have been computerized for fast and easy use. However, if no computer is available, fire danger can readily be calculated using simple tables. Both systems have broad similarities. Each requires daily measurements of temperature, relative humidity, wind speed and precipitation; each recognizes several size classes of forest fuels of different drying rates, whose moisture contents are measured or calculated each day; and each is composed of a series of "building blocks" or indices which represent different parameters of fire behavior. These building blocks are used to progress to the final index, which is a relative measure of fire behavior's contribution to the fire containment job. In the American system this is the Burning Index (BI) and in the Canadian system, The Fire Weather Index (FWI).

Although fire danger rating systems may appear complex because of their many components, they are not difficult to use. For some purposes, only one or two component indices may be required. For example, if the danger rating is to be used to warn the public, then only the final index (BI or the FWI) is needed. For fire suppression planning, rate of spread and fire intensity indices may be required.

III. Uses of Fire Danger Rating.

The present systems were designed for agencies responsible for the management of large tracts of forest or wildland. Typically, an agency of this type would have an extensive network of weather stations strategically located throughout its territory and reporting the required weather measurements daily to a central office. There the current and forecast danger indices may be calculated on

a computer and either sent back to the originating station or averaged for use as an area index. However, a single station can be used as the basis for fire danger rating for a local area, such as that served by a single department.

These systems have been set up to provide fire danger information. The real benefits are realized through the practical uses made of the information and how it is incorporated into fire protection operations. These uses fall into three main categories with appropriate codes or indices being used for each. All may be appropriate for rural fire departments. The categories are:

(A) Preparedness. The following activities will vary depending on the existing and predicted level of fire danger:

1. Implementing mutual assistance agreements with other agencies.
2. Scheduling personnel for various work activities.
3. Deployment of equipment.
4. Scheduling of equipment maintenance.
5. Fire hazard severity for zoning and land use planning.

(B) Prevention measures linked to fire danger:

1. Signs and media messages to the public.
2. Issuing of burning permits.
3. Restriction and closure of certain forest areas to the public.
4. Patrols for potential fire hazards.

(C) Response measures linked to fire danger:

1. Frequency of detection patrols.
2. Size of initial attack force and type of equipment to use.
3. Fire control strategy and tactics to be employed.
4. Alert calls to cooperating agencies.

IV. Fire Danger Rating in the Rural Scene.

Preparedness and prevention are particularly important to rural fire departments. On weekends and holidays, when the public will be making heavy use of the forests and wildlands, the fire danger rating is useful in helping to decide what size fire control force will be adequate. For such uses, the rating is often divided into a number of classes such as Extreme, High, Moderate, and Low. A plan may then be drawn up to specify what level of manning there should be when the index is Extreme, High, and so on. Staff may be given time off and equipment maintenance carried out when the index is Low.

V. How to Get Started.

If you have decided to take advantage of the fire danger rating system, you should make contact with the closest forest or land agency that is presently calculating or distributing fire danger ratings in your area. They will be able to help you select the codes or indices that would be most useful to you and may be able to provide you with this information daily. As you use the indices, they will become more meaningful in relation to actual fire experience.

If there is no local source of fire danger information, you might consider installing a simple weather station in your area, and operating your own system. Some of the referenced literature will be helpful in setting up a station. Advice can also be obtained from agencies in your region which are using a danger rating system.

In the United States, contact your closest state or National Forest office. If the information you need is not available there, write or call:

Cooperative Fire Protection
Forest Service, USDA
Room 1001-RP-E
P.O. Box 2417
Washington, DC 20013 Phone: 703-235-8039

In Canada, contact your closest provincial or territorial forest fire agency. If the information you need is not available there, write or call:

Canadian Forestry Service
Environment Canada
Ottawa, Ontario I1A OE7 Phone: 819-997-1107

VI. Fire Weather.

A good fire danger rating system is dependent on good fire weather measurements. A forest fire weather station need not be complicated or expensive, but there are a number of basic rules to observe to ensure sound weather measurements. A good handbook to follow is called "Fire Weather Observers' Handbook," Agriculture Handbook 494 (1976), issued by the US Department of Agriculture, Forest Service. A description of a simple fire weather station is also included in Chapter V of Forest Fire Danger Rating System by J.A. Turner and B.D. Lawson.

For those who may be interested in having more information on the danger rating systems in use in the United States and Canada, a list of pertinent publications is provided in the following section.

VII. National Wildfire Coordinating Group (NWCG) Standard Fire Reporting Information Requirements.

Through the efforts of the National Wildfire Coordinating Group, all US federal wildfire control agencies agreed each would report the same 25 essential data elements. Actual report format remains an agency option as long as the required information is reported. The 25 essential data elements are as follows:

1. Agency Name
2. Fire Number
3. State
4. County
5. Latitude and Longitude
6. Class of Ownership at Point of Origin
7. Equipment Involved in Ignition
8. Form of Heat of Ignition
9. Type of Material First Ignited
10. Form of Material Ignited
11. Ignition Factor
12. Age of Person Responsible for Fire Start
13. Sex of Person Responsible for Fire Start
14. Category of Person Responsible for Fire Start
15. Activity Involved
16. Date/Time of Ignition
17. Date/Time Fire Reported