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**BULLETIN 58**  
**PAMPHLET No. 7**

Revised 1964

**FORESTERS'**  
**MANUAL**

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DEPARTMENT OF CONSERVATION  
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WESTERN AUSTRALIA

**FIRE CONTROL**

**FORESTS DEPARTMENT**  
**PERTH**  
**WESTERN AUSTRALIA**

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FORESTS DEPARTMENT, WESTERN AUSTRALIA

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**FORESTERS' MANUAL**

# **FIRE CONTROL**

Prepared under the direction of  
**A. C. HARRIS, Conservator of Forests**

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**PERTH: 1964**

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## FOREWORD

(1) The attention of officers receiving this pamphlet is drawn to the introduction in Pamphlet No. 1 which is applicable to the Manual as a whole.

(2) It is to be noted that each section as issued will override the instructions contained in circulars on subjects covered by the section and such circulars will automatically be cancelled.

## THE IMPORTANCE OF FIRE CONTROL.

1. The problem of fire control is intimately bound up with the questions of reforestation and afforestation and the ultimate success of the Department's efforts in these projects is largely dependent on a strong measure of public sympathy and co-operation in attacking the fire problem.

Importance of  
Fire Control.

2. Of almost equal importance is the proper use of controlled fires in silvicultural and protective operations.

3. The eucalypt forests of Western Australia lend themselves to hazard reduction by the intelligent use of fire in the Spring, Autumn and Winter by Prescribed Burning.

## POLICY.

4. At the passing of the Forests Act, 1918, the Northern half of the State Forests had been ravaged by unrestricted cutting and uncontrolled fires.

5. Since 1919 the Northern half of the forest has been roaded and until recently given complete protection at a very high cost.

During this period, the extension of group settlement and other farming ventures resulted in heavy damage due to indiscriminate firing of much of the Southern forest area where the forestry organisation was not yet established.

6. It was found that after 15 or 20 years' protection the accumulation of combustible material was such that even very heavy expenditure on men and equipment could not "stay" a fire under the severe weather conditions that occur periodically in Western Australia. Other States have learned this lesson with equal force.

7. The result of nearly four decades of fire control experience and research is a policy introduced in 1954 which may be briefly summarised as follows:—

- (a) Put all available funds into the roading of valuable forest areas to check annual losses by uncontrolled fires.
- (b) Use prescribed burning and intelligent planning to the fullest extent possible to reduce the danger of severe uncontrolled fires.
- (c) Use our well developed fire-fighting organisation to quell outbreaks in the dangerous summer months, but fight fires with discretion and with an eye to the cost of operation.
- (d) Train officers and men to think in terms of costs and collateral values on every operation involving fire protection.
- (e) Train and trust the junior officer to use fire as a controlled weapon to accomplish silvicultural ends and to guard against calamities.

8. In the implementation of this policy it has been found necessary to divide the forest into three zones indicating the degree of fire protection aimed at and for the annual Fire Report.

Demarcation  
of Zones.

9. "A" Zone.—This will comprise all country on which fires will be attacked immediately they become known.

"A" Zone.

This will include regenerated or planted forest as well as the greater part of the prime forest over which fire control measures are gradually being extended.

Within this zone there will be a proportion of sub-marginal forest and even unforested country as well as private property.

10. "B" Zone.—Will include forest on which it is possible to afford limited protection only by broadcast burning in suitable weather.

"B" Zone.

Suppression of uncontrolled fires in this zone will only be delayed when commitments in Zone "A" require the postponing of an immediate attack.

This zone will also include certain areas of private property adjacent to State Forest boundaries.

Plantation Zone. 11. "Plantation" Zone will comprise areas planted or sown with exotic or indigenous species in plantation form, areas cleared or part cleared awaiting planting and a protective buffer area surrounding these areas.

The "Plantation" Zone is in "A" Zone as for paragraph 9 but is instituted for the convenience of the Annual Fire Report, see Appendix "F."

12. The boundaries of these zones will be reconsidered annually by the D.F.O. and, where necessary, will be revised after discussion with the Fire Control Superintendent.

Reports to refer to Zones. 13. All fire reports dealing with damage to the forest will refer to the area in terms of these zones.

14. The Forests Department's organisation covers a large area loosely controlled and must train, organise and prepare, in periods of little danger, for periods of extreme effort.

The Fire Organisation. The details and organisation of Fire Control within Divisions is the responsibility of the D.F.O. or other officer in charge.

To assist D.F.O.'s in this task the Fire Control Superintendent has a Fire Operations Officer, Fire Research Officer and Fire Control Foresters. These officers help with the planning of pre-suppression measures, inspection of fire control operations generally, training gangs and fighting large fires.

In all such organisation stress is placed on the clear definition of duties and responsibilities. Those definitions and responsibilities are laid down in this section of the Manual and all officers must clearly understand that such duties are the responsibility of the position rather than the actual rank of the officer.

Duties of Acting Officer. 15. For example, where the duties of a D.F.O. or District Officer are defined, it follows that in his absence, even temporarily, such duties devolve upon the officer acting in that position.

Branches of Fire Control. 16. The work of fire control falls into three main branches:—

- (1) Fire Prevention.
- (2) Fire Pre-suppression.
- (3) Fire Suppression.

These branches are dealt with under each heading in the following pages.

Fire Control Working Plans. 17. All Divisions must prepare Fire Control Working Plans. These W.P.'s will give regular checks, locally, of the general organisation within Divisions. They will also provide officers from other Divisions, relieving in an emergency, with a quick reference to available manpower and equipment and to the general situation concerning prevention and pre-suppression measures in the Division concerned.

The Fire Control Working Plan will consist of two parts under the broad headings set out below. The detail required in these parts is given in Appendix "A."

#### Part A.—Inventory.

- (1) Manpower and Equipment (Forests Department and outside sources).
- (2) Water Supplies.
- (3) Detection and Communications.
- (4) Access.
- (5) Previous Prevention Burning.

Part B.—Planning.

- (1) Prevention—Controlled Burning.
- (2) Pre-suppression—Fire Control training.
- (3) Suppression—Standing Orders and suppression organisation.

**DEFINITIONS.**

18. **Broadcast Burning.**—Fire used to destroy surface material in such a way that it burns freely over a considerable area with or without the use of firebreaks.

19. **Controlled Burning.**—(a) Any deliberate use of fire whereby burning is restricted to a predetermined area and intensity; or (b) Deliberate burning of a prescribed area at a predetermined time.

20. **Danger (Fire).**—A general term expressing the sum of the factors Risk, Hazard, Inflammability which determine whether fires will start, the damage they may cause and the extent to which they can be controlled.

21. **Fire, Crown.**—The crown fire is a fire burning through the crowns of the trees in advance of the following surface fire.

This type of fire is rare and occurs only under extreme weather conditions.

A crown fire cannot continue to burn unless fed by a following surface fire, by surface fires lit, either along with, or ahead of, the crown fire by burning debris dropping down from or blown ahead of the running crown fire.

22. **Fire, Ground.**—A ground fire is one that burns below the surface of the forest litter in peat or very deep litter.

This type of fire is rare in Western Australia, but has been experienced in some of our wide flats or in deep dry river bottoms.

23. **Fire, Surface.**—The surface fire is one that burns through the scrub and litter on the forest floor.

This is the usual type of fire in this State.

24. **Fire Protected Area.**—Any portion of the State declared a Fire Protected Area under the Bush Fires Act.

In a Fire Protected Area no one may light a fire between 1st October and the next 31 May, that is including the prohibited period without a permit from an officer authorised by the Minister for Lands (see paragraphs 46 and 47).

25. **Forest Officers.**—Any officer appointed under the Forests Act or the Public Service Act irrespective of whether they are permanent or temporary officers and includes Professional Officers and field staff, but does not include overseers or other wage employees.

26. **Hazard (Fire).**—A measure of that part of fire danger which is due to the fuels available for burning.

That is the relative amount, class, character, moisture content, condition and distribution.

Hazard refers to fuels only.

Risk refers only to the agencies that may cause fire.

27. **Inflammability** is the susceptibility of the fuel to ignition and is closely related to its moisture content.

28. **Mopping Up.**—The term used for the work done in rendering a fire safe after it has been brought under control.

29. **Prescribed Burning (American).**—The application of fire to land under such conditions of weather, soil moisture, time of day and other factors as will result in the controlled spread and intensity of heat required to accomplish specific silvicultural or fire hazard reduction purposes.

30. **Pre-Suppression.**—Those activities carried out during the safe period and maintained throughout the season to ensure that when a fire starts the whole suppression organisation will act efficiently.

The activities are the organisation, instruction and management of the fire control force, and the inspection, maintenance and improvement of fire control equipment and supplies to ensure effective suppression.

31. **Prevention.**—Those fire control activities concerned with the attempt to reduce the number of fires through Education, Law Enforcement and Hazard reduction.

All those steps taken prior to and during the fire season to stop fires from starting.

32. **Risk (Fire).**—The relative chance or probability of fire starting, determined by the presence or absence of causative agencies.

### FIRE PREVENTION.

Branches of Fire Prevention.

33. Fire prevention, a most important branch of fire control, can be divided into the following sections and subheadings which are dealt with in turn:—

- (1) Risk Reduction.
  - (a) Education.
  - (b) Law Enforcement.
- (2) Hazard Reduction.

Causes of Fires.

34. Before discussing details of fire prevention activities a study of fire causes will be of value as indicating sources of fire incidence and possible points of attack in the campaign against future outbreaks.

The percentage incidence of fire from various causes over past years is as follows:—

Cause	%
Escapes from Private Property	21
Escapes from Controlled Burning	9
W.A.G.R. Locomotives	8
Travellers	7
Unknown	7
Deliberately Lit	6
Hunters and Fishers	6
Lightning	5
Bush Workers	5
Children	3
Other Government Employees	2
Mill Surroundings	2
Householders	2
Mine Surroundings	1
Stockmen and Leaseholders	1
Tractors	1
Other causes*	14

\* Other causes—includes "Bush Locomotives." These have caused many fires in the past, but they have now ceased operations.

### RISK REDUCTION.

35. A study of fire causes will give some indication of the risks to be reduced or eliminated, and Risk Reduction can be either by Education, Law Enforcement or merely mechanical adjustment.

Smoking in Plantations.

36. Smoking will be prohibited in all plantations except on fire lines when butts and spent matches must be deposited on bare mineral soil and buried.

Billy fires.

37. When it is necessary to light a billy fire, it must be lit on an area cleared down to mineral soil and the remains of the fire doused with water and covered with soil.



38. All new employees must be instructed in these precautions and the provision of the two preceding paragraphs rigidly enforced.

Instruction of  
Employees.

### EDUCATION.

39. The most effective means of fire prevention is popular education. The objective is to make everyone fire conscious, and to make the general public realise the value and necessity of fire control.

Taking the long view, special attention should be given to the training of the younger members of society. Children are more receptive than adults, the child in the classroom today, is the responsible citizen of tomorrow. Moreover, the child will take the doctrine of fire prevention from the school room to the home. Every effort should be made by the Forest Officer to introduce the subject of fire prevention into the schools of his district.

Visiting of  
Schools.

40. Posters advocating fire prevention should be displayed at bus shelters, railway sidings, crossroads and other suitable permanent places throughout the forest. A recent innovation is the sign board carrying the daily Fire Weather Forecast which is a very effective means of educating the travelling public, but the information on the board must be always up-to-date. Generally, it is desirable for Bureau of Meteorology forecasts to be indicated on the board and this **MUST** be so when the forecast is Dangerous because of the special significance of this forecast under the Bush Fires Act.

41. Suggestions for striking posters should be submitted to the Fire Control Office, and officers are encouraged to develop fire warning signs.

Requisitions for posters required should be submitted to Head Office before September in each year.

42. Small pamphlets, giving information concerning the provisions of the Bush Fires Act, the fire provisions of the Forests Act, organisation of Bush Fire Brigades and hints on controlled burning and fire suppression methods are prepared by Head Office from time to time and should be distributed among local residents and settlers by the local Forest Officer.

Pamphlets.

Personal discussions at the time of distribution of these pamphlets and notes of intention to burn will greatly assist the work.

Recommendations for the printing of new pamphlets and requisitions for supplies should be submitted in September each year.

43. Lectures and the showing of such propaganda films as are available can be arranged where fire control measures are instituted.

Lectures and  
films.

Application for the services of a lecturer if none is available locally, and/or the Departmental projector should be made to Head Office, as required.

### LAW ENFORCEMENT.

44. Every forest officer must make himself acquainted with the Bush Fires Act and Regulations, and make sure that his copy of the Act is kept up-to-date by entering any amendments that are gazetted.

Bush Fires Act.

45. Besides the provision of the Bush Fires Act, the attention of all forest officers is drawn to the following fire provisions of the Forests Act:—

Fire Provisions  
of Forests Act.

Section 46.—Penalty for unlawfully lighting fires (minimum 1/20th of maximum).

Section 47.—Forest Officers calling for assistance to extinguish fires.

Section 48.—Setting fire to bush without notice to forest officers.

Fire Protected Areas.	<p>46. The Bush Fires Act makes provision for the declaration of Fire Protected Areas in which the lighting of fires (during the "restricted burning times") is prohibited except by written permit to burn issued by the Minister for Lands or an officer acting with his authority.</p> <p>There are only two such areas so far gazetted, one within a twelve mile radius of Collie Railway Station, and the other an irregular area in the Mundaring Weir district.</p>
Foresters issue permits.	<p>47. Forest officers have the sole authority to issue permits to burn in these areas.</p> <p>48. The correct procedure for the issue of permits to burn in fire protected areas is fully set out in the Regulations under the Bush Fires Act and must be followed.</p>
Inspection to be made.	<p>49. Generally, the forest officer shall have an inspection made of the area to be burned to ensure that all precautions are taken.</p>
No permits during prohibited period.	<p>50. No permit to burn shall be issued during the prohibited period except during a period when the Department has obtained a suspension of the prohibited period, and then only if the forest officer is satisfied that conditions are safe.</p>
Prohibited period.	<p>51. The Bush Fires Act provides that there shall be a prohibited period each year, during which the lighting of fires, except for certain specific purposes is prohibited. The dates for the prohibited periods for different zones are published in the <i>Government Gazette</i> from time to time.</p>
Suspension of prohibited period.	<p>52. Provision is also made for this Department to obtain a suspension of the prohibited period to enable us to carry out protective burning.</p>
Application for Suspension.	<p>53. Before the beginning of the prohibited period the Forester-in-Charge should apply to Head Office for any suspension required, setting out the reason for his request, the minimum period required, the Road District concerned and the particular areas on which the burning operations are to be carried out.</p> <p>All such applications for the suspension of the prohibited period must be countersigned by a S.D.F.O. and forwarded to the Fire Control Superintendent.</p>
Ascertain cause of Fire.	<p>54. In every case of fire the local officer must take immediate steps to ascertain the cause with a view to possible law enforcement. The procedure to be followed is set out in Appendix "C."</p>
Investigation of Fires.	<p>55. From his local knowledge the forester will generally have a good idea of the cause of most fires which occur, where it is obvious that it is directly due to human agency, immediate steps should be taken to obtain more specific information concerning the identity of the culprit, and some points on how to go about such an investigation are given in Appendix "C."</p>
Blacktrackers.	<p>56. Blacktrackers are now rarely available, but if the services of one are required application should be made to the Fire Control Superintendent who will endeavour to obtain one through the Police Department.</p>
Farmers' fires.	<p>57. A frequent source of uncontrolled fires is escapes from settlers' burning off operations.</p> <p>Most of these are due to ignorance and lack of experience so that discussion with farmers and bush fire brigades should go far to minimise this trouble.</p> <p>58. Some of these escapes are due to inadequate safeguards and where settlers persist in ignoring the provisions of the Bush Fires Act they must be prosecuted.</p>
Local Authority to Prosecute.	<p>59. Where a breach of the Bush Fires Act occurs on private property outside the boundary of State Forest the Local Authority, which is charged with the policing of the Act, should carry out the prosecution.</p>

60. The forester may assist officers of the Local Authority to obtain evidence, but as far as possible should leave prosecutions to the Local Authority where the breach occurs on private property. Forest Officer to Assist.
61. Where a Local Authority fails to take legal action against flagrant breaches of the Bush Fires Act, particularly if there are several cases of such failure, immediate advice of the incidents together with full details should be sent to the Fire Control Superintendent so that the matter may be taken up with the Bush Fires Board without delay. Lack of action by Local Authority.
62. When any illegal burning outside State Forest boundaries is located, the Local Authority should be notified immediately by telephone of the position of the fire and a record made in the office log book. Notice to Shire Council.
63. Once a week a confirmatory letter should be sent to the Shire Clerk listing all the fires located in their area during the period and notice of which they have already received by telephone. A copy of these letters should be sent to the Fire Control Superintendent.
64. If the Local Authority is known to be taking disciplinary action in any case advice of this should also be sent to Head Office without delay. Action by Shire Council.
65. Forest Officers must be most punctilious in the observance of all provisions of the Act. Forest Officers to observe the law.
- W.A.G.R. LOCOS.**
66. It is the policy and practice of the Railways Commission to fit all W.A.G.R. locomotives with spark arresters during the summer months. Forest officers have no authority to stop or inspect any W.A.G.R. locomotives suspected of being faulty. W.A.G.R. loco's have spark arresters.
67. The Railways Commissioners have promised full co-operation in fire prevention and details of the organisation set up will be found in Appendix "D." Liaison with W.A.G.R.
- Forest officers must maintain close liaison with local W.A.G.R. officers in all matters of fire prevention.
68. Immediately a forest officer is reasonably certain that a W.A.G.R. locomotive has started a fire he should advise, by telephone, either the District Locomotive Superintendent at East Perth, Bunbury or Narrogin, the Locomotive Foreman at Collie or the Driver in Charge at Pinjarra, depending on the locality. Fires to be reported promptly.
69. These telephoned reports must be confirmed in writing as soon as practicable and a copy forwarded to the Fire Control Superintendent in Perth. Report to be confirmed in writing.
70. The report of a fire having been lit by a W.A.G.R. locomotive should contain the following information:— Information required.
- (a) Number of the locomotive.
  - (b) Locality.
  - (c) Date and time.
  - (d) Direction of travel.
  - (e) Any other relevant information.
71. Every effort must be made to have the local Permanent Way Gang patrol behind a train with a defective engine to deal with any fires which may occur. Assistance from Permanent Way Gangs.
72. In dangerous fire weather it is often advisable for a Departmental gang with fire equipment to patrol a section of W.A.G.R. line behind a defective engine. Patrol of line.

## HAZARD REDUCTION.

### CONTROLLED BURNING.

Periodic burning.

73. All areas which do not require complete protection will be burned systematically by light controlled fires.

### TYPES OF CONTROLLED BURNING.

Types of controlled burning.

74. There are five types of controlled burning, for fuel reduction, that are standard practice.

- (a) Burning of buffer areas or firebreaks around areas of high risk—that is to contain fires in areas where they frequently start or occur more or less regularly, e.g., external boundaries, railway lines, main roads and certain areas of private property.
- (b) Burning of buffer strips or firebreaks around areas of high value—that is to keep fires out of places such as saw mills, schools, townsites, isolated settlements, plantations, research areas, regeneration, etc.  
(The burning of the above two types will be carried out as frequently as possible, but not less frequently than every third year.)
- (c) Prescribed burning of large areas on a rotational system. The length of the rotation will depend on seasonal weather, manpower available and other local circumstances.
- (d) Advanced burning: prior to logging operations.
- (e) Top disposal burning, for regeneration and hazard reduction, following logging operations.

Areas afforded complete protection.

75. Complete fire protection will be afforded to:—

- (a) Plantations.
- (b) Regeneration areas nominated in paragraphs 56, 60-62, 64, 75-80, Pamphlet No. 6 (revised) of the Manual.
- (c) Where possible, areas listed for trade operations in order that they will carry a fire immediately before trade cutting commences.
- (d) Karri tops awaiting a seed year.
- (e) Areas required for research and investigation.

### PLANNING FOR CONTROLLED BURNING.

Controlled burning Master Plans.

76. Officers in charge of Divisions must draw up controlled burning master plans. These plans will show:—

- (a) Areas which will be burnt on a three-year (or less) rotation—i.e., areas covered by burning types (a) and (b) above.
- (b) Areas for prescribed burning on a rotational basis. There may be one, two or more lengths of rotation in this burning in one Division. The fundamental which must not be overlooked here, however, is that the yearly or cyclic burning plans must aim at areas linked into continuous strips of not less than 40 chains width rather than a patchwork of scattered areas.
- (c) Advanced and top disposal burning will be incorporated in this plan.

The master plans must be checked annually and adjusted, if necessary, in the light of results of previous burning.

Current year's burning programme.

77. Immediately after the completion of the annual fire report and before the 15th August in each year, the D.F.O. shall draw up a current burning plan setting out his burning programme for the next Spring, Autumn and Winter. Subject to approval or amendment by the Fire Control Superintendent or his staff this plan shall form the basis of his controlled burning operations. (See paragraphs 111, 114 of Pamphlet No. 6 (revised) of the Manual.

(The master plan, mentioned in paragraph 76, and the plans showing the results of previous controlled burning will be used as guides in framing this annual programme.)

78. The Forester-in-Charge is responsible for burning in his own district.

Officer to inspect areas to be burnt.

A local officer must inspect each area to be burnt to assess the fuel condition and vulnerability and decide the weather conditions under which it should be burnt. A member of the field staff must issue instructions for each piece of burning. This should not be left to an overseer or leading hand.

79. A local officer should attend controlled burning operations on all possible occasions to check techniques used by gangs.

Officers to check burning operations.

80. Overseers or officers directly in charge of the burning operations must mark on plan the area considered to have been burnt. This will not be finally washed in on the Divisional burning plan until it has been inspected and the area and quality of the burn verified.

Areas burnt to be inspected and put on plan.

Areas not burned to schedule will be marked on the plan and arrangements made for these portions to be burned later.

#### **PARTICULAR AREAS.**

81. **Pine Plantations.**—No controlled burning under pine canopy is to be carried out except with the written authority of the Plantation Superintendent.

Pine plantations.

Full details of burning carried out under such authority must be measured and recorded.

#### **Schools**

82. Protective burning should be carried out around school buildings and quarters in the forest areas and nearby.

Burning around Schools.

Details of any school or other Government buildings not adequately protected must be forwarded to the Divisional Officer for advice to Head Office so that the departments concerned can be advised of the position.

#### **Mill Villages and Townships.**

83. For the protection of mill villages and townships against the danger of loss of life or material damage from uncontrolled forest fires the Forester-in-Charge should prepare details of any precautionary measures considered necessary and discuss them with the respective mill managers or Shire Clerk, or local Bush Fire Control Officer in the case of townships.

Mill Villages and Townships.

84. Around each mill, town or settlement in the forest it will be necessary to select or construct tracks such that it is possible to provide a burnt break around the settlement at least twenty chains deep from the perimeter.

85. The burning of these belts will be an important annual task to be so arranged that it is performed by the townspeople, mill employees or departmental gangs, as the case may be.

Local Settlers to assist.

86. A report on the lack of response of such local people should be submitted to Fire Control Superintendent early for further action if necessary.

Reports on Local Response.

87. It is of great importance to the economy of the State that the risk of damage or destruction of sawmills by fire be reduced to the absolute minimum and the controlled burning programme must ensure that mills are protected from bush fires.

Sawmills.

Occasional fires may arise in the grounds of mill towns and action should be taken in conjunction with the mill management to reduce the hazards responsible.

88. Every possible precaution must be taken to ensure that every forest settlement is safe from damage by forest fires. This is the direct obligation of the Forester-in-Charge of the settlement who should draw the attention of his Divisional Officer to any cases of exceptional hazard or risk.

#### **ADVANCE BURNING.**

(See also paragraphs 16-18, Pamphlet No. 6 (revised) of the Manual.)

89. The importance of burning country in advance of falling operations, as a means of modifying and controlling subsequent fires cannot be over-emphasised.

Exceptional cases will arise where burning is impossible, and in such cases the Forester-in-Charge should send prior information to the Divisional Office and the Fire Control Superintendent.

Burning should be confined to the annual cutting sections.

Time of advanced  
burning.

90. Preferably an area to be cut over should be burned in the early Spring prior to the fallers commencing operations, but in any case should not be burnt more than eighteen months in advance.

Where an Autumn burn is necessary it should be left as late as possible.

91. A fire twelve or eighteen months prior to the commencement of felling operations will leave the forest floor in such a state that it will not burn again immediately in front of the fallers, but will yet run a fire when the crowns and bark litter the ground. This adds to the difficulty of disposing of this litter without damage to the remaining crop.

#### **TOP DISPOSAL.**

92. Serious damage can be done to the remaining tree crop by uncontrolled fires following in the wake of "felling" operations. Not only are saplings, poles and piles destroyed in this way, but where the butts of mature trees are surrounded by a litter of tops the resulting scorching reduces the value of the standing crop by the production of dry sides, hollow butts, or death and by allowing the ingress of termites and wood destroying fungi.

Judicious expenditure on top disposal operations generally will be repaid many times over in the saving of valuable timber.

Clearing Debris.

93. Unless otherwise directed by the D.F.O., workmen will follow the fallers and clear away limbs and other debris for a distance of about three feet from around valuable trees and saplings. Elsewhere tops will be lopped flat.

The amount of work to be done around any tree will depend on its value. Trees which already have valuable timber in them are worth many saplings. A pile, for example, may justify the expenditure of a couple of hours' labour, while a short sapling (even though sound) requiring half an hour's work to clear round, would not be worth tackling.

In judging the value of a tree it should be borne in mind that many trees cut today would have been passed by a few years ago, and that some trees today considered uneconomic will be saleable in years to come.

Top Burning.

94. Top burning is carried out during mild weather or at night to reduce damage to the remaining trees. However, in order to dispose of as much limb wood as possible it should be left until the debris has dried out thoroughly.

The length of time between trade cutting and top disposal will be determined by the silvicultural requirements of the stand.

## METHODS OF BURNING.

### Stripping.

95. All recognised methods of burning large areas involve "stripping." (This refers to the lighting of roughly parallel lines of fire over varying distances and at set spacings between the lines.)

Stripping.

96. The lines will be lines of spot fires or lines of continuous fire, depending on conditions and the method of burning used.

Spot fires or continuous lines of fire.

97. Stripping may be done in "close formation" where three or more men run parallel lines of fire or spots and each maintains full time visual contact with his neighbours. Density of scrub and topography will govern the distance at which one man is visible from the next. This distance will seldom be more than five chains and often will be less.

Close formation stripping.

98. Alternatively, "open formation" may be adopted. Here the strip lines will be on a wide spacing of between approximately 8 to 15 chains. Visual contact, between such widely spaced lines, cannot be maintained and so, to avoid men working entirely alone, each of these trips will be run by a pair of lighters working in contact.

Open formation stripping.

### Maintaining Direction.

99. With all types of stripping it is essential that lighters maintain directions and position in the formation.

100. In close formation direction will be maintained by placing the most capable and experienced man or a "marker" on one end of the formation. This man keeps correct direction by compass, direction finder or natural skill as a bushman. The others maintain formation by keeping contact with him.

Compasses and direction finders.

In open formation stripping all pairs must be equipped with direction finders or compasses.

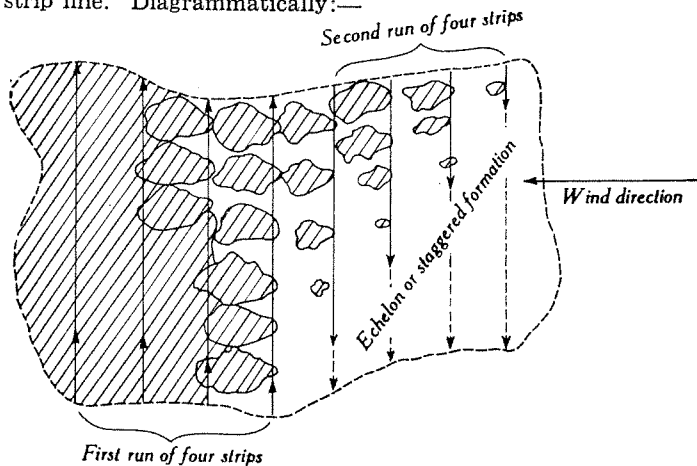
### Burning Methods.

101. There are two fundamental methods of stripping out large areas such as have to be burnt in fulfilling the prescribed burning programme. They are described below.

Two fundamental methods.

102. **Burning with Strips Across the Wind.**—In this method the direction of the strip lines (continuous or spots) will be approximately at right angles to the wind direction. The lighters must move in "echelon" formation with the lighter on the leeward side leading the staggered group. This allows the fire from one strip to run for some (allowed for) distance with the wind until it runs into the burn of the previous strip line. Diagrammatically:—

Burning with strips at right angles to wind direction.

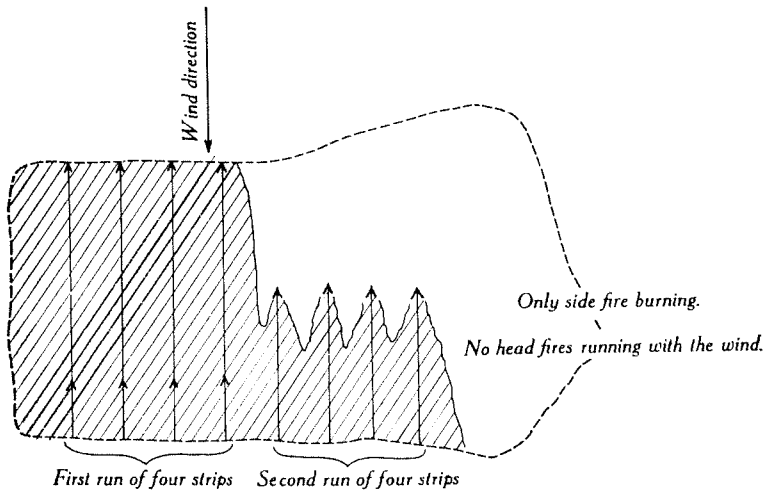


Strips roughly at right angles to wind direction—each successive strip run to windward of previous one.

Areas burnt by spots shown hatched. New spots running into previously burned area.

Burning with strips running straight into the wind.

103. **Burning with Strips Straight into the Wind.**—In this method the direction of the strip lines (continuous lines of fire) must be STRAIGHT into the wind. The lighters must move strictly in "line abreast" formation. This method allows that all fires burn only as side fires. Nowhere in this method should head fires run with the wind. The lighters must return to the same base line to start each new strip unless there is a change in wind direction.



Areas burnt by strips shown hatched.

Strips directly into the wind—must not waver off this direction—Lighters must return to same base line for each new strip.

Other methods.

104. **Other Methods.**—Other approved methods are variations or combination of the two outlined above.

#### GENERAL PROVISIONS.

Areas to be enclosed by tracks, fire lines, etc.

105. An area prescribed for burning in one day must be completely enclosed by lines within which the burn can be contained. Such lines will usually be roads, firelines or water reservoirs.

Area to be completed in one day.

106. The area so enclosed must be completely burnt out before the following day. No fire should be running out of control on that second day, even if it is "inside" the burn.

Leeward edge to be safe.

107. In all circumstances and by whatever method an area is burnt, the officer in charge must ensure that the leeward edge is safe before proceeding with the remainder of the burn. Expensive mop-up and control of "hop-overs" along this edge is to be avoided.

Early edging burns.

108. To strengthen roads and firelines acting as boundaries of a burn and so avoid time-consuming mop-up and patrol, early edging is allowed. This lighting of edges must be carried out in winter or very early spring when subsequent weather will not allow the edge burn to flare up and continue to run. The area within the edging burns must be burnt out later in the same season. Flame throwers may be used for edging.



109. The design of large area burning should take into account all information and experience so that levels of scorch are maintained within prescribed limits. The prescribed limits will be decided from the condition and height of the youngest crop stems. These must not have their crowns fully scorched.
- The scorch height is correlated with the flame height and so to the rate of fire spread.
110. The officer in charge must select the day on which weather and fuel conditions will give a rate of spread and so a flame height, which will keep scorch within the desired limits and yet will satisfactorily consume the ground fuel over the whole area.
- He must be able to do this either by experience or by reference to tables based on measured fire behaviour.
111. The officer, or overseer directly in charge at the burn, must then calculate the least amount of fire he is able to put into the area to ensure that it will still all be burnt out in the burning time available on the day.
112. He must space the strips and the spotting distance along those strips so that they will join, but only just join, by the time conditions alone will quell the fire.
113. He must continually observe the rate of spread and flame height, during the burn, to see that the fire behaviour is according to the prescription. He must alter strip spacing and spotting distance to suit changes of conditions. Wind direction and speed, the most difficult weather factors to forecast, must be checked with lookout towers.
114. Paragraph 78 sets out the necessity for officers to issue instructions or prescriptions for each burn.
115. The overseer (or officer) directly in charge of the burn must ensure that the gang members are fully briefed on the job ahead. They must know:—
- (a) The whole area to be burned and its boundaries. The most satisfactory procedure to achieve this is to drive the gang around the boundary tracks dragging a marker behind the vehicle.
  - (b) The method of lighting. They must be told the formation to be used and their individual places in it.
  - (c) The direction and approximate distance of each strip line.
116. Officers must ensure that all members of the Department under their control have read and understood Bulletin 71, "Safety in Controlled Burning."
117. No controlled burning shall be carried out in March without the authority of a D.F.O. or above.
118. No fires shall be lit on days of high summer hazard or higher without the authority of a D.F.O. or above.
119. Sufficient towers to give adequate coverage must be manned while controlled burning is being carried out, except that during the months May to September inclusive the manning of towers may be dispensed with at the discretion of the officer in charge of the Division.
120. A heavy duty outfit must be taken to every controlled burn except where otherwise directed by the officer in charge of the Division.
121. Patrol must be regarded as a very important duty. The officer responsible for the burn should also be responsible for the final patrol of the edge.
- The frequency of patrol and length of time for which it is continued should be decided after assessing the risk of break-away—i.e., by considering adjacent fuel, conditions of the fire edge, width of break and weather conditions.

Crown scorch to be strictly limited.

Officer must select correct conditions.

Least amount of fire that will complete burn.

Spacing of strips and spots.

Observe fire behaviour during burn.

Officer to issue instructions.

Overseers to brief and instruct gangs.

Bulletin 71.

No control burning in March.

No burning on high hazard.

Towers.

Heavy duty units.

Patrols important.

Recording areas burnt.

122. Officers in charge of Divisions must see that the day to day work of controlled burning is properly reported and recorded.

Assistance to settlers.

123. There is no objection to our assisting adjoining landholders in burning breaks either on their property or on adjoining State Forest or Crown Land. In many cases this assistance is most desirable and it may be necessary for the Forester-in-Charge to roster settlers burning to ensure that there is not an excessive number of fires burning simultaneously.

Responsibility of settler.

124. The settler's responsibilities must be clearly understood and impressed upon him. When the burning is being done on private property the owner must be in attendance and should do the actual lighting, or should at least commence it. He must understand also that future patrol is entirely his responsibility.

Responsibility of officers appointed by Shire.

125. Similarly, a Fire Control Officer or a Bush Fire Brigade Officer must at least commence the lighting where Departmental personnel are assisting Shire Councils by burning Crown Lands (other than Forest Land) at the Shire's request.

It is to be remembered that a Forest Officer has no legal protection when burning on other than Forest Land.

Breaks on State Forest.

126. When a break is being burned in State Forest or Crown Lands adjoining private property at the request of the owner of the property he must be notified of the time of the burn, irrespective of the time of year, and burning will not be done unless he agrees to attend the burn and assist with the fire, at least to the extent of patrolling his property, and accepting responsibility for future patrol on his land.

Form F.D.426.

127. When a request is received from a settler for assistance in carrying out any burning whatever, the request must be acknowledged on Form F.D.426 which sets out the above points.

Notice of intention to burn. F.D.243

128. When any burning is to be carried out by Departmental gangs adjacent to private property during the "restricted period" (see Bush Fires Act) notice of our intention to do such burnings must be given on Form F.D.243 to all adjoining landholders as required by the Bush Fires Act.

Forest Officers to comply strictly to Bush Fires Act.

129. We are looked upon as the main exponents of fire control and it is essential that all forest officers be most careful to comply with the provisions of the Bush Fires Act.

### FIRE PRE-SUPPRESSION.

130. Pre-suppression may be divided into the following headings:—

- (1) Manpower—
  - (a) Training.
  - (b) Departmental gangs.
  - (c) Auxiliary manpower.
- (2) Equipment.
- (3) Transport—
  - (a) Regular.
  - (b) Auxiliary.
- (4) Detection.
- (5) Communication.
- (6) Water Supplies.
- (7) Roads, tracks and firelines.

Inventories in Fire Control Working Plan.

131. Inventories and plans contained in Part "A" of the Fire Control Working plan (see paragraph 76) cover the sub-sectional headings listed above. The pro forma of this Working Plan is set out in Appendix "A."

## **MANPOWER.**

### **Training.**

132. The Forester-in-Charge shall see that his gangs get regular training in handling equipment, fire suppression methods and organisation of fire fighting gangs.

Each member of a regular fire gang should be trained so that as far as possible he is capable of taking charge of a gang, and should be fully instructed in the policy of the Department in fire control.

Training may be possible during the winter, but the early spring burning season should be a time of intensive training in preparation for the dangerous period.

The Forester-in-Charge, assisted by the Fire Control forester, must see that his gangs get ample opportunity for training. The overseer in charge of the gang can carry out the training as a routine part of his work, but the forester should exercise an overall supervision of this training.

133. Every effort should be made to encourage the formation of bush fire brigades in the surrounding community and these brigades, together with auxiliary gangs picked up from sawmills, etc., should be given training in handling Departmental equipment and in our methods of fire control and suppression.

Bush Fire  
Brigades.

Auxiliary gangs picked up to assist in controlled burning can gain valuable instruction while working with Departmental gangs.

### **Departmental Gangs.**

134. The Forester-in-Charge must so arrange the work of his gangs in the fire season that on days of bad hazard they are working in close proximity to Headquarters or to areas of high risk.

Location of gangs.

The location of all gangs must be shown on the Staff Movement Board or in the office log book.

### **Auxiliary Manpower.**

135. The Department has not sufficient men at this juncture completely to protect the forest.

Auxiliary  
Manpower.

However, there is a large manpower pool living in and around the forest, some of whom are forest workers and every effort must be made to have these men trained and available to assist in fire control measures as untrained men are an embarrassment at a fire.

136. Farmers outside the boundary of the forest should be helped and encouraged to form Bush Fire Brigades to combat fires likely to sweep in on the forest and to assist in controlled burning around the boundaries.

Farmers.

Isolated farmers living within the forest could almost be incorporated in regular Departmental gangs. Such association and training is of greater assistance to the farmer himself than a policy of isolationism and at the same time helps to augment our gangs.

137. Sawmill employees, both bush workers and those working in the mill form a very considerable body of men who should be available for fire control.

Timber  
workers.

The local forester should make it his business to encourage interest in the protection of the forest.

Large towns in the forest are a potential source of auxiliary manpower but these men are usually much more apathetic than timber workers.

All sources of auxiliary manpower and equipment must be listed in the Working Plans.

## **EQUIPMENT.**

### **Equipment.**

138. The Forester-in-Charge will list and order the equipment he considers necessary for his district and will be responsible for seeing that it is obtained and kept up to strength.

This equipment will comprise sufficient to equip his gangs with the necessary replacements and additional equipment for the auxiliary gangs he is likely to pick up under normal conditions.

Reserves of fire equipment will be held at centres determined by the Divisional Forest Officer.

### **Equipment to be branded.**

139. Units of equipment should be clearly distinguished by some painted mark to indicate the gang or district to which it belongs. This facilitates collection after a fire.

After every fire all equipment must be checked, to determine and replace losses and effect repairs to damaged items.

### **Insurance claims.**

140. In the case of equipment burnt or damaged in or at a fire, a claim for insurance must be submitted immediately. Any undue delay may result in the claim being disallowed.

### **Overhaul of equipment.**

141. At the end of the fire season all equipment shall be checked, overhauled and stored away ready for the next season.

Power pumpers must be thoroughly overhauled and put in good working condition at the end of the fire season then checked over and run for short intervals at least once a fortnight during the winter to obviate any deterioration during storage.

### **Pre-season check.**

142. Before the commencement of the spring burning season equipment must be checked over again to make sure it is all there and in good order, particular attention being given to pack sprays to ensure that the leather pump buckets, and rubber hose have not perished and that the tank is not leaking. Any replacement required should be requisitioned for early.

## **DETECTION.**

143. Early detection and accurate location of fires is of paramount importance in fire control.

Fires are located by plotting the bearings on it from two or more towers. Towers shall be manned continuously from the first day of average summer after the 1st October until the end of the fire season.

### **Inspection of towers.**

144. Prior to the manning of the towers the forester in charge shall arrange the inspection of all towers to ascertain what repairs are necessary, and to see that the area around the tower is clear of debris. See Appendix "E."

He shall see that all the equipment for the tower is installed and working or in the case of small articles, available in the district office.

He should arrange for towers to be visited at regular intervals and any officer carrying out an inspection should satisfy himself that all equipment is being correctly handled and cared for, and the tower log book properly maintained.

Inspecting officers should initial the log book on the day of their visit.

### **Equipment on towers.**

145. The equipment required in the tower is shown in Appendix "E."

### **Manning towers.**

146. Prior to the need for the manning of towers the forester shall make sure that a towerman is available.

If a local man is employed arrangements must be made for him to be available when required.

If no local man is available, a request must be sent to Head Office in ample time to have the man on the job when required.

147. The forester must make sure that he has an efficient towerman and should take some trouble in teaching him the requirements of the job and the lay-out of the country he is to guard.

148. The towerman is The Watchman of the forest and as such must be willing to render continuous service from dawn till after dark if required in an emergency.

Towerman.

He should possess the qualifications set out in Appendix "E" and should be tested for them.

149. At the end of the fire season the forester must submit a report to the Fire Control Office on each of the towermen employed in his district.

Report on towermen.

This report should be detailed and contain recommendations as to whether the towerman was satisfactory and suitable for further employment in that capacity.

If suitable, the forester in charge should indicate the likelihood or otherwise of the man being available for the following year and whether he is a local man or one engaged through Head Office.

150. Light aircraft are available on hire for fire spotting and location.

Aircraft for fire spotting.

Officers in charge of Divisions should contact Head Office with any request for aircraft to be used on this work.

Aircraft spotting can be of considerable value in the early morning following lightning storms, and on days when smoke haze cuts down visibility from lookout towers.

#### COMMUNICATION.

151. Effective means of communication are vital, not merely in fire control, but in the successful administration of the Department.

152. There are four "legs" to the communication system for fire control:—

- (1) Lookout to Headquarters.
- (2) Headquarters to fire gang.
- (3) Fire back to Headquarters.
- (4) Point to point round the fire.

153. The first "leg" will usually be by telephone line. Radio should only be used for this leg where no telephone lines exist or where the existing telephone line system has temporarily broken down.

154. The second, third and fourth legs will normally be by radio.

155. Traffic on radio systems must be kept to a minimum essential. To this end, where fires take some time to control and where a telephone line is available nearby, a field 'phone should be connected to cater for traffic from fire to H.Q.

Keep radio traffic to the minimum.

156. Where the use of radio from point to point around the fire proves to be difficult communication must be maintained by runners. The men selected as runners or messengers must be reliable and intelligent.

Use of messengers.

157. Full details of radio procedure are laid down in Radio Communication Orders and every officer must be conversant with the subject matter of the orders.

Radio procedure.

158. It is the forester's duty to see that his lines of communication are functioning efficiently.

Forester to watch communications.

Every failure of a telephone line circuit must be investigated as soon as possible and the fault rectified.

Before the spring burning season commences the forester must arrange a thorough maintenance of all his telephone lines.

**FIRE WEATHER.**

Daily forecasts.

159. Weather forecasts are broadcast over the Departmental radio network daily, at 0745 hours and 1615 hours, during the fire season.

These forecasts give brief information on expected cloud, wind direction and strength, maximum temperature, minimum relative humidity and fire hazard.

Where necessary separate forecasts for the Jarrah Forest Region and the Karri Forest Region are given.

Fire hazard scales.

160. Fire hazard is defined in paragraph 26 and in the Department it is expressed on two scales—an empirical scale from 0-10 and a general scale using descriptive names.

The measurement of the moisture content of wood cylinders is used as an aid to forecasting Fire Hazard. The relationship between the two hazard scales and the wood cylinders moisture content is set out below:—

	Empirical Scale.	Moisture Content of $\frac{1}{2}$ in. Pine Cylinders. Per Cent.
Nil	Less than 1	19.4-17.0
Low	1- 4	16.9-11.0
Moderate	4.1- 6	10.9- 7.9
Average	6.1- 7	7.8- 6.5
High	7.1- 8	6.4- 5.3
Severe	8.1- 9	5.2- 4.1
Dangerous	9.1-10	4.0- 3.2

Divisions must obtain 0745 hours forecast.

161. The 0745 hours forecast must be obtained by all Divisions each morning and passed on to Districts under their charge. (Should Divisions not be able to receive the forecast by radio they must obtain it by P.M.G. or Departmental telephone.)

Disposition of gangs according to forecast.

162. Officers in charge of Divisions and Districts must use these forecasts in deciding the daily disposition of fire gangs.

Part "B" of the Fire Control Working Plan sets out dispositions of gangs and equipment against the recognised hazard scale for normal working days and weekend and holiday "stand-by" periods.

Make full use of burning weather.

163. It has already been pointed out that a sound knowledge of the weather and the state of the fuel is essential in any prescribed burning operations. Officers must be able to interpret the effect of weather on the rate and intensity of burning if they are to make full use of all time suitable for controlled burning operations.

For similar reasons, where uncontrolled fires are being fought, a special forecast can be obtained from Dwellingup.

**WATER SUPPLIES.**

164. It is important that adequate static water points are available for fire control.

Intensity and size of water points.

165. The objective should be to provide major water points on a five mile grid pattern. Each water point should be capable of yielding a minimum of 10,000 gallons at any time during the summer.

Access to water supplies.

166. These water points should be placed as close to major access roads as possible. Access to the water supply must be positive and sufficient area to allow the turn-around of pumps and parking of control point traffic should be cleared and surfaced.

Location of water points.

167. As each new water point is established, its exact location should be indicated on office plans and Head Office advised so that master plans may be kept up to date for future inclusion in Departmental lithos.

Reference trees should be established at the water point or in close proximity to it.

This marking of the water points on lithos is particularly necessary for the information of officers or drivers from out-side districts and to ensure that water points not used for long intervals do not become lost.

168. The roads into water points should be well sign-posted. It is not sufficient to place one notice on the turn-off from a main track.

Signposting.

If a water point is some distance from a main track each intersection on the road to the point should have a sign indicating the correct route.

These signs should be prominently displayed so as to be easily visible to strange drivers using the road at night.

169. Notes should be kept in the local office of capacity, supply and permanence of water points with a view to incorporating this information on Departmental lithos at some future date and to improving the supply where necessary.

Notes on capacity, etc.

170. As soon as possible after the beginning of the spring burning season all wells and water holes should be put into good condition for the fire season.

Inspection and maintenance of water points.

The information required for this work will be obtained automatically where spring burning is being carried out, but a special patrol must be sent out to inspect all water points particularly in country that has not been burned within the previous three years.

## FIRE SUPPRESSION.

171. For the three types of forest fires—

- (a) ground fires,
- (b) surface fires,
- (c) crown fires,

see paragraphs 21, 22 and 23.

## FIRE BEHAVIOUR.

172. The intensity of a fire depends on weather conditions and fuel density, though rate of spread will be influenced also by topography and wind strength.

Fire behaviour.

In a dead calm, on a level surface, with an even fuel layer, a fire spreads slowly in an ever widening circle at an even rate in all directions.

A fire burning up a slope or with a wind blowing, rapidly assumes a long oval shape and has three distinct parts—

- (a) the head fire,
- (b) the flank or side fire,
- (c) the tail fire.

173. The head fire is the most forward portion of the fire, usually narrow, travelling fastest and very hot. It is causing the greatest damage and if possible must be controlled first.

Head fires.

174. The flank fires, on either side of the head fire are spreading more slowly but have greater length and can rapidly develop into head fires with change of wind or topography. One side is usually more dangerous than the other due to weather trends or topography and this dangerous flank must be controlled simultaneously with the head fire or very soon after it.

Flank fires.

Tail fires.

175. The tail fire is burning slowly and quietly against the wind, is doing least damage and should be controlled last, but must on no account be entirely neglected.

### FIRE ATTACK.

Fire attack.

176. No two bush fires can be fought in exactly the same manner, each one calls for a different approach depending on weather conditions, men and equipment available, fuel bed and topography.

Speed of attack.

177. The two essentials for all fires are early attack and aggressiveness. The earlier the fire is attacked the sooner it is brought under control. Once a fire is allowed to develop a long perimeter, the task of controlling it is increased tremendously.

Officer in Charge to take offensive.

178. The man in charge of the fire gang must take the offensive from the outset, he must realise he has the strength and training to stop any fire with which he is sent to deal.

Officers can do much to foster this idea in the minds of their gangs.

If a defensive attitude is adopted the fire is master of the situation, the gangs have a feeling of frustration, hesitate to attack the fire face directly, tend to fall back on fire lines or tracks and wait for better conditions, by which time the fire has increased in size and needs many more men and equipment to bring it under control.

Fire action.

179. Speed of attack is essential and will depend to a considerable extent on the Despatcher, who will usually be the officer responsible for co-ordination of fires.

Part B of the Divisional Fire Control Working Plan sets out the action required against fires according to the hazard of the day.

Sequence of first attack.

180. The following sequence of action by Despatcher and gangs will apply. Some slight modifications may be needed to cover peculiar local situations.

Despatcher action.

181. After locating the position of a fire requiring attention the Despatcher will—

- (1) Advise the nearest available fire gang (gang A) by the most rapid means of communication.
- (2) Record in the log book, the time of their departure.
- (3) Arrange for a listening watch.
- (4) Despatch one wagon pumper.
- (5) If in leaf litter over five years old, or on a day of severe summer or higher—load bulldozer and scraper.
- (6) Alert gang B or C if gang B already despatched.  
All subsequent gangs arriving at the fire will operate under overseer of gang A until relieved by senior officer.
- (7) Advise Officer-in-Charge concerned as soon as possible.

Overseer action.

182. The gang overseer will—

- (1) Advise Despatcher of time of departure.
- (2) Proceed directly by the quickest route to the nearest location to the head of the fire.
- (3) On arrival make a quick reconnaissance of the fire while the gang will—
  - (a) Set up radio and report arrival.
  - (b) Unload equipment and arrange for its protection. (Paragraphs 190-196.)
  - (c) Proceed to forward section of the fire and commence suppression under control of No. 1 pack-spray man.



- (4) After reconnaissance arrange report to Despatcher—
  - (a) Position of fire.
  - (b) Possible cause.
  - (c) Details of size.
  - (d) Type of fuel.
  - (e) Estimated time to control.
  - (f) Whether further assistance required.
- (5) Assume control of gang and proceed with suppression by the application of such routine as the situation demands.
- (6) Report to Despatcher at half-hourly intervals if possible, but without fail if fire is proving difficult to control.
- (7) Report fire under control and estimated time of mopping up.
- (8) Report when fire safe and gang leaving.
- (9) Advise Despatcher what further patrol action necessary.

183. The Officer-in-Charge will—

District action.

- (1) Inspect fire during or as soon as possible after suppression.
- (2) Check efficiency of gang's work.
- (3) Enquire into cause. (See Appendix "C.")
- (4) Complete Fire Report (Form F.D.304, see Appendix "F") in duplicate and forward original to Despatcher or Divisional officer.

184. Basically there are only two methods of fire suppression, direct attack and counter or back firing.

Fundamental methods.

185. The advancing edge of the fire is attacked directly and stopped either by the use of water, mineral soil, beating or raking the burning fuel back on to the burnt ground, or by raking a narrow strip clear of fuel a few feet ahead of the fire and letting the main fire burn up to the raked strip.

Direct attack.

This raked strip should be constructed as near to the fire face as the heat of the fire will permit.

If the area of unburned fuel is more than a few feet wide it should be lit up and burned out immediately but care must be taken not to prepare the strip too far back from the advancing fire.

The method of direct attack should be used whenever possible.

186. In counter-firing the fire fighters fall back some considerable distance from the advancing fire, usually to a prepared fire line or track and there set "back fires" which are allowed to run back towards the main fire with the object of burning out a wide strip of country ahead of the main fire.

Counter-firing.

This method should never be used if any of the direct attack methods are likely to succeed.

Back-firing is always risky since if the main fire is too hot to handle directly the back fire will also be very hot.

If the fire fighters fall back to an area that can be burned easily, then the main fire could be handled easily in this fuel type.

One of the main dangers in back-firing is the tremendous up-draft that frequently occurs when the two fires meet, leading to showers of burning debris being carried over ahead of the main fire beyond the line where the back fire started.

The greatest care must be taken in setting back-fires. As little face as possible should be lit at a time. Never back-fire from anything but a good break line which is long enough to ensure that the back fire does not escape round the ends of the fire line.

Always light close to the fire line so that the back-fire has no opportunity to gain any forward momentum and only burns back slowly towards the main fire.

#### GENERAL RULES.

- (1) Assess back-firing possibilities carefully before spending much time clearing the break.
- (2) Rake around dangerous trees well back from the edge. It is often advisable to burn heaps of debris separately before the back-fire reaches them.
- (3) Never light a longer line than can be held, special care is necessary if choppy winds are likely.
- (4) Always burn clear to the line and well in towards the main fire.
- (5) If burning on a slope, start at the top and burn down.
- (6) If the main fire is coming up a slope, back-fire from the lee of the ridge top, that is, just over the top from the direction of the main fire.
- (7) Patrol continuously.
- (8) Keep as close to the main fire as is commensurate with safety.
- (9) Back-fire against the head fire and attack the flanks and tail directly.
- (10) Select the base line with great care.

#### MOPPING UP AND PATROL.

Mopping up  
general.

187. Mopping up is the term used for the work done in rendering a fire safe after it has been brought under control.

When a running fire is brought under control it is only stopped and not by any means safe. It is obviously futile to spend considerable energy on stopping a bush fire only to have it escape and need as much or more work to bring it under control a second time.

Mopping up  
operations.

188. Mopping up means completely extinguishing every piece of burning material that might permit the fire to escape.

A strip at least 2 ft. wide must be cleared around every fire, strictly following its edge.

All low stumps or logs within a chain of the edge must be extinguished with water or mineral soil or both.

Heaps of smouldering debris must be broken up and dispersed to prevent too great a flame close to the edge.

Heaps of debris round the butts of trees close to the edge must be cleared away.

All burning trees or spars within five chains of the edge should be extinguished or felled or burnt around to provide an adequate margin of safety.

If water is used to extinguish burning logs or trees care must be taken to ensure that they are really out.

Piles of logs or tops must be separated and dampened down and if necessary, covered with earth.

In mopping up, power pumpers should be brought right in to the face so that water can be applied to burning trees and stumps.

If mopping up is done during the heat of the day the pumpers should go round fairly rapidly damping down the more dangerous areas and then return to consolidate the position.

Patrol.

189. Patrolling of all stopped fires is essential and should follow the instructions laid down under controlled burning.

## PROTECTION OF EQUIPMENT AT FIRES.

190. All equipment taken to the vicinity of a fire is in danger of being burnt and whenever any such equipment is left unattended every precaution must be taken to see that it is adequately protected.

Precautions to protect equipment.

Officers must ensure that overseers and gang members are conversant with the following instructions.

191. The overseer's first duty on arriving at a fire is to detail a man to prepare a cleared area to accommodate spare equipment with a minimum of four feet clearance round the gear.

Overseer to take precautions.

192. In the case of motor vehicles, greater care must be taken than for hand equipment in view of their greater value and the more inflammable nature of the unit.

Motor vehicles.

193. The safest place to park a vehicle is on cold burnt ground or bare mineral soil, such as gravel pits, away from overhanging trees.

If the ashes are still hot a strip must be raked down to mineral soil for each wheel and all smoking embers raked from under and round the truck. Care must be taken to see that the truck is sufficiently removed from burning trees to preclude the possibility of sparks or burning debris dropping on the vehicle.

194. If the vehicle must be left on unburned ground it should be placed on an area clear of scrub and trees. All litter must be raked from under it and for a space of six feet all round it, and any trees that might possibly drop debris on the truck must be raked to ensure that they do not become alight from any fire.

Raked litter must be well scattered and not left in heaps.

195. When a vehicle is left on a road, all litter must be raked away from the sides of the vehicle and dangerous trees raked.

Do not leave a vehicle on a road unless there is ample clearance to permit the passage of other vehicles.

196. A vehicle should always be left facing an escape route so that it is possible to drive straight away without the need for time-wasting manoeuvring. Ignition keys should be left in the vehicle.

Escape route.

## STAFF AND HEADQUARTERS ORGANISATION: LARGER FIRES.

197. Should this initial attack (as outlined in paragraphs 181-183) fail to control the fire, more gangs and equipment will be called in at the discretion of the Officer-in-Charge.

Large fires.

198. In such cases the Officer-in-Charge himself must not be left unaided. Should the fire still not be under control by sunset (on the day on which it starts), the "large-fire staff organisation," outlined in Appendix "B" will be put into effect.

Staff organisation.

It must be stressed that delay in effecting this organisation, or in calling outside assistance, may seriously impede the control operations at the fire face. "Too little, too late" has too often been the reason, in the past, for major losses.

199. Further, the relieving of all personnel, including officers at the fire and at Headquarters, must be planned and enforced according to plan. Nobody should exceed 20 hours to their first relief or 12 hours to subsequent reliefs.

Relief of officers and employees.

200. Although general titles are used in the organisation set out in Appendix "B," each Division must name the actual officers and their reliefs under these titles at the beginning of each season.

Naming of officers.

Distinguishing colour stripes on helmets.

201. The rank of officers at the fire face may be recognised by distinguishing colour stripes on their protective helmets. The colours to be used are:—

- Professional Officers—Black stripe on white helmet.
- Fire Control Foresters—Red stripe on white helmet.
- Assistant Foresters and above—Red stripe on yellow helmet.
- Forest Guards and Rangers—Green stripe on yellow helmet.
- Overseers—Black stripe on yellow helmet.

Office and yard layout.

202. Even though few Divisional offices and no two Divisional Headquarter yards are the same in layout, attention should be given to organising them, as far as possible, along standard lines for use as fire suppression centres.

Wall plan.

203. For day to day use each control Headquarters must have:—

A wall plan (with plotting facilities) situated close to the towers' communications terminals.

Office Daily Log.

An "Office Daily Log" (F.D.111) kept near the wall plan and communications mentioned above.

Staff movements board.

A staff movements board which will consist essentially of blackboard prominently displayed in the office and carrying information under the following headings:—

Date, weather forecast, officers' duties, location, means of communication and estimated time of return to Headquarters.

It should be extended to include this information for gangs as well as individual officers.

Forest Assistant responsible for board.

204. The Forest Assistant, who is vital to the fire organisation, will handle, direct, or supervise, the correct entering of details on the above board.

Acts as Despatcher.

205. He will also, in some cases, be expected to act initially as Despatcher and must therefore be fully conversant with standing and operation orders.

Responsible for receiving forecast.

206. He will be responsible for relaying the 0745 hours forecast within his Division and will also supervise communications.

Board to be kept up to date.

207. The Staff Movement Board must be brought up to date each morning, and as changes occur, otherwise it becomes misleading, useless, and therefore dangerous.

Messages.

208. All messages dealing with fires must be recorded in the office log as received. If the message is merely for the information of the office it may be recorded independently. If, however, it is an instruction to be passed to an officer it should be written out in duplicate, the original handed to the officer concerned or relayed to him by phone or radio and the duplicate filed. If the message is relayed to an officer the original should be sent to him as well, if possible. This procedure lessens the possibility of error, enables mistakes to be rectified, and is a protection for the Forest Assistant.

Duplicates of messages.

209. Duplicate messages are of considerable value to a relieving officer, enabling him to follow the progress of the organisation at the fire.

Radio message pads.

210. Radio message pads are recommended for the purpose, even if the message comes by 'phone or word of mouth.

Outward messages.

211. Messages should be written out before transmission by radio or 'phone, and the original filed for future reference for the same reasons as for inward messages.

It is essential that this procedure be followed in radio transmission to stop unnecessary talking.

212. When fires are not controlled by the initial attack, and the staffing organisation given in Appendix "B" is put into effect, it is necessary to set up a separate room or part of a room as a control centre.
- Fire operations room.
- This space need not be permanently allocated for this purpose alone, but should be able to be swung into such use quickly.
- It should be cut off from the noise of radio and 'phones where possible and should provide facilities as set out in the following paragraphs.
- Furniture and equipment in fire operations room.
213. Wall space on which plans covering the fire area can be fastened and covered with polythene. (A progressive record of fire spread will be kept in this way where it is available for study at any time by the Headquarters officers.)
- Wall space for plans.
214. A fuel age plan showing at least the previous four years' burning. This must also be prominently displayed.
- Fuel age plan.
215. A tactical Dispositions Board which will show the current distribution of all men and heavy equipment concerned in the suppression of the fire.
- Tactical Dispositions Board.
- Dispositions information will include those men and equipment items:—
- Resting, Stand-by (on call), on duty at Headquarters, at Sectors I, II, III, etc., and Miscellaneous.
- The Board should be a large section of peg board and the men and equipment designated by standard plastic tags as follows:—
- Individual officers—orange diamond.  
 Overseers with gangs—orange rectangle.  
 Heavy duty outfits—yellow rectangle.  
 Bulldozers—grey rectangle.  
 Miscellaneous—green rectangle.
216. A plan table for the spreading of loose plans and the marking up of field copies.
- Plan table.
217. A large desk for use by the Recorder and, if necessary, the Despatcher.
- Desk.
218. A fire diary to be kept up to date by the Recorder. This fire diary will consist of a large book or pad from which the pages can be torn for filing.
- Fire diary.
- Pages will be headed with the fire serial number, date and all relevant information, such as location, cause and weather conditions. A margin on the left hand side provides a space for entry of times and the 24-hour system should always be used. The remainder of the page will be used for details of all messages and reports received or transmitted.
- Later, the diary provides a basis on which to conduct a fire study from which much vital information may be obtained.
- A fire plan should be kept in conjunction with the diary to complete the picture of the situation.
219. The yard layout of a Headquarters will vary from place to place, but the following broad features must be ensured:—
- Headquarters-yard layout.
- (i) Straight through or circular access should avoid bottlenecks caused by having incoming and outgoing traffic using the same road or gateway.
  - (ii) Assembly points, for vehicles and manpower, should be within relatively easy reach of the Despatcher, but not close enough to allow unnecessary cluttering of the control room approaches or interference to the radio.
  - (iii) Assembly points should not block the through or circular roads, but should be big enough to hold approximately six normal gangs with vehicles.

- (iv) Fuel bowsers, drum dumps, water points, loading ramps and gantries should be well removed from the office and assembly points but should also be easily accessible.
- (v) A cordoned off space should be allowed near the assembly points for the dumping, sorting and issuing of hand equipment.
- (vi) A parking area should be set aside for the private vehicles of men going to the fire in Departmental trucks.
- (vii) Sign posts should be prepared prior to the season to allow strangers to find their way through the yard and to various points within it.

### **FIRE REPORTS.**

**F.D.304  
Preliminary  
Report.**

220. At the first opportunity the Officer-in-Charge of a gang shall fill in the preliminary fire report on Form F.D.304 and hand it in to the district office.

Reports should be submitted while details are fresh in mind because it is from these reports that wages sheets are checked and the Annual Fire Report prepared.

The reverse side of the form should be completed immediately by the office staff and the form submitted to the Senior Officer for his information and comments.

**Large fires to be reported.**

221. All fires in protected forest that are likely to attain an area of 100 acres and all fires in plantations must be reported immediately by telephone or radio to the Fire Control Office who will advise Head Office.

**Reports at 1615 hours.**

222. Divisions will also report to Dwellingup, on the 1615 hours forecast call, any fires which are still running in their Division at 1615 hours.

**Damage claims to be reported.**

223. In all cases where a claim for damages against the Department is likely to arise out of a fire the details must be reported immediately to the Fire Control Superintendent by telephone or telegram, and this must be confirmed in writing giving a full detailed report of the circumstances.

**Daily report of uncontrolled fires.**

224. All centres will submit to Como Headquarters (VL6DE) at 0815 hours (except Saturdays and Sundays) a report covering any uncontrolled fires of the previous day. The location, cause, size and whether controlled or still running shall be given for each fire.

**Annual Fire Report.**

225. Immediately on the close of the fire season but not later than the end of the June quarter, the Annual Fire Report, with the fire plan must be forwarded to the Fire Control Superintendent.

The Annual Fire Report shall be in the form set out in Appendix "F."

## **APPENDIX "A".**

### **FIRE CONTROL WORKING PLAN.**

#### **INVENTORY.**

**PART A.**

(To be made out in standardised form in a loose leaf register. Reviewed in July-August each year. Checked at the beginning and end of the prohibited burning period each season.)

**1. FIRE FIGHTING MANPOWER AND EQUIPMENT.**

**(a) Forests Department.**

**(i) Officers.**

Name, rank, normal duties and headquarter station.

**(ii) Summary of Gangs and Equipment.**

Established Gangs—

Name of Gang	Over-seer	Normal No. of Men	Make, type and No. of Gang Truck and pump	Radio call sign	HD outfit Make type and No. pump

**Total Numbers of Men and Equipment in the Division.**

Officers.

Overseers.

Employees.

Utilities.

Jeeps and Land Rovers.

Gang Trucks (equipped for fire gang).

Gang Trucks (not equipped for fire gang).

Heavy Trucks—carrying heavy duty outfits.

Heavy Trucks—other.

Bulldozers—light.

Bulldozers—heavy.

Wheeled tractors with blades.

**(iii) Detailed Manpower Lists.**

NAME
USUAL STATION
Light Truck Driver
Heavy Truck Driver
Low Loader Driver
HD Pump Operator
Light Dozer Driver
Heavy Dozer Driver
Chain Saw Operator
Circular Power Saw Operator
Storeman
Handyman
Carpenter
Mechanic

(iv) **Detailed List—Vehicles and Power Saws.**

Reg. No.	Usual Station or Driver	Make	Capacity	4 x 2, 4 x 4, or 6 x 6, etc.	Pump if any	Remarks
1	Cars and Utilities					
2	Jeeps and Land Rovers					
3	Medium Transport (equipped and used for fire gangs)					
4	Medium Transport (other than used for fire gangs)					
5	Heavy Transport (normally carrying H.D.)					
6	Heavy Transport (other—not normally carrying H.D.)					
7	Bulldozer—Light					
8	Bulldozer—Heavy					
9	Wheeled Tractors with Blades					
10	Chain Saws					
11	Circular Saws					

(b) **Outside Sources.**

- (i) **Established gangs.** (Defined crews with training or experience and with a nominated officer or foreman.)

**Immediately available.** (Those such as sawmill and Shire Council gangs immediately available for fire fighting in forest areas.)

Personnel  
and vehicle  
and equipment

**With other commitments.** (Such as Bush Fire Brigades of farming areas bordering forests.)

Personnel  
and vehicles  
and equipment

- (ii) **Supplementary Fire Fighting Personnel.** (Other sources of manpower and equipment which may be called upon. List names, telephone numbers or other means of contact.)

Bulldozing Contractors and machines.

Hauling and Carting Contractors and low loaders.  
and trucks.

Fallers and power saws.

Unorganised manpower }  
(not already mentioned) } and vehicles.  
(P.W.D., M.R.D., saw- } and equip-  
mills, etc.) } ment.

Oil Company Depots fuel supply.  
and water tankers.



(iii) **Auxiliary Services.** (List names and telephone numbers.)

Local Authority	Secretary. Chief F.C.O. Traffic Inspector.
Police	Names.
P.M.G.	Services and names.
Medical	Doctors. Ambulance. Hospital. Red Cross.
Food Supply	Caterers. Butcher. Baker. Grocer.
Accommodation	Halls. Bedding, etc.

2. **WATER SUPPLIES.**

- (a) Town, village and mill supplies.
- (b) Static water in forest (show on plan).
- (c) Ferry tankers (Forests Department, Oil Companies, M.R.D., etc.) Bulk Milk Companies.

3. **DETECTION AND COMMUNICATIONS.**

Lookout towers.  
Other Departmental and private information sources.  
Telephones—Departmental and P.M.G.  
Radio—Departmental—Bush Fire Brigades, etc.  
Aircraft—H/O liaison with Royal Aero Club.  
Landing strips—approved and emergency.

4. **ACCESS.** (Up to date master plan showing quality.)

Arterial.  
Sub-arterial.  
Forest track—good surface.  
Forest track—poor surface.

**PLANNING.**

**PART B.**

1. **PRE-SUPPRESSION BURNING.** (This section mostly illustrated on plans—little descriptive writing necessary.)

(a) **Master Plan.**

Proposals for rotational, prescribed burning shown on 80 scale plans.

Amendment of these plans should be considered each July and adjustments made where necessary.

(Copies need only be held by Local Office.)

(b) **Plan for the Current Year (Season).**—This plan is to be taken each year from the Master Plan mentioned above—with any necessary adjustments. It is to be made out each winter to show the complete controlled burning proposals for the ensuing season—the late winter, spring summer and autumn following.

**On plan.**—Detail will be shown under the legend below.

- (i) Numbers—each burning job will be numbered (1), (2), (3), etc.
- (ii) Areas edged with broken green line—proposed burning not yet carried out.
- (iii) Areas covered by green dashes—burning carried out but not yet inspected.
- (iv) Areas washed in green—areas burnt, inspected and found satisfactory.

**Note:**

- (a) Areas unsatisfactorily burnt will be left with green dashes.
- (b) Weaknesses or danger points will be noted on the plan in writing.

(Copies of this plan should be held by the Local Office and the Fire Control Forester of the Region.)

**(c) Previous Burning.**

An 80 scale plan showing areas burnt season by season for the previous four (4) seasons, together with the current season's proposals.

Such plans will be prepared during winter (July) of each year and will use a standard colour legend—

Current year—green—as in section (b) above.

Previous year—brown.

Two years old—grey (neutral).

Three years old—blue.

Four years old—yellow.

Copies should be—One on the burning plans folder (W.P.) at D.H.Q., another as wall plan at D.H.Q. and another held by the Fire Control Forester.

## **2. SUPPRESSION MEASURES.**

**(a) Standing Orders.**—In tabular form showing disposition of manpower and equipment against recognised "hazard" scale.

- (i) Deployment of gangs and equipment on normal working days.
- (ii) Action in the event of a fire.
- (iii) Week-end and holiday "stand-by."
- (iv) Allocation of assistance to other Divisions.

**(b) Staff Organisation (Larger Fires).**—List, with any relevant remarks, the officers or employees and their reliefs, in order of priority, who will fulfil the functions set out below and described in Appendix "B" of this pamphlet.

- (i) Controller.
- (ii) Fire boss.
- (iii) Sector bosses.
- (iv) Despatcher.
- (v) Recorder.
- (vi) Forest assistant.
- (vii) Radio operator (H.Q.).
- (viii) Storeman.
- (ix) Mechanic.
- (x) Field liaison officer.

## APPENDIX "B".

### LARGE FIRE STAFF ORGANISATION.

#### 1. THE CONTROLLER.

This will normally be the Officer-in-Charge of the Division in which the outbreak occurs.

He will have complete control of all the suppression forces and the tactics of the actual fire fighting.

The tasks of the other officers mentioned below are designed to shift some of the detailed work from the Controller to allow him to concentrate, both in the office and the field, on the tactics of suppression.

The Controller's relief must be fully effective by 0900 hours on the second day. The relieving officer should be at Headquarters by 0600 hours at the latest.

#### 2. FIELD STAFF.

##### (a) The Fire Boss.

He will be in direct charge of all forces in the field.

He will keep the Controller fully advised of the position at the fire front and will put into action such technical moves as that officer instructs.

He will normally be a Fire Control Forester or Senior Local General Staff Officer.

##### (b) The Sector Boss.

He will be in charge of all forces on the fire front in a particular sector.

He will keep the Fire Boss fully advised of the position on his sector.

He will put into action, with the men and equipment under his command, such fire fighting measures as advised by the Controller through the Fire Boss.

He will normally be a General Staff Officer of senior rank or marked fire fighting ability.

##### (c) The Gang or Unit Boss.

As the name suggests, this person will be in direct charge of the fire fighting gang or unit at the face of the fire.

##### (d) Field Control Centre (Rendezvous).

Normally this centre, which will be the field Headquarters for the fire, will be manned by Regional Working Plans Officers.

It will provide the direct link between Controller and Fire Boss and will give the direct point of reference for the other field officers mentioned above.

It should provide a convenient rendezvous for incoming officers, men and equipment.

It should also be the means of limiting radio traffic.

#### 3. HEADQUARTERS STAFF.—Assisting the Controller at the Headquarters, there should be:—

##### (a) The Despatcher.

He will have as his chief task the arrangements ensuring that the equipment and personnel decided upon by the Controller are moved to and from the fire face.

He will normally be a junior professional officer. (His employment on this Headquarters task during a large fire emphasises the necessity for these officers to obtain experience at all small fires, burning and training.)

**(b) The Recorder.**

This officer will virtually act as "Intelligence Officer" and his chief task will be to keep a detailed progress record of the movement of the fire and all personnel and equipment. This will require that he monitor the radio terminal and receive (in conjunction with the Controller, where necessary) other incoming information such as is proffered by runners and officers coming off shift.

**Note.**—During the early stages of the first night, or second day, the duties of Controller, Despatcher and Recorder, may overlap and be to some extent combined, but the danger of "putting off" the initiation of this organisation should be evident and avoided at all costs.

**(c) The Forest Assistant.**

This officer shall have two chief functions during the fighting of large fires:—

- (i) Control of the telephone terminal at the office. He should accept all incoming calls, vet them, and re-route them to the appropriate officer.
- (ii) The feeding and bedding of all troops employed on the suppression of the fire. This work should, of course, be planned with the D.F.O. and other officers, before the season starts.

**(d) The Radio Operator.**

To work merely as operator and have no executive role.

During the day this will be carried out by the person normally employed for that purpose—usually a female office assistant. At night it can be handled by the relief Forest Assistant or the Recorder.

**(e) The Storeman**

Most Divisional Headquarters now carry a storeman or at least a handy man.

This employee will assume the role of Storeman during the fire. It is important to note that his relief must be a local employee who knows the Headquarters layout and whereabouts of equipment.

**(f) The Mechanic.**

All Divisions have their own mechanic who will act as such on the first day. For relief, however, where only one mechanic is available, the Plant Inspector for the area must be called in by 0600 hours on the second day to organise the maintenance and repair of plant.

## **APPENDIX "C".**

### **POINTS IN INVESTIGATING OUTBREAK OF FIRE.**

Speed in reaching the source of the fire is important; it may be possible to intercept the persons lighting the fire, either on the spot or going away from it.

Further, an officer should get there early to pick up any tracks that may be in the vicinity before they are obliterated by fire fighters and to ascertain as nearly as possible the exact point of origin of the fire.

Any tracks found should be protected as far as possible by covering with bushes or bark or by placing a small log over them.

The following are a few of the possible clues that should be looked for:—

- (1) Remains of a camp fire.
- (2) Cartridge cases.
- (3) The spot where someone stopped to light a cigarette. This might be indicated by the tracks of two vehicles pulling up together, footprints by the side of the vehicle tracks, or by spent matches.
- (4) Cattle tracks overmarked by horse or dog tracks indicating travelling stock.
- (5) Pieces of smouldering bag or other lighting material.
- (6) Ash from old blackboy cores or rotten branches in a cleared patch indicating a delayed action fuse.

Careful note must be made of any tracks in the vicinity. Their direction, size, whether boots or shoes or in the case of horse tracks whether shod or unshod and any peculiarities such as hob-nails and patched shoes. The width and tread marks of tyres, the width between wheels and whether dual or single rear wheels, should be looked for.

It is usual and advisable to call in the services of the local police constable to accompany the forest officer and tracker. The moral effect of police attendance and questioning of suspected persons and possible informants is quite considerable.

Every person in the locality who is likely to have useful information must be interviewed.

A full report must be submitted to the Fire Control Office immediately after the investigation is completed. The following details should be included:—

- (1) Full name and address of the person lighting or suspected of having lit the fire.
- (2) Signed statements from this person, if possible.
- (3) The section of the Act infringed.
- (4) Exact location of the start of the fire with an attached plan.
- (5) Tenure of land where fire started, e.g., State Forest or private property.
- (6) Time fire started as nearly as possible.
- (7) Method of lighting.
- (8) Reason, e.g., carelessness, match, cigarette butt, or if deliberate incendiarism, the suggested motive.
- (9) Name and address of witnesses with signed statements.

## APPENDIX "D".

### W.A.G.R. ORGANISATION.

There are in the State eight railway districts, each with a Senior Locomotive Inspector or a Locomotive Foreman; and in each District a staff car is available.

Locomotives are checked in and checked out by a Locomotive Foreman or Driver-in-Charge who has to certify to the condition of:—

Smoke Box.  
Brick Arch.  
Ash Pan.

Every locomotive, before attachment to a train must be cleared on these three points and signed for by the officer in charge of the locomotive depot.

At destination, the Officer-in-Charge has to certify that the locomotive was received with the smoke box, brick arch and pan in correct order.

If a locomotive operating in a fire hazard area is found to be faulty, it proceeds to the next station where advice is sent that the train cannot proceed. The nearest centre then sends an officer out to inspect it.

Fines are imposed on engine crews when a fire is started by a defective locomotive, provided it is proved that the locomotive when received was in correct order.

There are District Locomotive Superintendents at:—Geraldton, Northam, Kalgoorlie, East Perth, Narrogin and Bunbury.

Bunbury controls the South-West from Pinjarra to Bowelling and all the lower South-West.

There are Locomotive Foremen in Charge of the depots at Bunbury and Collie, and Drivers-in-Charge at Brunswick Junction, Pinjarra, Bridgetown and Busselton.

## APPENDIX "E".

### TOWERS AND TOWERMEN.

The Towerman must possess the following qualifications:—

- (1) Must have good eyesight.
- (2) Must have reasonably good enunciation and good hearing for the use of the telephone.
- (3) Must be capable of reading a map and learning the country visible from the tower.
- (4) Must become proficient in using the instruments and in furnishing reliable information.
- (5) Must be able to endure the necessary isolation and take care of himself and must be sober.

#### Instructions for Use of Forest Service Eye Test for Fire Lookouts.

The lookout eye test is designed to measure the relative ability of Towermen to see **small** smokes. The eye test target which may be obtained from Head Office if testing of Towermen is to be done in the field, consists of a 7-inch square white board with a large black spot in the centre, black diagonal bars on the corners and a **small** (1/16th-inch) black spot midway between the centre and one diagonal bar. The maximum distance that a man can see this **small** spot is a measure of his power to see small columns of smoke at long distances. The eye test is given as follows:—

Select a suitable place out-of-doors. Either a sunny or cloudy day will do. A dark foreground, such as green grass or earth is necessary. Avoid bright foregrounds, such as dusty or gravelled roads.

Insert the round peg in the block on the back of the board to form a handle, hold eye test board in full light of open sky but shaded from direct rays of sun. Avoid getting under eaves of buildings or tree crowns.

Hold eye test board upright so that one pair of diagonal black bars is vertical, the other horizontal (the **small** spot will be up, down, to right, or to left), with white side of eye test board facing toward person being tested.

Have man being tested back away from eye test board until **small** black spot almost disappears (usually 35 or 40 feet). He should not face sun.

Whirl eye test board several times so the **small black spot** may assume a new position, up, down, right or left. Have observer signal or state new position of the **small spot**. If correct, have him step back two or three feet. Repeat procedure until the observer indicates position of **small black spot** incorrectly. Have him guess when he is no longer certain. He may rest his eyes if he wishes.

Record the observer's rating as the distance in feet from eye test board to the last point from which he can indicate position of the **small black spot** correctly. The distance at which this small spot can be seen is definitely related to the distance at which **small smoke columns** can be easily detected. The following tabulation indicates quality of eyesight in relation to eye test rating in feet:—

Maximum Distance at which Small Black Spot can be Seen (Feet).	Quality of Eyesight.
64 or over	Exceptional
58 to 63	Good
50 to 57	Average
44 to 49	Fair
43 or under	Poor

The Towerman shall be required to—

- (1) Make such early and late observations as the D.F.O. shall require.
- (2) At first observation ensure that the orientation of the plan and finder is correct. This may be done by checking the bearings on one or two known points.
- (3) At 8 a.m. he will obtain the early morning fire weather forecast and pass it on to neighbouring towers or Divisions. This information should be written on the top of the page of the day's observations.
- (4) Report the wind direction and strength and visibility in each of the four quarters of the compass to District Headquarters. This information must be supplied as conditions change, hourly or more frequently as required.
- (5) Remain on continuous watch during such hours of the day as the D.F.O. shall determine with stipulated times off for meals or short breaks as advised.
- (6) Maintain a careful watch at all times for smoke.
- (7) Immediately on locating a smoke the lookout man should take a bearing and estimate the position of the fire. He should communicate this bearing and approximate location together with a description of volume and character of the smoke to central Towerman or District Headquarters, as previously instructed by the D.F.O.
- (8) When the position of a fire has been definitely determined, the Towerman will be supplied with the location and the serial number of the fire to be entered in the log book and in the margin of the plan at a point which is a continuation of the bearing. This serial number will be used in all further reports concerning such fire.
- (9) All messages to and from the tower must be entered in the tower log book against the time of the transmission.

In transmitting information from the tower the following codes will be used:—

Visibility—

- (1) Clear vision up to 15 miles.
- (2) Clear vision up to 10 miles.
- (3) Clear vision up to 7 miles.
- (4) Clear vision up to 5 miles.
- (5) Clear vision less than 5 miles.

Wind strength—

- A.—Calm.
- B.—Gentle breeze.
- C.—Moderate breeze.
- D.—Strong wind.

Description of smokes—

- A.—Direct view.
- B.—Not direct view.

Volume		Character		Colour	
Fine	1	Columnar	1	Blue	1
Medium	2	Spiral	2	White	2
Heavy	3	Billowy	3	Brown	3
Dense	4	Blankety	4	Black	4
		Drift	5	Copper	5

The Towerman should receive some instructions on the use and care of instruments along the following lines.

**Direction Finder.**—Care should be taken in removing and replacing the steel arm of the direction finder to see that the sighting vane and arm are not damaged. Any damage should be reported immediately.

**Plan Board.**—The plan board should be protected as much as possible from any damage by rubbing and scraping and should be covered in the event of rain.

On vacating the tower each evening the cover should be placed on the plan.

**Binoculars.**—The binoculars now being issued to towers, besides being a precise optical instrument are also a very costly item of equipment and must receive every care in use.

The binoculars should be worn with a short strap and should not be left lying on the table or box to be picked up when required.

When not in use they should be kept out of the sun, either by keeping them in the cupboard or, if they are hung in their case, the lid of the case must be kept closed to protect the lenses.

Prolonged exposure to direct sunlight causes crystallisation of the cement used in the assembly of the large objective lens, causing a blurring of the image and necessitating complete dismantling and cleansing of the lens at considerable expense for rectification.

In no circumstances should binoculars be left on unattended towers, if the Towerman is not at the tower the binoculars must be locked up either in the tower hut or taken in to Headquarters.

**Sunglasses.**—Sunglasses assist in the detection of fires in hazy conditions and to relieve unnecessary eye strain resulting from continuous observation under conditions of heavy haze, sun glare and high winds. They should be kept clean and placed in the case when not in use.

The best type of sunglasses are of the "polaroid" type, but it sometimes happens, particularly with the vizor type of sun shield that the material is not mounted in the plane of best effect. This can be tested by holding the shield or glasses before the eyes and slowly rotating to find the position of least glare. It might be necessary to use them with the head tilted slightly to one side.

**Panorams.**—Panorams should be kept as clean as possible. Covers should be placed over the boards each evening and sometimes during the day to give protection from sun, wind and rain.

The Towerman should be encouraged to make additions to the panorams as points are identified from time to time.



**Care of Fire Towers and Lookout Trees.**—At the end of the fire season the tower plan, sighting vane, log book, panorams, binoculars and sunglasses should be removed from the tower and the two lastmentioned locked up.

At the same time the tower or tree hut should be inspected and a full report with suggested renovations or repairs, if any, should be submitted to the Divisional Office. The tower should be inspected with a view to determining:—

- (1) Whether it is necessary to place iron bands round uprights which may be splitting badly.
- (2) The need for treating exposed ends of timber with hot creosote, petrolatum or some similar compound.
- (3) The need for painting or otherwise treating any exposed wood or ironwork.
- (4) The need for renovations or improvements to the tower cabin and hut.

Trees should be inspected for the following:—

- (5) Dying back of the limbs or trunk.
- (6) Patches of rot in dead areas.
- (7) Rot or borer attack in tree pegs.

With the exception of towers which have been erected on a concrete base, it is important that each fire tower should be carefully examined two years after erection and at regular intervals from two to three years thereafter particularly the condition of piles supporting the tower where they enter the ground.

At each inspection the ground around the piles should be opened to a depth of 18 inches and any weathered or decayed wood should be scraped off and the exposed section whether sound, or showing superficial signs of decay or termite attack, should be painted thoroughly with hot creosote. If there are any indications of termites or decay, deeper holes should be opened and the affected wood cleaned away. The creosote, before application, should be heated to simmering point, but not allowed to boil violently. The piles should be allowed to dry before treatment.

The tightening of bolts used in the construction of fire towers should only be necessary at the beginning of each fire season for the first two or three years, after which further tightening should not be necessary.

Excessive tightening of bolts is to be avoided. In the course of this work any patches of decay noted in the structural timbers should be cleaned out and a dressing of hot creosote applied to the affected area.

It is estimated that for the treatment of the supporting piles in each tower eight gallons of creosote may be required.

Any excess creosote left after painting the legs and other affected parts can be used for puddling the earth round the legs, particularly in the vicinity of any patches showing rot or termite attack.

Supplies of creosote as required should be requisitioned.

In addition to the above periodic inspections, all towers and trees should be inspected before each fire season and Officers-in-Charge of Districts where towers or trees are located should submit a report to the Fire Control Superintendent not later than the 30th September in each year setting out the general condition of the lookout and the Towerman's hut.

At the beginning of the fire season steps must be taken to clear all undergrowth for a radius of five chains round each tower or tree so that there is no possibility of its carrying fire on the hottest day.

During the fire season at least two pack sprays or four-gallon drums filled with water must be kept on the tower in case of emergency.

## APPENDIX "F".

### REPORTS AND FORMS.

Form F.D.434 will form the basis of the Annual Fire Report and should be kept as a running day to day record of fire occurrence.

It should be kept in duplicate and the original forwarded to Head Office with the Annual Fire Report.

It is essential that this form be filled in correctly during the season. The greater part of the tabular information given in the Annual Fire Report is dependent on this.

Column 1 is the serial number of the outbreak.

Column 2 date of outbreak.

Column 3 maximum hazard of day of outbreak.

Column 4 point of origin will indicate the type of tenure of point of origin such as State Forest, Crown Lands, Private Property or as the case may be. (Map references will assist in the definition of the point of origin.)

Column 5 zone of origin indicates in which of the three zones, as set out in paragraphs 9-12 the point of origin occurs.

Column 6 location is the name of compartment or property.

Column 7 cause.

Columns 8, 9, 10 and 11 give the area burnt in "A" zone in three degrees of scorching and should indicate the actual fire damage done to the forest.

Column 12 gives the total area burnt in "B" zone.

Column 13 gives the area burnt in plantation ("P") zone.

Column 14 gives the total area of the fire, i.e., areas already mentioned in 11, 12 and 13, plus any private property burnt.

### ANNUAL FIRE REPORT.

A separate Annual Fire Report is required for the natural forest and for the plantation zone where a plantation has been established in a district that also fire protects the natural forest.

The Annual Fire Report for areas of natural forest will be in the following form and this schedule must not be departed from without Head Office approval.

### ANNUAL FIRE REPORT.

.....Division No..... Season.....

#### 1. Introduction.

Areas protected—Zones A. and B.

Treated for Regeneration.

Period considered as fire season and covered by the Report.

2. Prevention.
  - (a) Controlled burning.
  - (b) Top disposal.
  - (c) Roads and tracks.
  - (d) Fire lines and firebreaks.
  - (e) Publicity and propaganda.
  - (f) Co-operation with local settlers.
  - (g) Notes on notable "saves" of property.
3. Organisation for Fire Season.
  - (a) Fire hazard—notes on fire season.
  - (b) Detection. Dates of manning and vacating towers.
  - (c) Communication.
  - (d) Suppression. Efficiency of employees; fire training schools.
  - (e) Water supply.
4. Fires during Season.
  - Date of first fire.
  - Date of last fire.

TABLE I.—DETAILS OF FIRES ATTENDED.

(This table will be Form F.D.434.)

TABLE II.—POINTS OF ORIGIN AND TOTAL NUMBER OF FIRES SUPPRESSED OR INVESTIGATED.

Point of Origin	Zone of Origin	Number of Fires	Number and area where Forest Land Burnt	
			No.	Area
" Forest Land " (S.F. or T.R.)	A			
	B			
Private Property	A or bordering A			
	B " " B			
Other Crown Lands	A " " A			
	B " " B			
Totals ....				

TABLE III.—ATTENTION GIVEN TO FIRES WHICH BURNT ON FOREST LAND.

Attention	Zone	No.	Area
Suppressed	A		
	B		
Investigated Only	A		
	B		
Totals ....			

TABLE IV.—TOTAL FIRES SUPPRESSED IN ZONE A.

Size of Fire	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
acres								
Less than 1 ....								
1 to 5 ....								
6 to 10 ....								
11 to 20 ....								
21 to 50 ....								
51 to 100 ....								
101 to 200 ....								
Over 200 ....								
Total ....								

TABLE V.—TOTAL FIRES SUPPRESSED IN ZONE B.

Size of Fire	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
acres								
Less than 1 ....								
1 to 5 ....								
6 to 10 ....								
11 to 20 ....								
21 to 50 ....								
51 to 100 ....								
101 to 200 ....								
Over 200 ....								
Total ....								

TABLE VI.—CAUSES OF ALL FIRES ATTENDED.

Cause.....	No.....	Area.....
W.A.G.R. Locos.		
Escape from private property.		
Escapes from controlled burning. (F.D.)		
Bush workers.		
Hunters and fishers.		
Householders.		
Firewood cutters.		
Travellers.		
Lightning.		
Deliberately lit.		
Children.		
Mill surroundings.		
Mine surroundings.		
Other Government employees.		
Stockmen.		
Unknown.		
Totals		

TABLE VII.—OCCURRENCE OF FIRES IN RELATION TO MONTH AND HAZARD.

Month	Low	Moderate	Average	High	Severe	Dangerous	Total
Totals							

TABLE VIII.—CONTROLLED BURNING CARRIED OUT.

Season	No. of Days when burning took place	Areas (acres)		
		Prescribed Area Burning	Advance Burning	Top Disposal Burning
Spring ....				
Autumn ....				
Totals ....				

TABLE IX.—RAINFALL FIGURES FOR THE SEASON.

Month ..... Wet Days ..... Points .....

June  
to  
May

5. Recommendations for next season.
6. Fire Plan. A paper litho to be forwarded with fire report showing:—
  - (1) A, B Zone boundaries BLUE
  - (2) Controlled burning—
    - Spring YELLOW
    - Autumn BROWN
    - Top disposal YELLOW WITH RED HATCH
  - (3) Uncontrolled fires RED and numbered with Serial No.
  - (4) Private property fires during prohibited period GREEN cross hatched RED
  - (5) Private property fires during open season GREEN

(The plan should not be folded but rolled on stick for placing in folder.)

**Plantation Zone.**

The Annual Fire Report for a plantation zone will be in the following form and this schedule must not be departed from without Head Office approval.

## ANNUAL FIRE REPORT.

- ..... Plantation      Season .....
1. Areas within Plantation Zone.
    - (a) Planted area.
    - (b) Area of natural forest (S.F. and T.R.) within zone.
    - (c) Areas of private property and other Crown lands within zone.
  2. Prevention.
    - (a) Controlled burning, i.e., any burning within the Plantation Zone (including boundary burning within buffer area, protective burning around settlements, etc.).
    - (b) Clearing burn for planting or sowing.
    - (c) Roads, tracks and fire lines:—
      - (i) Construction—details with chainages of new work within the plantation. Progressive total chainage of roads, track and fire lines.
      - (ii) Maintenance—details, with chainages, of grading, handwork, etc.
    - (d) Firebreaks:—
      - (i) Construction—details of new work.
      - (ii) Maintenance—details of old breaks cultivated or scraped.
    - (e) Publicity and propaganda.
    - (f) Co-operation with local settlers.
 

(Note.—(e) and (f) not required if ordinary fire report is also forwarded unless there are some special features.)
  3. Organisation for Fire Season.—As for natural forest report and not required if ordinary report forwarded unless there are some special features.
  4. Fires during the Season.
 

Date of first fire.

Date of last fire.

TABLE I.—DETAILS OF FIRES ATTENDED.

(Form F.D.434.)

TABLE II.—POINTS OF ORIGIN AND TOTAL NUMBER OF FIRES ATTENDED WITHIN PLANTATION ZONE.

Point of Origin	Number of Fires	Number and area where forest land burnt	
		No.	Area
Planted area ....			
Natural Forest within Zone ....			
P.P. and other Crown Land, within Zone ....			
*Outside Zone....			

\* Where not reported in other report.

TABLE III.—AREAS OF FIRES IN PLANTATION ZONE.

Area acres	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
	X Y	X Y	X Y	X Y	X Y	X Y	X Y	
0- 5	....							
6-10	....							
11-20	....							
21-50	....							
Over 50	....							
Total	....							

Total area burnt X acres.

Total area burnt Y acres.

X represents areas planted or sown.

Y represents fires in the buffer belt or in waste land within the planted areas.

TABLE IV.—CAUSES OF FIRES WITHIN PLANTATION ZONE.

Cause	Number	Area of Plantation

TABLE V.—OCCURRENCE OF FIRES IN RELATION TO MONTH AND HAZARD.

Month	Low	Moder- ate	Aver- age	High	Severe	Danger- ous	Total
Totals							

TABLE VI.—SUMMARY OF DAMAGE TO PLANTATION.

Area killed:—

(a) Salvageable .....

(b) Non-salvageable .....

Area burnt but not damaged.....

TABLE VII.—RAINFALL FIGURES.

Month	No of Wet Days	Points
June		
—		
—		
—		
—		
—		
May		
Total		

5. Recommendations for next season.
6. Fire Plan.—A paper litho to be forwarded with the fire report showing (this plan should not be folded but rolled on stick for placing in folder):—
  - (1) Zone Boundaries—Blue.
  - (2) Controlled Burning—  
Spring—Yellow.  
Autumn—Brown.  
Clearing Burn—Yellow with Red hatch.
  - (3) Uncontrolled fires—Red and numbered.
  - (4) Private property during prohibited period—  
Green crosshatched Red.
  - (5) Private property fires during open season—  
Green.

The following pages illustrate the various F.D. Forms mentioned in the foregoing text.

Form F.D.243  
Forests Department  
.....  
(District Office)  
.....  
.....

Dear Sir,

It is our intention, weather permitting, to carry out some protective burning adjoining your property.....  
Location No.....on or about the.....19.....

I would very much appreciate your co-operation in this controlled burning and it might be in your interest to be present.

I would remind you that the Bush Fires Act makes provision for you to carry out the burning of breaks on your own property in co-operation with this Department and it is suggested that now is an opportune time for you to do any burning you consider desirable for our mutual protection.

If you wish to discuss the programme more fully, I shall arrange for an officer to call on you at an early date.

Yours faithfully,  
Divisional Forest Officer,  
Forester-in-Charge.



Dear Sir,

I beg to acknowledge receipt of your notice of intention to burn.....  
on your property.....  
on .....

**This is not a Permit to Burn.**—A “permit” is only obtainable from your Fire Control Officer, or Shire Clerk if a Fire Control Officer is not available.

**Please Note the Conditions on the Back of the Permit.**

Yours faithfully,

Forest Officer.

**FIRE REPORT.**

Instructions concerning fire received from.....  
..... at..... a.m./p.m. on.....

Position of fire was given as.....

Position of fire was found to be.....  
.....  
.....

Time of arrival at fire..... a.m./p.m.

Estimated area then burnt..... acres.

Time required to stop running fire..... hours..... minutes.

Time spent mopping up..... hours..... minutes.

Main gang left the fire at..... a.m./p.m. and recommenced work at..... a.m./p.m.

Suspected cause of fire was.....  
.....  
.....

Total area burnt was estimated to be..... acres, made up as follows:—

Treated or planted forest—

Badly damaged..... acres.

Slight damage..... acres.

Untreated areas—

Good quality forest..... acres.

Waste land..... acres.

Private property..... acres.

Quantity of water used ..... gallons.

Men employed on fire—

Departmental Employees	Ordinary Hours	Outside Ordinary Hours	Additional Men	Ordinary Hours	Outside Ordinary Hours

Mileage run by Departmental vehicles.....miles.

If any other vehicles engaged, give name of owner, mileage and rate of payment arranged.....

What arrangements were made for patrol of burnt area? .....

Special comments (if any).....

Signature.

Report to be made out by man in charge of fire gang and forwarded to local office within 12 hours of leaving fire.

**Office Record.**

Serial No..... Zone.....

Report received at office at.....a.m./p.m. on.....

**COSTS—**

	£	s.	d.
Departmental employees:			
Within ordinary hours	:	:	
Outside ordinary hours	:	:	
Extra labour engaged:			
Within ordinary hours	:	:	
Outside ordinary hours	:	:	
Transport costs:			
Departmental vehicle:			
.....miles at 6d. per mile	:	:	
Hired vehicle:			
.....miles at.....per mile	:	:	
TOTAL	:	:	

Particulars of area burnt and damage done.....

.....  
 .....  
 .....  
 .....

Weather data—

Fire weather forecast for day.....

Local estimate.....

At time of outbreak      Peak for the day

Temperature .....

Relative humidity .....

Wind direction and force (from nearest tower) .....

Cause of fire .....

Officer Compiling.

Notes and Comments by D.F.O.—

Form F.D.426

Forests Department,

Date.....

To .....

Dear Sir,

In connection with your request that this Department—

(a) assist you in carrying out a controlled burn on your location....., or

(b) burn a break adjoining your location.....

I have to advise that we are prepared to accede to your request and the burning will be carried out at..... a.m./p.m. on.....

You are requested to be in attendance with whatever men and equipment you have available and it will be your responsibility to patrol your property during and subsequent to the burning operations.

Forest Officer.

