Directive 3.5 - Bushfire

SOP 3.5.10 - Crew Safety at Bushfires

Introduction

1. The following procedures are designed to minimise the risks associated with operational bush firefighting. Crew safety at bushfires is underpinned by a developed knowledge and experience of bush fire behaviour, situational awareness and the application of safety procedures.
All emergency services personnel are responsible for their own safety and the safety of others at an incident. The IC has ultimate responsibility to ensure the implementation of safe working practices at an incident. The Strategic Control Priorities outlined within State Hazard Plan – FIRE make clear that:

"Protection and Preservation of Life: *This is the fundamental overarching priority for the State, and includes:*

- *Safety of emergency services personnel.*
- *Safety of community members including vulnerable community members and visitors/tourists located within the incident area."*

Directive 3.5 – Bushfires

Procedures

2. **LACES.** During bushfire operations, there is a requirement to continuously reassess the changing dynamics of the fire to ensure a safer working environment for all. All personnel are to utilise **LACES** to plan their safety at incidents. The concept of LACES with detailed descriptions and tasking for each component in the attached Annex A.

3. **Routine Safety Practices:** The safety of Emergency Services Personnel is to be the highest priority. DFES have a number of safety practices to ensure the safety of all emergency services personal at incidents. Hazards exist at bush fires and the ongoing reassessment of risk to emergency services personal needs to be undertaken.

Safety Practice	Description
Red Flag Warnings	Red Flag Warning is a message system that provides a process to ensure critical messages (such as immediate weather changes) are confirmed and received by all relevant emergency services personnel. SOP 3.2.7 - Red Flag Warnings
Operations Pre-Start Briefing/Briefings (SMEACS Format)	Provides emergency services personnel with critical information relating to the incident. The briefing/s should include previous, current and predicted information on the incident as well as safety messages, tasking, predicted outcomes and contingency plans. SAP 3.2.C - Incident Action Planning
Situation Reporting	Regular reports on the progress of an incident and the efforts to control it. It confirms the location of the fire, its status and potential, the number, nature and effectiveness of resources deployed. Situation reports are normally provided at regular

	intervals determined by the Incident Controller and/or Operations Officer to meet State Operations Reporting Cycle requirements until the fire is declared safe.
Protective Water Supply	Crews should maintain 25% reserve of the water on an appliance during bushfire operations. This to ensure there is sufficient water to protect crews while exiting the incident area should they be impacted by fire.
Appliance Fuel Supplies	Crews should maintain a minimum fuel supply in appliances of one third (1/3) to ensure that the appliance and water deluge systems maintain functionality whilst on the fire ground. On appliances where the firefighting pump fuel is a direct supply from the appliance fuel tank the firefighting pump will not work once it reaches quarter of a tank. **(this will affect water deluge system operation on applicable appliances)**

4. **Common Hazards:** During bushfire operations emergency services personnel are surrounded by many hazards. A list of common hazards identified from previous safety incidents has been developed to assist personnel in managing safety however this list does not identify all hazards on fire ground.

Hazard	**Description**
Dead Man's Zone	The 'dead man zone' is the area directly around a bushfire that is likely to burn within 5 minutes and encompasses the distance the fire can travel in 5 minutes if the wind changes direction, turning a flank fire into a head fire. While conducting fire suppression in the dead man zone, there is a risk that the fire intensity and spread can suddenly increase dramatically if the wind direction changes, leaving little or no time for firefighters to seek refuge before being enveloped in a burnover. The safest place to be when conducting fire suppression duties within vegetation is on burnt ground where the fuel load has already been consumed by the fire, well out of the dead man zone.
Entrapment	A situation in which individuals are exposed to life threatening or potentially life-threatening conditions from which they cannot safely remove themselves.
Burnover	A section of a bushfire that overruns personnel and/or equipment.
Radiant Heat	The transfer of heat from a bushfire to nearby objects I.e. trees, appliances, personnel, etc. This is the direct heat felt from the bushfire.
Visibility	Visibility can be greatly reduced by many factors during operations at incidents. These can include smoke, dusk, dawn, night fall and steep dense terrain. Each of these have their own risks associated with them including vehicle accidents, slips, trips and falls, overhead dangers and personnel being struck by vehicles.
Refuelling	When refuelling plant and equipment during operations firefighters are exposed to a significant risk of injury should the fuel or vapour ignite. Fuel cans stored on appliances are likely to become pressurised due to exposure to higher ambient temperatures, direct sun, proximity to heat sources (e.g. exhaust, fire) and vibration. If opened too quickly, pressurised fuel and fuel

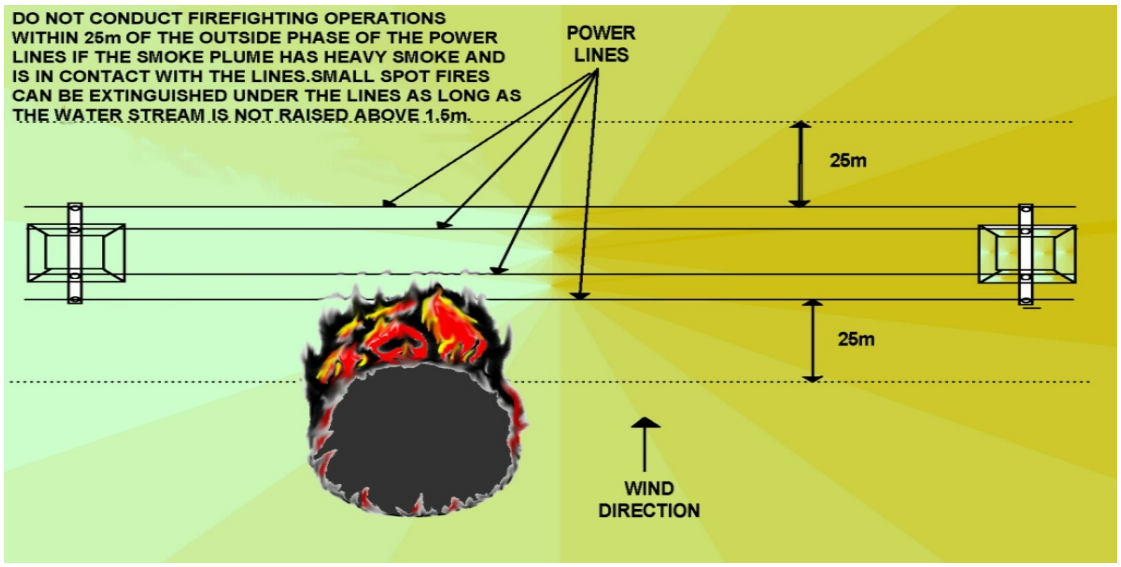
	vapours will discharge rapidly. It is possible for the fuel to ignite and cause significant injury to personnel. Light Tankers involved in actively fighting the fire are to remove fuel cans from their appliance and place at either; 1. A control point; 2. With an additional appliance responding to the incident (other than a Light Tanker) that has the capacity to store the fuel can away from direct heating from the fire; or 3. A shaded area that will not be impacted by fire. In all other circumstances the OIC should consider the removal of fuel cans from Career and DFES Volunteer Light Tankers on arrival at an incident based on a risk assessment and if required place the fuel can at a location identified above. NUCOM – Fuel Can (Refer eAcademy)
Riding on Appliances	At bushfires, deaths and injuries have occurred to personnel traveling on the back of firefighting appliances. To ensure the ongoing safety of firefighters attending bushfires, the following restrictions to traveling on the back of appliances are to be observed: • Appliances are not to carry more people than its designated seating capacity. • Riding on the back of appliances is ***only to occur*** under the following circumstances: – When the appliance is directly involved in firefighting operations and moving at a safe working speed – Where the appliance has been specifically designed to do so • Riding on the back of appliances while traveling between sectors or divisions is ***not to occur***. Firefighters are to be seated in the cabin wearing a seat belt.
Machinery	Throughout operations at bushfires, various machines may be required to contain and control the fire. When operating around machinery there are risks to emergency services personnel and operators. The use of trained and experienced machine supervisors when machinery is engaged at incidents will ensure some of these risks are addressed. These risks may result in injury or death of personnel and cause vehicle damage. Risks include unskilled operators, lack of visibility, unfamiliar terrain and entrapment while creating new control lines. Further information on the use of machinery and the hazards associated with their operation is in Bush Fire Firefighting and Machine Supervision learners manuals found in eAcademy.
Aircraft	Aircraft have become an integral part of firefighting operations at bush fires. Activities including reconnaissance, fire detection and water bombing all increase risks to pilots and ground personnel at bushfires. Further information relating to working safely around aircraft can be found in the Bush Fire Fighting and Ground Controllers learners manuals found in eAcademy and Directive 3.11 – Air Operations.
Respiratory	Common respiratory hazards present at bushfires are thermally generated particles (particulate matter) and gaseous toxins released during the ignition of vegetation. Additionally, bushfire firefighting along the rural urban interface (RUI)

	has the potential to involve a complex mixture of unknown fuels and therefore atmospheric hazards The particulates and gaseous toxins contained in bushfire smoke have the potential to cause irritation to the eyes and upper respiratory tract, leading to acute and chronic health effects.
Heat Related	Emergency services personnel are reminded to take extra care to reduce the risk of heat related illnesses. Emergency services personnel are at an increased risk due to the duration of time spent performing physically demanding activities within extreme environmental conditions. Heat-related illness occurs when our body is unable to cool itself sufficiently and maintain a healthy temperature. If ignored or left untreated, symptoms can become severe and may require immediate medical attention. Prevention is the best approach, and therefore it is important that all personnel take appropriate steps to prevent heat-related illness. Continually monitor yourself and crew members for symptoms of heat–related illness and notify your supervisor immediately if symptoms are experienced. Early management is the key. The OIC should also continuously monitor operational activity during adverse environmental conditions. Hydration and Electrolyte Replacement
Terrain	Bushfires can occur over many various types of terrain. Each type of terrain can pose a significant risk to personnel. When working on steep and sloping terrain for example, risks such as increased rates of spread, rough ground, rocky terrain and risk of vehicle rollover are increased.
Off road driving	Emergency services personnel encounter various types of hazards when attending bushfires. When personnel are required to leave bitumen roads at incidents drivers should assess the terrain and capability of the appliance and also determine whether they need to take the vehicle into that area. For example, if a fire is burning in bushland close to a road do you need to enter the bush, or can the fire be allowed to safely burn to existing roads or breaks.
Trees and Overhead Risks	The impact of intense fire on trees weakens both trunks and limbs. Limb failure or total tree collapse may occur well after the passing of the fire front and presents a hazard to firefighters during both the offensive attack and mop-up phases of a fire. Equally, previous events may have weakened tree limbs and present compounded hazards. Firefighters must remain aware of the risk to their personal safety from falling limbs and unstable trees and are encouraged to frequently 'Look Up for Over Dangers'. Isolation of hazardous trees is integral to reduce the risk of injury or death to emergency services personnel. The unstable tree should be marked to identify the hazard and any tracks, roads or areas cordoned off to reduce the risk of injury to firefighters. Trees suspected of posing a risk to firefighters are to be marked and recorded for inspection by qualified tree-fellers whereupon decision will be made to trim/lop limbs or fell the tree. Such events are to be reported through the chain-of-command to the Operations Officer. Tree-fellers are to comply with the PPC/PPE standards detailed at SOP 3.2.1 – Order of Dress-PPC Matrix.

	Further procedures for the identification and removal of dangerous trees at bushfires are detailed at SOP 3.5.12 - Tree Removal at Bushfires
Support Wires	Some power poles are stabilised using an anchored wire rope (guy wire) to provide tension. In some situations this supporting cable is established over property boundaries and within firebreaks where firefighting operations occur. These cables pose a hazard as they may not be initially observed by firefighting crews due to obstruction by vegetation, smoke, dust or darkness. If such cables are encountered at an incident, demarcation tape or some other form of high visibility indicator should be used to indicate the hazard.
Unexploded Ordnance (UXO)	UXO's may be detonated through vibration, wilful tampering, and mechanical disturbance or localised and extended exposure to a heat source all of which occur during bushfires. If a UXO detonate during firefighting activities, it could cause death or injury to personnel operating in these areas. Strict guidelines are to be adhered to when operating in and around UXO areas and procedures for this are detailed at - SOP 3.5.13 - Operating Within Registered UXO Sites
Bridges	There are many types of bridges throughout WA. Each type of bridge presents different hazards to emergency services personnel. These hazards include weight limit restricted bridges, bridge construction material and bridges impacted by fire which may have weakened their structure.
Fencing	Fencing presents many risks to fire fighters at incidents. Fire fighters can be trapped in paddocks by fencing with an approaching fire front and have no safe exit options. If the driver has not seen the fencing material it can become entangled in the drive train of appliances making them immobile with the possibility of the crew and appliance being overrun by fire.
Catalytic Converters	Catalytic converters form part of the exhaust system on many of our firefighting appliance. A catalytic converter operates between 300-600^{o}c and although shielded, there is a real possibility for dry grass and other combustible material to get caught in the shielding and ignite. • Crews should avoid remaining stationary for long periods in unburnt vegetation, particular grass • Monitor potential buildup of combustible material around exhaust systems and catalytic converters.
Diesel particulate diffuser regeneration	Firefighting appliances that include Diesel Particulate Diffusers (DPD) in their exhaust systems require regular regeneration. This regeneration burns off the soot and prevents blockages. Appliances with DPD have two potential risks associated with DPD regeneration • Should regeneration not occur, the appliance may go in to limp mode slowing exit from fire ground with the potential for entrapment. • As the exhaust system becomes very hot during regeneration, there is a possibility for dry grass to ignite under the appliance. SOP 3.5.2 - DPD Regeneration during Bushfire Firefighting

5. **Operations around electrical infrastructure** Firefighting operations in close proximity to high voltage power lines expose crews to significant risk. In order to provide a safe working environment, the following measures should be observed.

- Assume all lines are energised. Contact the relevant power authority and inform them of the threat to the power lines.
- Do not fight the fire within 25m of the power line zone (fig 1).
- If the smoke plume impinges on the power lines do not direct a water stream inside the zone.
- Water streams of no more than 1.5m in height can be directed inside the zone provided the smoke is not impinging on the power lines.
- When moving a vehicle under power lines, always pass under the wires more than 25m away from the fire or smoke plume.



Use of LACES. LACES are to be implemented and utilised as a procedure at all bushfire incidents. OIC of appliances and crew are responsible for implementing and maintaining LACES. **Although individual parts of LACES can be tasked, all emergency services personnel should take an active role in maintaining LACES.**

Control	Description	Tasks
Lookouts	The establishment of lookouts at a bushfire is vital. Lookouts maintain awareness of the environment immediately surrounding personnel.	• Monitor the immediate surroundings of the crew • Look for potential hazards • Observe current weather • Look for changes in weather (wind strength, direction) • Monitor fire behavior • Monitor vehicle movements • Maintain line of sight with crew/personnel • Signs of fatigue
Awareness	Awareness is the responsibility of all personnel. OIC (and crew leaders) are responsible for ensuring common operating picture between personnel.	• Remain aware of the fire situation including (Current and potential weather, Terrain and aspect, fuel types and fuel loads, hazards, crew locations) • Be alert and act decisively before situations become critical. • Consider welfare and fatigue management and requirements
Communications	OIC (and crew leaders) are responsible for establishing and maintaining effective communications. It is not acceptable for personnel to be without communications at any time at a bushfire.	• Receive a pre-deployment briefing from the IC (preferably SMEACS) • On arrival at the fireground establish radio communications • Maintain radio communications by ensuring planned regular communications within the chain of command • Ensure that visual and/or verbal communications are maintained between crew. • Immediately communicate any changes in situation
Escape Routes	OIC (and crew leaders) are responsible for identifying and communicating to crew a minimum of 2 suitable escape routes.	<u>Locating Suitable escape routes that include</u>: • Containment lines of appropriate width • Firebreaks • Roads (sealed or unsealed) <u>OIC are to ensure all personnel</u>: • Know their escape route at all times • Ensure vehicles are positioned to allow for rapid escape
Safety Zones	A safety zone is an area cleared of flammable material and large enough to provide adequate space for crew protection.	• Safety zones must be monitored by OIC to ensure they remain suitable for use • All personnel must be aware of the location of established safety zones. • OIC are to ensure that an appropriate safety zone is identified and accessible to crews at all times at a bushfire.

DOCUMENT HISTORY

VERSION	DATE	DESCRIPTION of CHANGE
1.0	Jan 11	New SOP created. New sections created: • (All) **Source documents:** SOP ***All listed SOP/SAP, now retired.***
1.1	Aug 11	New Section Created • Section 4 – Special Risks
1.2	Jan 14	Update formatting and general review
1.3	Apr 15	Added "Refuelling" to Safe Working Practices table.
1.4	Dec 17	Changed the special risk titled section to operating around electrical hazards Added new special risk section and added catalytic converters and Diesel particulate diffuser regeneration to newly titled special risk section
2.0	Mar 18	Major review of SOP • New introduction added bushfire behavior, situational awareness and safety procedures. • Added LACES overview and how to implement annex. • Added routine safety practices section. • Updated common hazard on fire ground.
2.1	Sep 2020	Inclusion of guidance for re-fuelling LT fuel cans.