

1 Chapter ~~1514~~

2 Firefighting Equipment

3

4 Introduction

5 The agency wildland fire program equipment resources include engines, dozers,
6 water tenders, and other motorized equipment for fire operations.

7

8 Policy

9 Each state/region will comply with established standards for training,
10 equipment, communications, organization, and operating procedures required to
11 effectively perform arduous duties in multi-agency environments and various
12 geographic areas.

13

14 Approved foam concentrate may be used to improve the efficiency of water,
15 except near waterways where accidental spillage or over spray of the chemical
16 could be harmful to the aquatic ecosystem, or other identified resource concerns.

17

18 Driving Standard

19 Refer to ~~the current~~ driving standards ~~for each individual agency~~ in Chapter
20 ~~0607~~.

21

22 Firefighting Engines

23

24 Operational Procedures

25 All engines will be equipped, operated, and maintained within guidelines
26 established by the Department of Transportation (DOT), regional/state/local
27 operating plans, and procedures outlined in BLM Manual H-9216, Fire
28 Equipment and Supply Management, or agency equivalent. All personnel
29 assigned to agency fire engines will meet all gear weight, cube, and manifest
30 requirements specified in the National Mobilization Guide.

31

32 Fire Engine Staffing

33 An ENGB will be with every engine, and the minimum staffing is two
34 individuals for Type 6 and Type 7 engines.

35

36 For Type 3, 4, and 5 engines, minimum staffing is three individuals, including a
37 ~~Single Resource Boss for each engine.~~

38 ~~BLM Firean Engine Staffing~~

39 ~~Minimum staffing for Type 3, 4, and 5 engines is one ENGB and two FFT2s.~~

40 ~~Minimum staffing for Type 6 and 7 engines is one ENGB and one FFT2Boss.~~

41 FWS Fire Engine Staffing

42 Minimum staffing for Type 3 engine is one ENGB and two FFT2s.

43 Minimum staffing for Type 4, 5, 6 and 7 engines is one ENGB and one FFT2
44 (off Refuge).

45 Target staffing for Type 4, 5 and 6 engines is one ENGB, one ENOP and one
46 FFT2.

- 1 Minimum staffing for Type 4, 5, 6 and 7 engines (on Refuge lands) is one
2 ENOP and one FFT2.
- 3 NPS - Staffing levels - Engines of any type when responding to off-park
4 assignments, will be staffed by an ENGB and the appropriate number of Module
5 Members. Type 6 or 7 engines may be supervised by an ENOP on in-park fires
6 only. For an engine supervised by an ENOP when used for initial attack (on in-
7 park fires only), the ENOP must also be minimally ICT5 qualified. Type 3, 4,
8 or 5 engines, regardless of assignment location, will be minimally supervised by
9 an ENGB.
- 10 NPS - Type 6 and 7 engines will have a minimum crew of two – an ENGB or
11 ENOP (in-park only), and an Engine Module Member.
- 12 NPS - Type 3, 4, or 5 engines will have a minimum crew size of three, an
13 ENGB, an ENOP and one Engine Module Member; or an ENGB and two
14 Engine Module Members.
- 15 NPS - Working Capital Fund (WCF)/Non-WCF, Additional requirements
16 NPS - WCF engines are identified below.
- 17 NPS - All engines will be typed in accordance with the specifications identified
18 in the 410-1. Minimum engine staffing requirements:
- 19 Approved WCF Type 6 or 7 engines during the defined fire season is 3
20 personnel effective 7 days per week.
- 21 Approved Working Capital Fund (WCF) Type 3, 4, or 5 engines during the
22 defined fire season is 5 personnel effective 7 days per week.
- 23 Non-WCF engines (or WCF engines outside defined fire season), Type 6 or 7
24 engines is a minimum of 2.
- 25 Non-WCF engines (or WCF engines outside defined fire season), Type 3, 4, or 5
26 engines is a minimum of 3.
- 27 FS - A [singleSingle](#) Resource Boss may supervise a type 6 or 7 engine.

28
29 ~~Supplemental Performance Standards for Fire Engine Operators
30 The Engine Module Member (EMM) and Engine Operator (ENOP)
31 supplemental standards were created to provide managers and firefighters
32 consistent training and performance standards for firefighters moving from
33 Firefighter Type 1 (FFT1) to Engine Boss (ENGB). The supplemental standards
34 are intended to develop firefighter skills and to improve overall performance.
35 These standards are not part of the NWCG Wildland Fire Qualifications
36 Subsystem Guide (NWCG 310-1).~~

37
38 ~~Engine Module Member (EMM) Supplemental Performance Standards
39 Minimum FFT2 qualification.
40 Ability to maintain inventory in a constant state of fire readiness.
41 Ability to use, check condition of, and identify repair/replacement needs as
42 identified in Firefighters Guide NFES 1571. All tools and equipment must meet
43 refurbishment standards specified in Fire Equipment Storage and Refurbishment
44 NFES 2249.
45 Working knowledge of hose pack types and how to safely and efficiently deliver
46 water to the fire.~~

- 1 Working knowledge of hose identification and use. See Wildland Fire Hose
- 2 Guide NFES 1308.
- 3 Ability to identify fittings and nozzles, understand use, capabilities, limitations,
- 4 and perform maintenance.
- 5 FS—The FS recommends the performance requirements for each FFT2.
- 6
- 7 Engine Operator (ENOP) Supplemental Performance Standards
- 8 All EMM standards stated above, plus
- 9 Minimum FFT1 qualification.
- 10 Successful completion of L-280 Followership to Leadership.
- 11 Successful completion of PMS 419 Engine Operator Course, or Geographic
- 12 Area Engine Academies
- 13 Ability to perform safe and effective stationary pumping operations.
- 14 Ability to perform multi-engine mobile attack safely and efficiently.
- 15 Demonstrated knowledge of policy, strategies, tactics, and hazards of urban
- 16 interface firefighting.
- 17 Understand capabilities, limitations, and joint operations with municipal fire
- 18 apparatus, including pressures, flow rates, and potential effects on wildland fire
- 19 equipment.
- 20 Ability to use engine protection lines and to protect engine through effective
- 21 positioning.
- 22 Knowledge of pump theory and operation. Ability to effectively apply this
- 23 knowledge to fire situations. Ability to troubleshoot pump/valve problems in
- 24 various fire and drill situations.
- 25 Ability to perform pump package maintenance to manufacturer/agency
- 26 standards and keep pump package in a constant state of fire readiness. Ability to
- 27 troubleshoot equipment problems and develop solutions/repair needs. Ability to
- 28 perform required pump test to ensure pump/plumbing are operating to
- 29 specifications. Ability to keep accurate maintenance log.
- 30 Ability to effectively apply calculations and formulas relating to fire hydraulics,
- 31 including friction loss. Knowledge of pump capabilities and limitations (GPM,
- 32 PSI, elevation gain and loss, etc).
- 33 Ability to perform simple hoselay, including initial layout and effective delivery
- 34 of water to fire.
- 35 Ability to perform progressive hoselay, including initial layout and effective
- 36 delivery of water to fire.
- 37 Ability to perform effective hoselay troubleshooting and develop effective
- 38 solutions to problems.
- 39 Ability to perform foam equipment maintenance, including flushing engine
- 40 foam proportioner according to the manufacturer's recommended procedures.
- 41 Ability to efficiently produce different types of foam from nozzle(s).
- 42 Ability to apply drafting theory. Ability to draft from external source and fill
- 43 engine tank, and draft from external source and deliver water through a hoselay.
- 44 Application of safe and effective hydrant use. Ability to set up engine for
- 45 hydrant water delivery.

1 Vehicle maintenance capability adequate to maintain vehicle per
2 manufacturer's/agency standards and keep vehicle in a constant state of fire
3 readiness. Ability to troubleshoot equipment problems, develop solutions, and
4 make repairs.

5 Ability to perform effective winterization of apparatus and pump package to
6 protect from potential freeze damage.

7 FS—The FS recommends the performance requirements for each ENOP.

8 **BLM—Engine Module Leader (EML)—Agency Specific Position**

9 **——Minimum Qualifications**

10 **ICT4, ENOP, ENGB.**

11 **BLM—Additional Required Training**

12 **——I-200, S-200, S-231, S-234, S-260, S-270.**

13 **BLM—Additional Performance Requirements**

14 **BLM—Same as for ENOP, plus the following:**

15 **BLM—Supervision**

16 **The Engine Module Leader is responsible for the overall operation of the**
17 **module's activities. Directs module personnel during fire preparedness review,**
18 **suppression activities, fuels management, and project work. Provides direction**
19 **to the module commensurate with members' qualifications and experience.**

20 **BLM—Equipment Capability**

21 **Has a thorough knowledge of tactical equipment capabilities and limitations,**
22 **and their relationship to fuels, topography, and fire behavior.**

23 **BLM—Training**

24 **Provides and facilitates training of personnel through mentoring, formal and**
25 **informal instruction. Identifies training needs in the Individual Development**
26 **Plan (IDP) and performs Task Book management for module members.**

27 **BLM—Administration**

28 **Performs administrative duties relating to the operation of the module, including**
29 **(but not limited to time and attendance, procurement activities (credit card),**
30 **personnel management (recruitment and hiring), IDP development, and property**
31 **management.**

32 **BLM—Coordination**

33 **Develops and maintains working relationships with BLM counterparts,**
34 **cooperators, other agencies, general public, and media.**

35 **BLM—Safety**

36 **Ensures compliance with safety procedures and policies and mitigates**
37 **potentially hazardous situations.**

38 **BLM—Physical Fitness**

39 **Train, test, and evaluate module members to ensure that required physical**
40 **fitness standards are met.**

41 **BLM—Communication**

42 **Ensures that Module Members receive situational briefings. Provides briefings**
43 **during daily work activities, fireline duties, and fireline transitions. Solicits and**
44 **provides feedback.**

45 **BLM—Equipment Development & Evaluation**

1 ~~Identifies problems with BLM equipment and suggests possible solutions.~~
2 ~~Provides feedback to equipment development groups. Tests and evaluates~~
3 ~~prototype equipment through the use of deficiency reporting.~~
4 ~~NPS/FS—The NPS/FS recommends the performance requirements for the~~
5 ~~Engine Module Leader as outlined in the Interagency Fire Program Management~~
6 ~~Qualifications Standard and Guide.~~

7
8 Engine Typing

9 Engine Typing and respective standards are identified in the NWCG Fireline
10 Handbook, 410-1.

11
12 Engine Water Reserve

13 Engine Operators will maintain at least 10 percent of the pumpable capacity of
14 the water tank for emergency engine protection and drafting.

15
16 Chocks

17 At least one chock will be carried on each engine and will be properly utilized
18 whenever the engine is parked or left unattended. This includes engine
19 operation in a stationary mode without a driver “in place.”

20
21 Fire Extinguisher

22 All engines will have at least one 5 lb. ABC-rated (minimum) fire extinguisher,
23 either in full view or in a clearly marked compartment.

24
25
26
27 Nonskid Surfaces

28 All surfaces will comply with National Fire Protection Association (NFPA)
29 1906 Standards for Wildland Fire Apparatus (6.4.3.) guidelines.

30
31 First Aid Kit

32 Each engine shall carry, in a clearly marked compartment, a fully equipped 10-
33 person first aid kit.

34
35 Gross Vehicle Weight (GVW)

36 Each engine will have an annually certified weight slip in the vehicle at all
37 times. Operators of engines and water tenders must ensure that the maximum
38 certified GVW is never exceeded, including gear, personnel and fuel. If the
39 proper number of personnel are not available during the weighing. The NFPA
40 1906 standard of 250 pounds for each person and their personal gear may be
41 used to calculate the loaded weight.

42 FS - Supervisors must ensure that the maximum allowable weight of the vehicle
43 is not exceeded. For commercially designed highway vehicles used in off-
44 highway applications the Gross Vehicle Weight (GVW) shall not, the Cargo
45 Load (CL) must not exceed 90% of the difference between the Gross Vehicle

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Weight Rating (GVWR) and shall not exceed 90% of the Gross Axle Vehicle's Curb Weight Rating (GAWR) on any axle.

For commercially designed off highway vehicles, the (CW). In numerical form: Max CL = .90 (GVWR - CW) - DP. The curb weight (CW) is defined as the actual weight of a vehicle including all permanently attached items and a full tank of fuel. It does not include the cargo (water, tools, supplies, gear, etc), the driver, or passengers. DP is the driver and passengers riding in the vehicle. GVWR is the maximum weight at which the vehicle is certified to operate. The maximum allowable vehicle operating weight is therefore the curb weight plus the allowable cargo load. The Gross Axle Weight Ratings (GAWR) do not need to be reduced but must shall not be exceeded for off highway travel, under any circumstances.

Speed Limits
Posted speed limits will not be exceeded.

XXX Lighting

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All new orders for fire engine apparatus will include an overhead lighting package in accordance with statewide agency standards. It is recommended that the lighting package Lighting packages will meet NFPA 1906 standards. Engines currently in service may be equipped with overhead lighting packages.

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Colors

Lighting packages containing blue lights are not allowed and must be replaced. Blue lights have been reserved for law enforcement and must not be used on fire vehicles. A red, white, and amber combination is the accepted color scheme for fire.

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Emergency Light Use

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While off road and/or during suppression, prescribed fire or other emergency activities, headlights Headlights and taillights will be illuminated at all times while the vehicle is in motion. Emergency lighting will be used only during on site wildland fire operations or to mitigate serious safety hazards. Overhead lighting and other emergency lighting must meet state code requirements, and will be illuminated whenever the visibility is reduced to less than 300 feet. Blue lights are not acceptable for wildland fire operations.

Light Use Visibility

Headlights and taillights shall remain illuminated at all times while the vehicle is in operation. Overhead lighting (or other appropriate emergency lights) shall be illuminated whenever visibility is reduced to less than 300 feet.

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NPS - Vehicle Color and Marking. Vehicles dedicated to wildland fire activities shall be white in color and have a single four-inch wide red reflective stripe placed according to NFPA 1906 (NFPA 1906 7-6.2 1995 edition). The word "FIRE" red with white background color will be centered on the front fenders.

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1 “FIRE” may also be placed on the front and rear of the vehicle. The NPS
2 Arrowhead will be placed on the front doors. The size and placement of the
3 arrowhead will be as specified in RM-9. An identifier will be placed on the
4 vehicle according to local zone or GACC directions. Roof numbers will be
5 placed according to local zone procedures.

6 ~~On Board Flammable Liquid Fuel Use, Storage~~

7 ~~Occupational Safety and Health Administration (OSHA) regulations state, “only~~
8 ~~approved metal containers, of not more than 5 gallons capacity, having a spring-~~
9 ~~closing lid and spout cover and so designed that it will safely relieve internal~~
10 ~~pressure when subjected to fire exposure, be used for storing or transporting~~
11 ~~flammable liquids” (29 CFR 1910.106). To comply with OSHA requirements~~
12 ~~and agency directives, only OSHA approved, type II metal safety cans should be~~
13 ~~used. Approved are the 2 in 1 polyethylene containers (Dolmars) used to fill~~
14 ~~chainsaws and steel Jerry cans that are used as a fuel tank for Mark III pumps.~~
15 ~~Cans must be clearly marked as to their content (e.g., gasoline, diesel, drip torch~~
16 ~~fuel). Dolmars must also be marked with the fuel oil ratio and the date of the~~
17 ~~saw gas mix so its suitability for use can be easily determined.~~

18 ~~BLM – Drip Torch Fuel Transportation and Dispensing~~

19 ~~Reference Instruction Memorandum FA IM 2005-030. This IM provides~~
20 ~~direction for drip torch fuel transportation and dispensing to bring BLM~~
21 ~~equipment and practices into compliance with applicable regulations and~~
22 ~~nationally recognized standards. It also provides direction on procurement of~~
23 ~~new equipment.~~

24 ~~Guidance and direction for the use, storage, and transportation of fuel can be~~
25 ~~found in the interagency interim policy “Interagency Fuel Transportation Guide”~~
26 ~~at:~~

27 ~~<http://www.fs.fed.us/t-d/fueltran/> (Use t-d as user and password logins)~~

28 Fire Engine Maintenance Procedure and Record

29 Apparatus safety and operational inspections will be accomplished either on a
30 post-fire or daily basis. Offices are required to document these inspections.
31 Periodic maintenance (as required by the manufacturer) shall be performed at
32 the intervals recommended and properly documented. All annual inspections
33 will include a pump gallons per minute (GPM) test to ensure the pump/plumbing
34 system is operating at desired specifications.
35

36 Engine Inventories

37 An inventory of supplies and equipment carried on each vehicle is required to
38 maintain accountability and to obtain replacement items lost or damaged on
39 incidents. The standard inventory for engines is found in Appendix R
40

41 Water Tenders

42 Water Tender Operators Performance Standards

43 Water Tender Operator (Support)

1 Qualifications: CDL (tank endorsement).

2 Staffing: A water tender (Support) may be staffed with a crew of one (a
3 driver/operator) when it is used in a support role as a fire engine refill unit or for
4 dust abatement. These operators do not have to pass the Work Capacity Test
5 (WCT) but are required to take annual refresher training.

6
7 Water Tender Operator (Tactical)

8 Tactical use is defined as “direct fire suppression missions such as pumping
9 hoselays, live reel use, running attack, and use of spray bars and monitors to
10 suppress fires.”

11 Qualifications: ENOP, CDL (tank endorsement)

12 Staffing: Tactical water tenders will carry a minimum crew of two:

13 One ENOP

14 One Engine Module Member

15
16 Dozers/Tractor Plows

17
18 **Policy**

19 **Dozer/Tractor Plow Training and Qualifications**

20 Agency personnel assigned as dozer/tractor plow operators will meet the
21 training standards for a Firefighter 2 (FFT2). This includes all safety and annual
22 refresher training. While on fire assignments, all operators and support crew
23 will meet PPE requirements including the use of aramid fiber clothing, hard
24 hats, fire shelters, boots, etc.

25 FWS - Dozer/tractor plow Operators must complete Intermediate Fire Behavior
26 (S-290) and the FWS Heavy Equipment Safety Training course SAF2002 for
27 dozer and/ or SAF2000 for Agriculture Tractor. Additional training which
28 supports development of knowledge and skills includes S-232 and S-233
29 respectively, other positions that meet currency requirements is none.

30
31 **Dozer/Tractor Plow** Physical Fitness Standards

32 BLM/FWS - All employee dozer/tractor plow operators will meet the WCT
33 requirements at the Moderate level before accepting fire assignments.

34 FS - FS dozer operators refer to 5134.32.

35
36 **Dozer/Tractor Plow** Operational Procedures

37 Agency owned and operated dozer/tractor plows will be equipped with
38 programmable two-way radios, configured to allow the operator to monitor
39 radio traffic.

40 Agency dozer/tractor plows with non-red carded operators and all contract
41 dozer/tractor plows will have agency supplied supervision when assigned to any
42 suppression operations.

43 Contract or offer-for-hire dozers must also be provided with radio
44 communications, either through a qualified dozer/tractor plow boss or an
45 agency-supplied radio. Contract dozer/tractor plows will meet the specifications
46 identified in their agreement/contract.

1 Operators of dozer/tractor plows and transport equipment will meet DOT
2 certifications and requirements regarding the use and movement of heavy
3 equipment, including driving limitations, CDL requirements, and pilot car use.
4
5 All Terrain Vehicles (ATV)/Utility-Terrain Vehicles (~~UV~~UTV)
6 Policy
7 The operation of ATV/~~UV~~UTV is high risk and should be utilized only when
8 their use is essential to accomplishment of the mission and not as a matter of
9 convenience. Because of the high risk nature, agencies have developed specific
10 operational policy as highlighted below:
11 Specific authorization for ATV/~~UV~~UTV use is required. Refer to current
12 agency policy.
13 All personnel authorized to operate an ATV must first complete agency specific
14 or manufacturer training in safe operating procedures and appropriate PPE.
15 Refer to agency specific guidelines on required frequency of ATV refresher
16 training.
17 Required PPE includes ~~helmet~~;
18 Helmet (DOT, ANSI-90, or SNELL M-95 approved); Use of half "shorty"
19 helmets require a JHA for fireline use and must include justification for its use.
20 Refer to MTDC Tech Tip publication, A Helmet for ATV Operators with
21 Fireline Duties (0651-2350-MTDC).
22 eye protection (goggles, face shield, or safety glasses);
23 gloves;
24 long sleeves;
25 long pants;
26 and leather boots (minimum 8" height).
27 The standard wildland hardhat will not be worn while operating an ATV.
28 Except in emergency situations, no passengers will be carried unless vehicle is
29 designed by the manufacturer to carry operator and passengers.
30 Operating speed will be appropriate for the conditions and terrain.
31 ATV training shall include safe operation while carrying loads.
32 Loads shall be mounted and secured as to not affect the vehicle's center of
33 gravity.
34 Load weights shall not exceed manufacturer's recommendations.
35 A risk assessment must be completed and approved by the supervisor prior to
36 vehicle operation.
37 BLM - Refer to BLM Interim Policy - Utilization of Off-Road Vehicles (ORVs)
38 IM 2005-148.
39 BLM - ~~Refresher training is required every 3 years for all off road vehicles~~
40 ~~(ORVs). Refresher training consists of a field "check ride," at minimum. The~~
41 ~~ATV refresher will~~ All operators shall be ~~conducted~~ re-evaluated by an ASI
42 Certified ~~Instructor~~ Trainer every three years.
43 FWS/NPS - Exceptions to the above policy are:
44 SPH-4, SPH-5, or other comparable flight helmets meet the DOT requirements
45 ~~for a motorcycle helmet~~ and may be used in lieu of:

~~Standard fire hardhats or flight helmets are required for ATV use when on the fireline under low operating speeds. (Motorcycle helmets have not yet been tested and approved for fireline use) described above.~~

~~Chinstraps must be used.~~

~~A motorcycle helmet or flight helmet will be required when operating to and from fire management activities and while loading and unloading the ATV.~~

NPS - All personnel authorized to operate an ATV must first complete training in safe operating procedures from a nationally recognized source such as the ATV Safety Institute ATV Rider Course (<http://www.atvsafety.org>) or as required by state statute. ~~Safe operating procedures information is also available from the National Off Highway Vehicle Conservation Council (http://www.nohvcc.org/html/ohv_safety.htm)~~

NPS - Annual refresher training must be conducted in accordance with an approved JHA.

FS - Refer to Health and Safety Code Handbook 6709-11.

FWS - Refer to Service Manual 243 FW 6 Off Road Utility Vehicle Safety.

Vehicle Cleaning/Noxious Weed Prevention

To reduce the transport, introduction, and establishment of noxious weeds or other biological contaminants on the landscape due to fire suppression activities, fire suppression and support vehicles should be cleaned at a ~~predestinated~~ designated area prior to arriving and leaving the incident. Onsite fire equipment should be used to thoroughly clean the undercarriage, fender wells, tires, radiator, and exterior of the vehicle. The cleaning area should also be clearly marked to identify the area for post fire control treatments, as needed.

24

▲ Fire Remote Automated Weather Stations

Fire Remote Automated Weather Stations (FRAWS) are portable weather stations that pack up into a single container and may be utilized in any location to monitor local weather conditions. FRAWS are intended for use on or near the fireline and are rapidly relocated to points desired by Fire Behavior ~~Analysts (FBAs)~~ Analyst (FBAN) for real time weather data. ~~Fire Managers and FBAs use FRAWS weather data to predict fire behavior, prescription times, fire weather forecasting, canyon, and ridgetop winds.~~

35

National resource FRAWS systems are cached at National Interagency Fire Center (NIFC) and may be ordered through standard equipment resource ordering systems. Maintenance and recalibration of these stations must be coordinated with the NIFC Remote Sensing/Fire Weather Support Unit (RSFWSU).

41

Ignition Devices

Fuel Use, Storage and Transportation

Guidance and direction for the use, storage, and transportation of fuel can be found in the interagency interim policy "Interagency Fuel Transportation Guide" at:

1514-10

Release Date: January ~~2007~~ 2008

- 1 <http://www.fs.fed.us/t-d/fueltran/>. (Use t-d as user and password logins)
- 2
- 3 Aerial Ignition Devices
- 4 Information on types of aerial ignition devices, operational guidelines and
- 5 personnel qualifications may be found in the Interagency Aerial Ignition Guide.
- 6
- 7 Ground Ignition Devices
- 8 BLM - Guidance and direction for use and procurement of approved ground
- 9 ignition equipment and the transportation and dispensing of drip torch fuel can
- 10 be found in: Instruction Memorandum No. OF&A 2005-030, 7/20/05, Drip
- 11 Torch Fuel Transportation and Dispensing Direction.
- 12 NPS - Agency direction may be found in the 04/04/03 Memorandum Y14
- 13 (9560) Aerial and Ground Ignition Equipment.
- 14 FWS - specific information on ignition devices may be found in the January 28,
- 15 2003 Memorandum: "Direction for Use and Purchase of Aerial and Ground
- 16 Ignition Equipment."
- 17 FS - direction is found in FSH5109.32a and 6709.11.