

Chapter 15 Firefighting Equipment

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Introduction

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

Policy

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

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

Driving Standard

Refer to the current driving standards for each individual agency in Chapter 06.

Firefighting Engines

Operational Procedures

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

Fire Engine Staffing

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

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

- **BLM Fire Engine Staffing**
 - *Minimum staffing for Type 3, 4, and 5 engines is one ENGB and two FFT2s.*
 - *Minimum staffing for Type 6 and 7 engines is one ENGB and one FFT2.*
- **FWS Fire Engine Staffing**
 - *Minimum staffing for Type 3 engine is one ENGB and two FFT2s.*
 - *Minimum staffing for Type 4, 5, 6 and 7 engines is one ENGB and one FFT2 (off Refuge).*

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

32 **Supplemental Performance Standards for Fire Engine Operators**

33 The Engine Module Member (EMM) and Engine Operator (ENOP)
34 supplemental standards were created to provide managers and firefighters
35 consistent training and performance standards for firefighters moving from
36 Firefighter Type 1 (FFT1) to Engine Boss (ENGB). The supplemental standards
37 are intended to develop firefighter skills and to improve overall performance.
38 These standards are not part of the NWCG *Wildland Fire Qualifications*
39 *Subsystem Guide (NWCG 310-1)*.

40 **Engine Module Member (EMM) Supplemental Performance Standards**

- 41
- 42 • Minimum FFT2 qualification.
- 43 • Ability to maintain inventory in a constant state of fire readiness.
- 44

- 1 • Ability to use, check condition of, and identify repair/replacement needs as
2 identified in *Firefighters Guide NFES 1571*. All tools and equipment must
3 meet refurbishment standards specified in *Fire Equipment Storage and*
4 *Refurbishment NFES 2249*.
- 5 • Working knowledge of hose pack types and how to safely and efficiently
6 deliver water to the fire.
- 7 • Working knowledge of hose identification and use. See *Wildland Fire*
8 *Hose Guide NFES 1308*.
- 9 • Ability to identify fittings and nozzles, understand use, capabilities,
10 limitations, and perform maintenance.
- 11 • *FS - The FS recommends the performance requirements for each FFT2.*
12

13 **Engine Operator (ENOP) Supplemental Performance Standards**

- 14 • All EMM standards stated above, plus
- 15 • Minimum FFT1 qualification.
- 16 • Successful completion of L-280- Followership to Leadership.
- 17 • Successful completion of PMS 419 Engine Operator Course, or Geographic
18 Area Engine Academies
- 19 • Ability to perform safe and effective stationary pumping operations.
- 20 • Ability to perform multi-engine mobile attack safely and efficiently.
- 21 • Demonstrated knowledge of policy, strategies, tactics, and hazards of urban
22 interface firefighting.
- 23 • Understand capabilities, limitations, and joint operations with municipal fire
24 apparatus, including pressures, flow rates, and potential effects on wildland
25 fire equipment.
- 26 • Ability to use engine protection lines and to protect engine through effective
27 positioning.
- 28 • Knowledge of pump theory and operation. Ability to effectively apply this
29 knowledge to fire situations. Ability to troubleshoot pump/valve problems
30 in various fire and drill situations.
- 31 • Ability to perform pump package maintenance to manufacturer/agency
32 standards and keep pump package in a constant state of fire readiness.
33 Ability to troubleshoot equipment problems and develop solutions/repair
34 needs. Ability to perform required pump test to ensure pump/plumbing are
35 operating to specifications. Ability to keep accurate maintenance log.
- 36 • Ability to effectively apply calculations and formulas relating to fire
37 hydraulics, including friction loss. Knowledge of pump capabilities and
38 limitations (GPM, PSI, elevation gain and loss, etc).
- 39 • Ability to perform simple hoselay, including initial layout and effective
40 delivery of water to fire.
- 41 • Ability to perform progressive hoselay, including initial layout and effective
42 delivery of water to fire.
- 43 • Ability to perform effective hoselay troubleshooting and develop effective
44 solutions to problems.

- 1 • Ability to perform foam equipment maintenance, including flushing engine
2 foam proportioner according to the manufacturer's recommended
3 procedures.
- 4 • Ability to efficiently produce different types of foam from nozzle(s).
- 5 • Ability to apply drafting theory. Ability to draft from external source and
6 fill engine tank, and draft from external source and deliver water through a
7 hoselay.
- 8 • Application of safe and effective hydrant use. Ability to set up engine for
9 hydrant water delivery.
- 10 • Vehicle maintenance capability adequate to maintain vehicle per
11 manufacturer's/agency standards and keep vehicle in a constant state of fire
12 readiness. Ability to troubleshoot equipment problems, develop solutions,
13 and make repairs.
- 14 • Ability to perform effective winterization of apparatus and pump package to
15 protect from potential freeze damage.
- 16 • **FS - The FS recommends the performance requirements for each ENOP.**
17
- 18 • **BLM - Engine Module Leader (EML)-Agency Specific Position**
19 **Minimum Qualifications**
 - 20 ➤ **ICT4, ENOP, ENGB.**
 - 21 ➤ **BLM - Additional Required Training**
22 *I-200, S-200, S-231, S-234, S-260, S-270.*
 - 23 ➤ **BLM - Additional Performance Requirements**
 - 24 ➤ **BLM - Same as for ENOP, plus the following:**
 - 25 ➤ **BLM - Supervision**
26 *The Engine Module Leader is responsible for the overall operation of*
27 *the module's activities. Directs module personnel during fire*
28 *preparedness review, suppression activities, fuels management, and*
29 *project work. Provides direction to the module commensurate with*
30 *members' qualifications and experience.*
 - 31 ➤ **BLM - Equipment Capability**
32 *Has a thorough knowledge of tactical equipment capabilities and*
33 *limitations, and their relationship to fuels, topography, and fire*
34 *behavior.*
 - 35 ➤ **BLM - Training**
36 *Provides and facilitates training of personnel through mentoring,*
37 *formal and informal instruction. Identifies training needs in the*
38 *Individual Development Plan (IDP) and performs Task Book*
39 *management for module members.*
 - 40 ➤ **BLM - Administration**
41 *Performs administrative duties relating to the operation of the*
42 *module, including (but not limited to time and attendance,*
43 *procurement activities (credit card), personnel management*
44 *(recruitment and hiring), IDP development, and property*
45 *management.*

- 1 ➤ **BLM - Coordination**
- 2 *Develops and maintains working relationships with BLM*
- 3 *counterparts, cooperators, other agencies, general public, and media.*
- 4 ➤ **BLM - Safety**
- 5 *Ensures compliance with safety procedures and policies and*
- 6 *mitigates potentially hazardous situations.*
- 7 ➤ **BLM - Physical Fitness**
- 8 *Train, test, and evaluate module members to ensure that required*
- 9 *physical fitness standards are met.*
- 10 ➤ **BLM - Communication**
- 11 *Ensures that Module Members receive situational briefings. Provides*
- 12 *briefings during daily work activities, fireline duties, and fireline*
- 13 *transitions. Solicits and provides feedback.*
- 14 ➤ **BLM - Equipment Development & Evaluation**
- 15 *Identifies problems with BLM equipment and suggests possible*
- 16 *solutions. Provides feedback to equipment development groups.*
- 17 *Tests and evaluates prototype equipment through the use of*
- 18 *deficiency reporting.*
- 19 ● **NPS/FS - The NPS/FS recommends the performance requirements for the**
- 20 *Engine Module Leader as outlined in the Interagency Fire Program*
- 21 *Management Qualifications Standard and Guide.*

22

23 **Engine Typing**

24 Engine Typing and respective standards are identified in the *NWCG Fireline*
25 *Handbook*, 410-1.

26

27 **Engine Water Reserve**

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

30

31 **Chocks**

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

35

36 **Fire Extinguisher**

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

39

40 **Nonskid Surfaces**

41 All surfaces will comply with National Fire Protection Association (*NFPA*)
42 *1906 Standards for Wildland Fire Apparatus* (6.4.3.) guidelines.

43

44 **First Aid Kit**

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

1 Gross Vehicle Weight (GVW)

2 Supervisors must ensure that the maximum allowable weight of the vehicle is
3 not exceeded. For commercially designed highway vehicles used in off-
4 highway applications the Gross Vehicle Weight (GVW) shall not exceed 90% of
5 the Gross Vehicle Weight Rating (GVWR) and shall not exceed 90% of the
6 Gross Axle Weight Rating (GAWR) on any axle.

7
8 For commercially designed off-highway vehicles, the Gross Axle Weight
9 Ratings (GAWR) do not need to be reduced but must not be exceeded for off-
10 highway travel.

11 Speed Limits

12 Posted speed limits will not be exceeded.

13 Lighting

14
15 All new orders for fire engine apparatus will include an overhead lighting
16 package in accordance with statewide standards. It is recommended that the
17 lighting package meet NFPA 1906 standards. Engines currently in service may
18 be equipped with overhead lighting packages.

19 Colors

20
21 Lighting packages containing blue lights are not allowed and must be replaced.
22 Blue lights have been reserved for law enforcement and must not be used on fire
23 vehicles. A red, white, and amber combination is the accepted color scheme for
24 fire.

25 Light Use

26
27 While off-road and/or during suppression, prescribed fire or other emergency
28 activities, headlights and taillights shall remain illuminated at all times while the
29 vehicle is in operation. Overhead lighting (or other appropriate emergency
30 lights) shall be illuminated whenever visibility is reduced to less than 300 feet.

- 31 • *NPS - Vehicle Color and Marking. Vehicles dedicated to wildland fire*
32 *activities shall be white in color and have a single four-inch wide red*
33 *reflective stripe placed according to NFPA 1906 (NFPA 1906 7-6.2 1995*
34 *edition). The word "FIRE" red with white background color will be*
35 *centered on the front fenders. "FIRE" may also be placed on the front and*
36 *rear of the vehicle. The NPS Arrowhead will be placed on the front doors.*
37 *The size and placement of the arrowhead will be as specified in RM-9. An*
38 *identifier will be placed on the vehicle according to local zone or GACC*
39 *directions. Roof numbers will be placed according to local zone*
40 *procedures.*

41 On-Board Flammable Liquid Storage

42
43 Occupational Safety and Health Administration (OSHA) regulations state, "only
44 approved metal containers, of not more than 5 gallons capacity, having a
45 spring-closing lid and spout cover and so designed that it will safely relieve
46

1 *internal pressure when subjected to fire exposure, be used for storing or*
2 *transporting flammable liquids” (29 CFR 1910.106). To comply with OSHA*
3 *requirements and agency directives, only OSHA approved, type II metal safety*
4 *cans should be used. Approved are the 2-in-1 polyethylene containers*
5 *(Dolmars) used to fill chainsaws and steel Jerry cans that are used as a fuel tank*
6 *for Mark III pumps. Cans must be clearly marked as to their content (e.g.,*
7 *gasoline, diesel, drip torch fuel). Dolmars must also be marked with the fuel oil*
8 *ratio and the date of the saw gas mix so its suitability for use can be easily*
9 *determined.*

- 10 • ***BLM - Drip Torch Fuel Transportation and Dispensing***
11 *Reference Instruction Memorandum FA IM. 2005-030. This IM provides*
12 *direction for drip torch fuel transportation and dispensing to bring BLM*
13 *equipment and practices into compliance with applicable regulations and*
14 *nationally recognized standards. It also provides direction on procurement*
15 *of new equipment.*

16 **Fire Engine Maintenance Procedure and Record**

17 Apparatus safety and operational inspections will be accomplished either on a
18 post-fire or daily basis. Offices are required to document these inspections.
19 Periodic maintenance (as required by the manufacturer) shall be performed at
20 the intervals recommended and properly documented. All annual inspections
21 will include a pump gallons per minute (GPM) test to ensure the pump/plumbing
22 system is operating at desired specifications.
23

24 **Engine Inventories**

25 An inventory of supplies and equipment carried on each vehicle is required to
26 maintain accountability and to obtain replacement items lost or damaged on
27 incidents. The standard inventory for engines is found in Appendix R
28

29 **Water Tenders**

30 **Water Tender Operators Performance Standards**

31 **Water Tender Operator (Support)**

- 32 • **Qualifications:** CDL (tank endorsement).
- 33 • **Staffing:** A water tender (Support) may be staffed with a crew of one (a
34 driver/operator) when it is used in a support role as a fire engine refill unit
35 or for dust abatement. These operators do not have to pass the Work
36 Capacity Test (WCT) but are required to take annual refresher training.
37

38 **Water Tender Operator (Tactical)**

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

- 42 • **Qualifications:** ENOP, CDL (tank endorsement)
- 43 • **Staffing:** Tactical water tenders will carry a minimum crew of two:
 - 44 > One ENOP

45 **Release Date: January 2007**

46 **15-7**

1 ➤ One Engine Module Member

2

3 **Dozers/Tractor Plows**

4

5 **Policy**

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

- 11 • *FWS - Dozer/tractor plow Operators must complete Intermediate Fire*
12 *Behavior (S-290) and the FWS Heavy Equipment Safety Training course*
13 *SAF2002 for dozer and/ or SAF2000 for Agriculture Tractor. Additional*
14 *training which supports development of knowledge and skills includes S-*
15 *232 and S-233 respectively, other positions that meet currency*
16 *requirements is none.*

17

18 **Physical Fitness Standards**

- 19 • *BLM/FWS - All employee dozer/tractor plow operators will meet the WCT*
20 *requirements at the Moderate level before accepting fire assignments.*
- 21 • *FS - FS dozer operators refer to 5134.32.*

22

23 **Operational Procedures**

- 24 • Agency owned and operated dozer/tractor plows will be equipped with
25 programmable two-way radios, configured to allow the operator to
26 monitor radio traffic.
- 27 • Agency dozer/tractor plows with non-red carded operators and all contract
28 dozer/tractor plows will have agency supplied supervision when assigned
29 to any suppression operations.
- 30 • Contract or offer-for-hire dozers must also be provided with radio
31 communications, either through a qualified dozer/tractor plow boss or an
32 agency-supplied radio. Contract dozer/tractor plows will meet the
33 specifications identified in their agreement/contract.
- 34 • Operators of dozer/tractor plows and transport equipment will meet DOT
35 certifications and requirements regarding the use and movement of heavy
36 equipment, including driving limitations, CDL requirements, and pilot car
37 use.

38

39 **All Terrain Vehicles (ATV)/Utility Vehicles (UV)**

40 **Policy**

41 The operation of ATV/UV is high risk and should be utilized only when their
42 use is essential to accomplishment of the mission and not as a matter of
43 convenience. Because of the high risk nature, agencies have developed specific
44 operational policy as highlighted below:

- 1 • Specific authorization for ATV/UV use is required. Refer to current
2 agency policy.
- 3 • All personnel authorized to operate an ATV must first complete agency
4 specific or manufacturer training in safe operating procedures and
5 appropriate PPE.
- 6 • Refer to agency specific guidelines on required frequency of ATV
7 refresher training.
- 8 • Required PPE includes helmet (DOT, ANSI-90, or SNELL M-95
9 approved), eye protection (goggles, face shield, or safety glasses), gloves,
10 long sleeves, long pants, and leather boots (minimum 8" height).
- 11 • The standard wildland hardhat will not be worn while operating an ATV.
- 12 • Except in emergency situations, no passengers will be carried unless
13 vehicle is designed by the manufacturer to carry operator and passengers.
- 14 • Operating speed will be appropriate for the conditions and terrain.
- 15 • ATV training shall include safe operation while carrying loads.
- 16 • Loads shall be mounted and secured as to not affect the vehicle's center of
17 gravity.
- 18 • Load weights shall not exceed manufacturer's recommendations.
- 19 • A risk assessment must be completed and approved by the supervisor prior
20 to vehicle operation.
- 21 • **BLM** - Refer to *BLM Interim Policy - Utilization of Off-Road Vehicles*
22 (*ORVs*) *IM 2005-148*.
- 23 • **BLM** - Refresher training is required every 3 years for all off-road
24 vehicles (*ORVs*). Refresher training consists of a field "check-ride," at
25 minimum. The ATV refresher will be conducted by an ASI Certified
26 Instructor.
- 27 • **FWS/NPS** - Exceptions to the above policy are:
 - 28 ➤ *SPH-4, SPH-5, or other comparable flight helmets meet the DOT*
29 *requirements for a motorcycle helmet and may be used in lieu of.*
 - 30 ➤ *Standard fire hardhats or flight helmets are required for ATV use*
31 *when on the fireline under low operating speeds. (Motorcycle helmets*
32 *have not yet been tested and approved for fireline use).*
 - 33 ➤ *Chinstraps must be used.*
 - 34 ➤ *A motorcycle helmet or flight helmet will be required when operating*
35 *to and from fire management activities and while loading and*
36 *unloading the ATV.*
- 37 • **NPS** - All personnel authorized to operate an ATV must first complete
38 training in safe operating procedures from a nationally recognized source
39 such as the *ATV Safety Institute ATV Rider Course*
40 (*<http://www.atvsafety.org>*) or as required by state statute. Safe operating
41 procedures information is also available from the *National Off-Highway*
42 *Vehicle Conservation Council*
43 (*http://www.nohvcc.org/html/ohv_safety.htm*)

- 1 • *NPS - Annual refresher training must be conducted in accordance with an*
- 2 *approved JHA.*
- 3 • *FS - Refer to Health and Safety Code Handbook 6709-11.*
- 4 • *FWS - Refer to Service Manual 243 FW 6 Off Road Utility Vehicle Safety.*

6 **Vehicle Cleaning/Noxious Weed Prevention**

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

15 **Fire Remote Automated Weather Stations**

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

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

30 **Ignition Devices**

32 **Aerial Ignition Devices**

33 Information on types of aerial ignition devices, operational guidelines and
34 personnel qualifications may be found in the *Interagency Aerial Ignition Guide*.

36 **Ground Ignition Devices**

- 37 • *BLM - Guidance and direction for use and procurement of approved*
- 38 *ground ignition equipment and the transportation and dispensing of drip*
- 39 *torch fuel can be found in: Instruction Memorandum No. OF&A 2005-030,*
- 40 *7/20/05, Drip Torch Fuel Transportation and Dispensing Direction.*
- 41 • *NPS - Agency direction may be found in the 04/04/03 Memorandum Y14*
- 42 *(9560) Aerial and Ground Ignition Equipment.*
- 43 • *FWS - specific information on ignition devices may be found in the*
- 44 *January 28, 2003 Memorandum: "Direction for Use and Purchase of*
- 45 *Aerial and Ground Ignition Equipment."*
- 46 • *FS - direction is found in FSH5109.32a and 6709.11.*