

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 engine modules will meet all gear weight, cube, and manifest requirements specified in the *National Mobilization Guide*.

Fire Engine Module 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 - Staffing levels** - Type 6 and 7 engines will have a minimum crew size of two. This crew will consist of one ENGB with ICT5 qualifications and one Engine Module Member.
 - **BLM** - An engine operating as a single resource will have a minimum of one ENGB who is qualified as an ICT5 and one Crew Member.
 - **BLM** - If configured with more than one engine module for local assignments, engines may be staffed by one Engine Operator (ENOP) and one Engine Module Member, provided an Engine Module Leader is assigned to the group for operational supervision.

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

33 34 **Performance Requirements for Engine Modules**

35 The following performance requirements are based on the daily duties of engine
36 module personnel and may exceed the standards listed in the *Wildland Fire*
37 *Qualifications Subsystem Guide (NWCG 310-1)*.

38
39 The following standards are in addition to the minimum requirements found in
40 the *Wildland Fire Qualifications Subsystem Guide (NWCG 310-1)*.

1 **Engine Module Member (EMM)**

2 **Minimum Qualifications**

3 FFT2

4 **Additional Required Training**

5 None

6 **Additional Performance Requirements**

7 **Apparatus Inventory**

8 Ability to maintain inventory in a constant state of fire readiness.

9 **Tool and Equipment Standards**

10 Ability to use, check condition of, and identify repair/replacement needs as
11 identified in *Firefighters Guide NFES 1571*. All tools and equipment must meet
12 refurbishment standards specified in *Fire Equipment Storage and Refurbishment*
13 *NFES 2249*.

14 **Hose Packs**

15 Working knowledge of hose pack types and how to safely and efficiently deliver
16 water to the fire.

17 **Types of Hose**

18 Working knowledge of hose identification and use. See *Wildland Fire Hose*
19 *Guide NFES 1308*.

20 **Fittings/Nozzles**

21 Ability to identify fittings and nozzles, understand use, capabilities, limitations,
22 and perform maintenance.

- 23 • *FS - The FS recommends the performance requirements for each Engine*
24 *Module Member.*

25

26 **Engine Operator (ENOP)**

27 The agencies have established an ENOP position and associated Task Book to
28 meet field needs.

29 **Minimum Qualifications**

30 CDL (where appropriate for the GVW), FFT1

31 **Additional Required Training**

32 L-280- Followership to Leadership

33 **Recommended Training**

34 PMS 419 Engine Operator Course, Geographic Area Engine Academies

35 **Additional Performance Requirements**

36 Same as for the Engine Module Member, plus the following:

37 **Stationary Pumping**

38 Ability to set up stationary pumping operations to safely and efficiently deliver
39 water to a fire through a hoselay.

40 **Mobile Attack**

41 Ability to set up and perform mobile attack safely and efficiently. Understand
42 roles and responsibilities associated with multi-engine mobile attack.

43 **Urban Interface**

44 Understand strategies, tactics, recognize hazards, and know agency policy with
45 regards to urban interface situations.

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1 **Interface with Municipal Fire Apparatus**

2 Understand capabilities and limitations and how to effectively interface with
3 equipment. Be aware of the pressures and flow rates used with municipal
4 apparatus and their potential effects on wildland fire equipment.

5 **Engine Protection**

6 Ability to protect engine by positioning in a fire safe area; set up and use engine
7 protection lines.

8 **Pump Theory and Operation**

9 Ability to effectively apply this knowledge to fire situations most commonly
10 encountered. Must be able to troubleshoot pump/valve problems in various fire
11 and drill situations.

12 **Pump Package Maintenance Procedures**

13 Ability to maintain pump package per manufacturer's/agency standards. Pump
14 package must be in a constant state of fire readiness. Ability to troubleshoot
15 equipment problems and develop solutions/repair needs. Ability to perform
16 required pump test to ensure pump/plumbing are operating to specifications, and
17 maintain log.

18 **Hydraulics**

19 Ability to effectively apply calculations and formulas relating to fire hydraulics,
20 including friction loss. Must understand pump capabilities and limitations
21 (GPM, PSI, elevation gain and loss, etc).

22 **Simple Hoselays**

23 Ability to perform initial layout and extend a simple hoselay delivering water to
24 fire safely and efficiently.

25 **Progressive Hoselays**

26 Ability to perform initial layout and extend a progressive hoselay delivering
27 water to fire safely and efficiently.

28 **Hoselay Troubleshooting**

29 Ability to troubleshoot hoselay problems and develop solutions.

30 **Foam Equipment Maintenance**

31 Ability to flush the engine foam proportioner according to the manufacturer's
32 recommended procedures.

33 **Foam**

34 Ability to efficiently produce different types of foam from nozzle(s).

35 **Drafting Theory**

36 Ability to draft from external source and fill engine tank, and draft from external
37 source and deliver water through a hoselay.

38 **Hydrant Use**

39 Understand and apply the safe and effective operation of fire hydrants and be
40 able to set up an engine for hydrant water delivery.

41 **Vehicle Maintenance Procedures**

42 Ability to maintain vehicle per manufacturer's/agency standards, keeping
43 vehicle in a constant state of fire readiness. Ability to troubleshoot equipment
44 problems, develop solutions/repair needs.

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1 **Winterization**

2 Ability to properly winterize apparatus and pump package to protect from
3 potential freeze damage.

4 **Radio Use**

5 Understand and apply BLM policy regarding radio use and protocol; be
6 proficient at radio programming.

- 7 • **FS - The FS recommends the performance requirements for each engine**
8 **ENOP.**

9
10 • **BLM - Engine Module Leader (EML)-Agency Specific Position**

11 **Minimum Qualifications**

12 ➤ **ICT4, ENOP, ENGB.**

13 ➤ **BLM - Additional Required Training**

14 *I-200, S-200, S-231, S-234, S-260, S-270.*

15 ➤ **BLM - Additional Performance Requirements**

16 ➤ **BLM - Same as for ENOP, plus the following:**

17 ➤ **BLM - Supervision**

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

23 ➤ **BLM - Equipment Capability**

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

27 ➤ **BLM - Training**

28 *Provides and facilitates training of personnel through mentoring,*
29 *formal and informal instruction. Identifies training needs Individual*
30 *Development Plan (IDP) and performs Task Book management for*
31 *module members.*

32 ➤ **BLM - Administration**

33 *Performs administrative duties relating to the operation of the*
34 *module, including (but not limited) to time and attendance,*
35 *procurement activities (credit card), personnel management*
36 *(recruitment and hiring), IDP development, and property*
37 *management.*

38 ➤ **BLM - Coordination**

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

41 ➤ **BLM - Safety**

42 *Ensures compliance with safety procedures and policies and*
43 *mitigates potentially hazardous situations.*

44 ➤ **BLM - Physical Fitness**

45 *Train, test, and evaluate Module Members to ensure that required*
46 *physical fitness standards are met.*

- 1 ➤ **BLM - Communication**
- 2 *Ensures that Module Members receive situational briefings. Provides*
- 3 *briefings during daily work activities, fireline duties, and fireline*
- 4 *transitions. Solicits and provides feedback.*
- 5 ➤ **BLM - Equipment Development & Evaluation**
- 6 *Identifies problems with BLM equipment and suggests possible*
- 7 *solutions. Provides feedback to equipment development groups.*
- 8 *Tests and evaluates prototype equipment.*
- 9 • **NPS/FS - The NPS/FS recommends the performance requirements for the**
- 10 *Engine Module Leader as outlined in the Interagency Fire Program*
- 11 *Management Qualifications Standard and Guide.*

12 **Engine Standards**

13 **Engine Typing**

14 Engine Typing and respective standards are identified in the *NWCG Fireline*

15 *Handbook*, 410-1.

16 **Engine Water Reserve**

17 Engine Operators will maintain at least 10 percent of the pumpable capacity of

18 the water tank for emergency engine protection and drafting.

19 **Chocks**

20 At least one chock will be carried on each engine and will be properly utilized

21 whenever the engine is parked or left unattended. This includes engine

22 operation in a stationary mode without a driver “in place.”

23 **Fire Extinguisher**

24 All engines will have at least one 5 lb. ABC-rated (minimum) fire extinguisher,

25 either in full view or in a clearly marked compartment.

26 **Nonskid surfaces**

27 All surfaces will comply with National Fire Protection Association (*NFPA*)

28 *1906 Standards for Wildland Fire Apparatus* (6.4.3.) guidelines.

29 **First Aid Kit**

30 Each engine shall carry, in a clearly marked compartment, a fully equipped 10-

31 person first aid kit.

32 **Gross Vehicle Weight (GVW)**

33 Each engine will have an annually certified weight slip in the vehicle at all

34 times. Operators of engines and water tenders must ensure that the maximum

35 certified GVW is never exceeded, including gear, personnel and fuel. If the

36 proper number of personnel are not available during the weighing. The *NFPA*

37 *1906* standard of 250 pounds for each person and their personal gear may be

38 used to calculate the loaded weight.

39 **Speed Limits**

40 Posted speed limits will not be exceeded.

41 **Lighting**

42 All new orders for fire engine apparatus will include an overhead lighting

43 package in accordance with statewide standards. It is recommended that the

44 lighting package meet *NFPA 1906* standards. Engines currently in service may

45 be equipped with overhead lighting packages.

1 **Colors**

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

6 **Light Use**

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

- 11 • **NPS - Vehicle Color and Marking.** *Vehicles dedicated to wildland fire*
12 *activities shall be white in color and have a single four-inch wide red*
13 *reflective stripe placed according to NFPA 1906 (NFPA 1906 7-6.2 1995*
14 *edition). The word "FIRE" red with white background color will be*
15 *centered on the front fenders. "FIRE" may also be placed on the front and*
16 *rear of the vehicle. The NPS Arrowhead will be placed on the front doors.*
17 *The size and placement of the arrowhead will be as specified in RM-9. An*
18 *identifier will be placed on the vehicle according to local zone or GACC*
19 *directions. Roof numbers will be placed according to local zone*
20 *procedures.*

21
22 **On-Board Flammable Liquid Storage**

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

- 35 • **BLM - Drip Torch Fuel Transportation and Dispensing**
36 *Reference Instruction Memorandum FA IM. 2005-030. This IM provides*
37 *direction for drip torch fuel transportation and dispensing to bring BLM*
38 *equipment and practices into compliance with applicable regulations and*
39 *nationally recognized standards. It also provides direction on procurement*
40 *of new equipment.*

41
42 **Fire Engine Maintenance Procedure and Record**

43 Apparatus safety and operational inspections will be accomplished either on a
44 post-fire or daily basis. Offices are required to document these inspections.
45 Periodic maintenance (as required by the manufacturer) shall be performed at
46 the intervals recommended and properly documented. All annual inspections

1 will include a pump gallons per minute (GPM) test to ensure the pump/plumbing
2 system is operating at desired specifications.

3

4 **Engine Inventories**

5 An inventory of supplies and equipment carried on each vehicle is required to
6 maintain accountability and to obtain replacement items lost or damaged on
7 incidents. The standard inventory for engines is found in Appendix AA.

8

9 **Water Tenders**

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11 **Water Tender Operators Performance Standards**

12 **Water Tender Operator (Support)**

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

18

19 **Water Tender Operator (Tactical)**

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

- 23 • **Qualifications:** ENOP, CDL (tank endorsement)
- 24 • **Staffing:** Tactical water tenders will carry a minimum crew of two:
 - 25 > one ENOP
 - 26 > one Engine Module Member

27

28 **Dozers/Tractor Plows**

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30 **Policy**

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

- 36 • **FWS - Dozer/tractor plow Operators must complete Intermediate Fire
37 Behavior (S-290) and the FWS Heavy Equipment Safety Training course
38 SAF2002 for dozer and/ or SAF2000 for Agriculture Tractor. Additional
39 training which supports development of knowledge and skills includes S-
40 232 and S-233 respectively, other positions that meet currency
41 requirements is none.**

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1 Physical Fitness Standards

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

6 Operational Procedures

- 7 • Agency owned and operated dozer/tractor plows will be equipped with
- 8 programmable two-way radios, configured to allow the operator to
- 9 monitor radio traffic.
- 10 • Agency dozer/tractor plows with non-red carded operators and all contract
- 11 dozer/tractor plows will have agency supplied supervision when assigned
- 12 to any suppression operations.
- 13 • Contract or offer-for-hire dozers must also be provided with radio
- 14 communications, either through a qualified dozer/tractor plow boss or an
- 15 agency-supplied radio. Contract dozer/tractor plows will meet the
- 16 specifications identified in their agreement/contract.
- 17 • Operators of dozer/tractor plows and transport equipment will meet DOT
- 18 certifications and requirements regarding the use and movement of heavy
- 19 equipment, including driving limitations, CDL requirements, and pilot car
- 20 use.

22 All Terrain Vehicles (ATV)/Utility Vehicles (UV)**23 Policy**

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

- 28 • Specific authorization for ATV/UV use is required. Refer to current
- 29 agency policy.
- 30 • All personnel authorized to operate an ATV must first complete agency
- 31 specific or manufacturer training in safe operating procedures and
- 32 appropriate PPE.
- 33 • Refer to agency specific guidelines on required frequency of ATV
- 34 refresher training.
- 35 • Required PPE includes helmet (DOT, ANSI-90, or SNELL M-95
- 36 approved), eye protection (goggles, face shield, or safety glasses), gloves,
- 37 long sleeves, long pants, and leather boots (minimum 8" height).
- 38 • The standard wildland hardhat will not be worn while operating an ATV.
- 39 • Except in emergency situations, no passengers will be carried unless
- 40 vehicle is designed by the manufacturer to carry operator and passengers.
- 41 • Operating speed will be appropriate for the conditions and terrain.
- 42 • ATV training shall include safe operation while carrying loads.
- 43 • Loads shall be mounted and secured as to not affect the vehicle's center of
- 44 gravity.
- 45 • Load weights shall not exceed manufacturer's recommendations.

- 1 • A risk assessment must be completed and approved by the supervisor prior
2 to vehicle operation.
- 3 • **BLM** - Refer to *BLM Interim Policy - Utilization of Off-Road Vehicles*
4 (*ORVs*) IM 2005-148.
- 5 • **BLM** - Refresher training is required every 3 years for all off-road
6 vehicles (*ORVs*). Refresher training consists of a field "check-ride," at
7 minimum. The ATV refresher will be conducted by an ASI Certified
8 Instructor.
- 9 • **FWS/NPS** - Exceptions to the above policy are:
 - 10 ➤ *SPH-4, SPH-5, or other comparable flight helmets meet the DOT*
11 *requirements for a motorcycle helmet and may be used in lieu of.*
 - 12 ➤ *Standard fire hardhats or flight helmets are required for ATV use*
13 *when on the fireline under low operating speeds. (Motorcycle helmets*
14 *have not yet been tested and approved for fireline use).*
 - 15 ➤ *Chinstraps must be used.*
 - 16 ➤ *A motorcycle helmet or flight helmet will be required when operating*
17 *to and from fire management activities and while loading and*
18 *unloading the ATV.*
- 19 • **NPS** - Refresher training is not required.
- 20 • **FS** - Refer to *Health and Safety Code Handbook 6709-11.*
- 21 • **FWS** - Refer to *Service Manual 243 FW 6 Off Road Utility Vehicle Safety.*

22 **Vehicle Cleaning/Noxious Weed Prevention**

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

30 **Fire Remote Automated Weather Stations**

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

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

1 **Ignition Devices**

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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 - Ground Ignition Devices***

- 9 • *BLM - Guidance and direction for use and procurement of approved*
10 *ground ignition equipment and the transportation and dispensing of drip*
11 *torch fuel can be found in: Instruction Memorandum No. OF&A 2005-030,*
12 *7/20/05, Drip Torch Fuel Transportation and Dispensing Direction.*
- 13 • *NPS - Agency direction may be found in the 04/04/03 Memorandum Y14*
14 *(9560) Aerial and Ground Ignition Equipment.*
- 15 • *FWS - specific information on ignition devices may be found in the*
16 *January 28, 2003 Memorandum: "Direction for Use and Purchase of*
17 *Aerial and Ground Ignition Equipment."*
- 18 • *FS - direction is found in FSH5109.32a and 6709.11.*