

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

Engines will be staffed to meet NWCG standards. An ENGB will be with every engine, and the minimum staffing is two individuals for Type 6 and Type 7 modules. 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 - WCF/Non-WCF, Additional requirements**
- 19 • **NPS - WCF engines** are identified below.
- 20 • **NPS - All engines** will be typed in accordance with the specifications
21 identified in the IRPG. Minimum engine staffing requirements:
 - 22 • **Approved Working Capitol Fund (WCF) Type 6 or 7 engines** during the
23 defined fire season is 3 personnel effective 7 days per week.
 - 24 • **Approved Working Capitol Fund (WCF) Type 3, 4, or 5 engines** during the
25 defined fire season is 5 personnel effective 7 days per week.
 - 26 • **Non-WCF engines (or WCF engines outside defined fire season), Type 6 or**
27 **7 engines** is a minimum of 2.
 - 28 • **Non-WCF engines (or WCF engines outside defined fire season), Type 3,**
29 **4, or 5 engines** is a minimum of 3.

31 **Performance Requirements for Engine Modules**

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

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

38 **Engine Module Member (EMM)**

39 **Minimum Qualifications**

40 FFT2

41 **Additional Required Training**

42 None

43 **Additional Performance Requirements**

44 **Apparatus Inventory**

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

1 Tool and Equipment Standards

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

6 Hose Packs

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

9 Types of Hose

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

12 Fittings/Nozzles

13 Ability to identify fittings and nozzles, understand use, capabilities, limitations,
14 and perform maintenance.

- 15 • *FS - The FS recommends the performance requirements for each Engine*
16 *Module Member.*

18 Engine Operator (ENOP)

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

21 Minimum Qualifications

22 CDL (where appropriate for the GVW), FFT1

23 Additional Required Training

24 L-280- Followership to Leadership

25 Recommended Training

26 PMS 419 BLM Engine Operator Course

27 Additional Performance Requirements

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

29 Stationary Pumping

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

32 Mobile Attack

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

35 Urban Interface

36 Understand strategies and tactics recognize hazards, and know BLM policy with
37 regards to urban interface situations.

38 Interface with Municipal Fire Apparatus

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

42 Engine Protection

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

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1 Pump Theory and Operation

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

5 Pump Package Maintenance Procedures

6 Ability to maintain pump package per manufacturer's/BLM standards. Pump
7 package must be in a constant state of fire readiness. Ability to troubleshoot
8 equipment problems and develop solutions/repair needs. Ability to perform
9 required pump test to ensure pump/plumbing are operating to specifications, and
10 maintain log.

11 Hydraulics

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

15 Simple Hoselays

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

18 Progressive Hoselays

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

21 Hoselay Troubleshooting

22 Ability to troubleshoot hoselay problems and develop solutions.

23 Foam Equipment Maintenance

24 Ability to flush the engine foam proportioner according to the manufacturer's
25 recommended procedures.

26 Foam

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

28 Drafting Theory

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

31 Hydrant Use

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

34 Vehicle Maintenance Procedures

35 Ability to maintain vehicle per manufacturer's/BLM standards, keeping vehicle
36 in a constant state of fire readiness. Ability to troubleshoot equipment problems,
37 develop solutions/repair needs.

38 Winterization

39 Ability to properly winterize apparatus and pump package to protect from
40 potential freeze damage.

41 Radio Use

42 Understand and apply BLM policy regarding radio use and protocol; be
43 proficient at radio programming.

- 44 • *FS - The FS recommends the performance requirements for each engine*
- 45 *ENOP.*

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- 1 • **BLM - Engine Module Leader (EML)-Agency Specific Position**
- 2 **Minimum Qualifications**
- 3 ➤ *ICT4, ENOP, ENGB.*
- 4 ➤ **BLM - Additional Required Training**
- 5 *I-200, S-200, S-231, S-234, S-260, S-270, S-390, L-381 (Leadership*
- 6 *and Organizational Development) or equivalent.*
- 7 ➤ **BLM - Additional Performance Requirements**
- 8 ➤ **BLM - Same as for ENOP, plus the following:**
- 9 ➤ **BLM - Supervision**
- 10 *The Engine Module Leader is responsible for the overall operation of*
- 11 *the module's activities. Directs module personnel during fire*
- 12 *preparedness review, suppression activities, fuels management, and*
- 13 *project work. Provides direction to the module commensurate with*
- 14 *members' qualifications and experience.*
- 15 ➤ **BLM - Equipment Capability**
- 16 *Has a thorough knowledge of tactical equipment capabilities and*
- 17 *limitations, and their relationship to fuels, topography, and fire*
- 18 *behavior.*
- 19 ➤ **BLM - Training**
- 20 *Provides and facilitates training of personnel through mentoring,*
- 21 *formal and informal instruction. Identifies training needs (IDP) and*
- 22 *performs Task Book management for module members.*
- 23 ➤ **BLM - Administration**
- 24 *Performs administrative duties relating to the operation of the*
- 25 *module, including (but not limited) to time and attendance,*
- 26 *procurement activities (credit card), personnel management*
- 27 *(recruitment and hiring), IDP development, and property*
- 28 *management.*
- 29 ➤ **BLM - Coordination**
- 30 *Develops and maintains working relationships with BLM*
- 31 *counterparts, cooperators, other agencies, general public, and media.*
- 32 ➤ **BLM - Safety**
- 33 *Ensures compliance with safety procedures and policies and*
- 34 *mitigates potentially hazardous situations.*
- 35 ➤ **BLM - Physical Fitness**
- 36 *Train, test, and evaluate Module Members to ensure that required*
- 37 *physical fitness standards are met.*
- 38 ➤ **BLM - Communication**
- 39 *Ensures that Module Members receive situational briefings. Provides*
- 40 *briefings during daily work activities, fireline duties, and fireline*
- 41 *transitions. Solicits and provides feedback.*
- 42 ➤ **BLM - Equipment Development & Evaluation**
- 43 *Identifies problems with BLM equipment and suggests possible*
- 44 *solutions. Provides feedback to equipment development groups.*
- 45 *Tests and evaluates prototype equipment.*

- 1 • *NPS/FS - The NPS/FS recommends the performance requirements for the*
2 *Engine Module Leader.*
3
- 4 **Engine Standards**
5 **Engine typing**
6 Engine Typing and respective standards are identified in the *NWCG Fireline*
7 *Handbook*, 410-1.
8 **Engine Water Reserve**
9 Engine Operators will maintain at least 10 percent of the pumpable capacity of
10 the water tank for emergency engine protection and drafting.
11 **Chocks**
12 At least one chock will be carried on each engine and will be properly utilized
13 whenever the engine is parked or left unattended. This includes engine
14 operation in a stationary mode without a driver “in place.”
15 **Fire Extinguisher**
16 All engines will have at least one 5 lb. ABC-rated (minimum) fire extinguisher,
17 either in full view or in a clearly marked compartment.
18 **First Aid Kit**
19 Each engine shall carry, at a minimum, a fully equipped 10-person first aid kit.
20 **Gross Vehicle Weight (GVW)**
21 It is each agencies policy to have an annually certified weight slip in the vehicle
22 at all times. Operators of engines and water tenders must ensure that the
23 maximum certified GVW is never exceeded, including gear, personnel and fuel.
24 If the proper number of personnel are not available during the weighing the
25 NFPA 1906 standard of 250 pounds for each person and their personal gear may
26 be used to calculate the loaded weight.
27 **Speed Limits**
28 Posted speed limits will not be exceeded.
29 **Lighting**
30 All new orders for fire engine apparatus will include an overhead lighting
31 package in accordance with statewide standards. It is recommended that the
32 lighting package meet NFPA 1906 standards. Engines currently in service may
33 be equipped with overhead lighting packages.
34 **Colors**
35 Lighting packages containing “blue” lights are not allowed and must be
36 replaced. Blue lights have been reserved for law enforcement and must not be
37 used on fire vehicles. A red, white, and amber combination is the accepted color
38 scheme for fire.
39 **Light Use**
40 While off-road and/or during suppression, prescribed fire or other emergency
41 activities, headlights and taillights shall remain illuminated at all times while the
42 vehicle is in operation. In addition, overhead lighting (or other appropriate
43 emergency lights) shall be illuminated whenever visibility is reduced to less than
44 300 feet.
45 • *NPS - Vehicle Color and Marking. Vehicles dedicated to wildland fire*
46 *activities shall be white in color and have a single four-inch wide red*

1 *reflective stripe placed according to NFPA 1906 (NFPA 1906 7-6.2 1995*
2 *edition). The word “FIRE” red with white background color will be*
3 *centered on the front fenders. “FIRE” may also be placed on the front and*
4 *rear of the vehicle. The NPS Arrowhead will be placed on the front doors.*
5 *The size and placement of the arrowhead will be as specified in RM-9. An*
6 *identifier will be placed on the vehicle according to local zone or GACC*
7 *directions. Roof numbers will be placed according to local zone*
8 *procedures.*

10 **On-Board Flammable Liquid Storage**

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

23 **Fire Engine Maintenance Procedure and Record**

24 Apparatus safety and operational inspections will be accomplished either on a
25 post-fire or daily basis. Offices are required to document these inspections.
26 Periodic maintenance (as required by the manufacturer) shall be performed at
27 the intervals recommended and properly documented. All annual inspections
28 will include a pump gpm test to ensure the pump/plumbing system is operating
29 at desired specifications. Specifications can be found at
30 <http://web.blm.gov/internal/fire/textdocs/specs.pdf>

32 **Engine Inventories**

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

37 **Water Tenders**

39 **Water Tender Operators Performance Standards**

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

- 1 • **Water Tender Operator (Tactical)**
2 Tactical use is defined as “direct fire suppression missions such as
3 pumping hoselays, live reel use, running attack, and use of spray bars and
4 monitors to suppress fires.”
5 • **Qualifications:** ENOP, CDL (tank endorsement).
6 • **Staffing:** Tactical water tenders will carry a minimum crew of two- one
7 ENOP and one Engine Module Member.
8 • *FS – The FS recommends the performance requirements for support and
9 tactical water tenders.*

11 **Other Water Tenders**

12 Contract water tenders will meet the specifications identified in their
13 agreement/contract. All water tenders from other agencies will meet the
14 requirements of their agency.

16 **Dozers**

18 **Policy**

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

- 24 • *FWS – Dozer Operators must be a Certified FWS Heavy Equipment
25 Operator and must complete Intermediate Fire Behavior (S-290).*

27 **Physical Fitness Standards**

- 28 • *BLM/FWS - All employee dozer operators will meet the WCT
29 requirements at the Moderate level before accepting fire assignments.*
30 • *FS - FS dozer operators refer to 5134.32.*

32 **Operational Procedures**

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

45

1 All Terrain Vehicles (ATV)**2 Policy**

- 3 • Specific authorization for ATV use is required. Refer to your
4 state/regional or local policy.
- 5 • All personnel authorized to operate an ATV must first complete agency
6 specific or manufacturer training in safe operating procedures and
7 appropriate PPE.
- 8 • ATV refresher training is required every 5 years.
- 9 • Required PPE includes helmet (DOT, ANSI-90, or SNELL M-95
10 approved), eye protection (goggles, face shield, or safety glasses), gloves,
11 long sleeves, long pants, and leather boots (minimum 8" height).
- 12 • The standard wildland hardhat will not be worn while operating an ATV.
- 13 • No passengers will be carried except in emergency situations.
- 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 prior to traversing steep slopes with
20 operator's abilities and vehicle capabilities considered.
- 21 • **FWS/NPS - Exceptions to the above policy are:**
 - 22 ➤ *SPH-4, SPH-5, or other comparable flight helmets meet the DOT*
23 *requirements for a motorcycle helmet and may be used in lieu of.*
 - 24 ➤ *Standard fire hardhats or flight helmets are required for ATV use*
25 *when on the fireline under low operating speeds. (Motorcycle helmets*
26 *have not yet been tested and approved for fireline use).*
 - 27 ➤ *Chinstraps must be used.*
 - 28 ➤ *A motorcycle helmet or flight helmet will be required when operating*
29 *to and from fire management activities and while loading and*
30 *unloading the ATV.*
 - 31 ➤ *Refresher training is not required.*
- 32 • **FS - Refer to Health and Safety code 6709-17.**
- 33 • **FWS - Service Manual 241 FWS7 Firefighting. All Terrain Vehicle**
34 **operations shall follow the detailed guidelines in the Service's All Terrain**
35 **Vehicle Training Guide.**

37 Vehicle Cleaning/Noxious Weed Prevention

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

1 Fire Remote Automated Weather Stations

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

9
10 National resource FRAWS systems are cached at National Interagency Fire
11 Center (NIFC) and may be ordered through standard equipment resource
12 ordering systems. Maintenance and recalibration of these stations must be
13 coordinated with the NIFC Remote Sensing/Fire Weather Support Unit
14 (RSFWSU).

15 Ignition Devices**16 Aerial Ignition Devices**

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18 Information on types of aerial ignition devices, operational guidelines and
19 personnel qualifications may be found in the *Interagency Aerial Ignition Guide*
20
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22 Ground Ignition Devices

- 23 • **BLM** - *Guidance and direction for use and procurement of approved*
24 *ground ignition equipment and the transportation and dispensing of drip*
25 *torch fuel can be found in: Instruction Memorandum No. OF&A 2003-025,*
26 *04/14/0, Drip Torch Fuel Transportation and Dispensing Directions.*
- 27 • **NPS** - *Agency direction may be found in the 04/04/03 Memorandum Y14*
28 *(9560) Aerial and Ground Ignition Equipment.*
- 29 • **FWS** - *specific information on ignition devices may be found in the*
30 *January 28, 2003 Memorandum: "Direction for Use and Purchase of*
31 *Aerial and Ground Ignition Equipment."*
- 32 • **FS** - *direction is found in FSH5109.32a and 6709.11.*