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Water Handling Equipment Guide

Prepared by:
NWCG Fire Equipment
Working Team

PMS 447-1

March 1994

NFES 1275

Fourth Edition

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March 1994**

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Working Team**

WATER HANDLING EQUIPMENT GUIDE

This Interagency Water Handling Equipment Guide has been developed and published by the NWCG Fire Equipment Working Team (FEWT). A subcommittee was formed in 1980 and development of this Guide was accomplished in 1981 and 1982 with the first, second, and the third editions being published in June of 1983, 1985, and 1988 respectively. The NWCG FEWT subcommittee for the fourth edition consisted of:

Gordon Foster—Forest Service, USDA (Chairperson)

Sig Palm—Forest Service, USDA

Robert Stroud, Jr.—Bureau of Land Management, USDI

Jack Farmer—State of North Carolina

John McCarty--Commonwealth of Pennsylvania

Steve Raybould—Forest Service, USDA

Tom Hutchinson—Forest Service, USDA

WATER HANDLING EQUIPMENT GUIDE
Fourth Edition

Introduction

Through a survey of Federal and State wildland fire fighting agencies, a need was expressed to identify interagency water handling equipment and to disseminate this information to field users. The pictures, performance, and equipment descriptions found within this Guide represent the various types of pumps, equipment, and other components found in the fire community and offered by manufacturers. It is not meant to indicate sponsorship or validation of any particular manufacturer or product.

The primary objective of the Guide is to provide field users in wildland firefighting agencies with a basic information document on water handling equipment. Within the wildland fire community, every imaginable type of water handling equipment is in use. This Guide does not contain all water handling equipment in use, but does contain equipment components that are (1) commercially available or economically reproducible, (2) interagency in scope or application, and (3) currently in use. To qualify for being reproducible, there normally has to be the availability of specifications and drawings that have been tested.

The information contained in this latest edition has been completely updated to incorporate recently developed concepts in wildland fire organization, changes in equipment, and deletion of no longer used or available items. Information and technology on foam generating equipment has been placed into a separate section. Appendixes have been expanded to provide a ready source of technical data and conversion factors required by the practitioner.

Agency-developed systems or components portrayed, but not available from a vendor or manufacturer as a unit, are included to promote standardization among agencies, resulting in reduced equipment costs and increased efficiency and safety.

Users are encouraged to submit at any time new equipment ideas. Information submitted will be reviewed for inclusion in the next revision of the Guide. (See inside back cover for the address.)

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WATER PUMPING EQUIPMENT

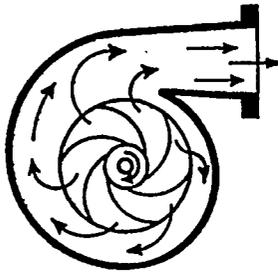
Pumps

I. WATER PUMPING EQUIPMENT

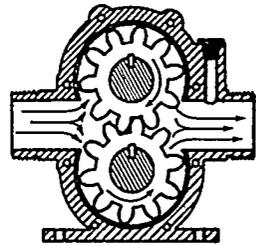
For the purpose of this Guide, water pumping equipment has been divided into five categories: Pumps (a fire pump and an engine), plumbing, engines (a vehicular fire engine), water tenders, and specialized.

A. Pumps

Pumps are basically centrifugal or positive displacement; both types are used in wildland firefighting equipment. The centrifugal pumps employ outward force from a center of rotation (known as the eye) to move or impel water. With these pumps, the volume will vary with speed (rpm) and pressure. Centrifugal pumps are usually larger than positive displacement units in design and are employed for higher volumes.



Centrifugal pump



Positive displacement pump

Positive displacement pumps move a quantity of water with each stroke or revolution of the piston or impeller. Volume depends only upon speed (rpm). The rotary gear, vane, cam-and-piston, and rotary piston are typical units. Most are self-priming. Most require relief valves to handle line surges, overloads, and flows not needed at the nozzle. Typical gear pumps have tight tolerances between the rotating parts and the pump housing.

For purposes of this Guide, a pump is a combination of a fire pump and an engine. Components normally include engine controls, starter, spark arrester and muffler, pump primer, pressure gauge, fittings, connections, valves, and frame.

Hand pumps are operated by hand in a push-pull action. Water is drawn from a backpack-type tank through a hose connection.

Special Considerations

- **The size of the job**—The length of perimeter to be worked with water, the volume of fuels involved, the size and arrangement of fuel, and the distance from the fire to water or tender.
- **The character of the fire**—Either smoldering, creeping, running, crowning, and/or spotting.
- **The number and kind of exposures ahead of the fire**—Involving standing snags, down rotten logs, red slash, buildings, or a good stand of timber.
- **The static head, friction loss, and nozzle pressure needed**—All affect pressure requirements.
- **Other factors**—Establish flow (gpm) and pressure (psi) requirements for doing the job right, with a margin for safety.
- **Hearing safety sound level**—Ensures that the pump will not exceed OSHA standards. If the pump unit produces more than 90 decibels (dBA) at the operators ear, a label shall be attached as required by OSHA.
- **Communication safety sound level**—Ensures that it causes no undue interference with spoken or shouted communication. The sound level of the pump shall not exceed 96 dBA when tested in accordance with Forest Service specification 5100-274.

Work Assignments

The typical assignments for a wildland fire pump are demanding and require rugged equipment. The following should be taken into consideration:

- Flow (gpm) requirements are highly variable; water conservation is important.
- Service is through lightweight, small-diameter hose lines, where friction loss is high.
- Hose lays are often long.
- Hose is often laid up steep slopes, with resulting high static head pressures.
- Water is normally under high static suction lifts from source to pump.
- Engine power will be reduced as altitude increases.
- Temperatures are often high.
- Hours of work are long.
- Long service life is required.
- Weight is an extremely important factor, particularly with portable pumps.
- Available water is often abrasive.

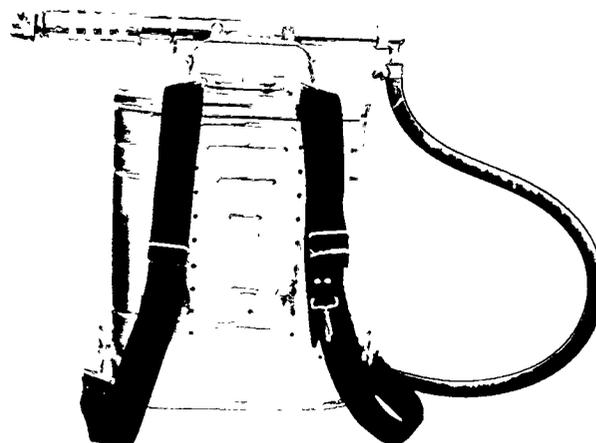
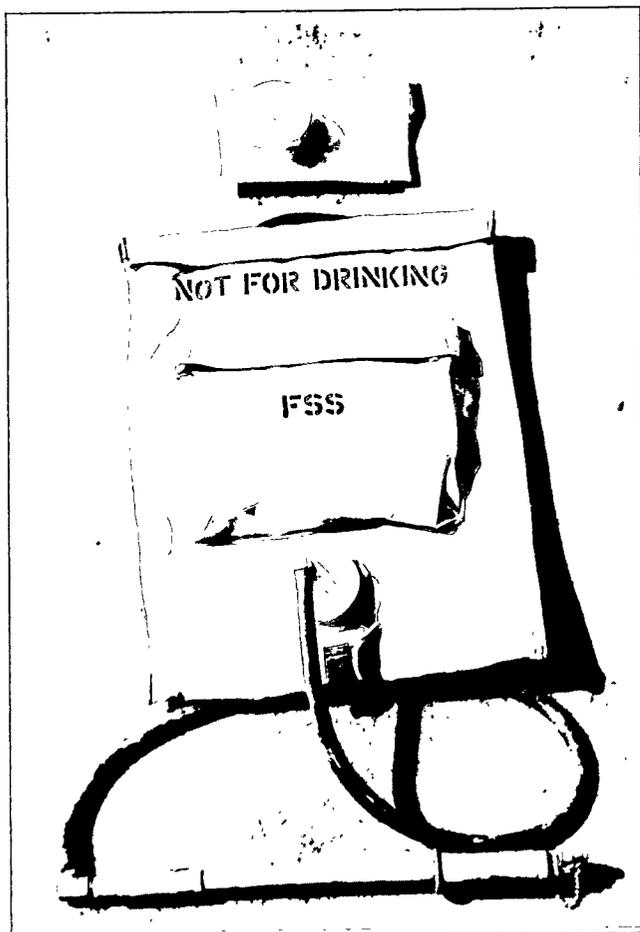
WATER PUMPING EQUIPMENT

Pumps

- Pump reliability is extremely important.
- Ease of operation and maintenance.
- Performance versus initial investment and repairs.

1. Hand-operated

In many areas of the United States, the backpack pump is a primary fireline tool. These hand-operated pumps are designed to pump water from a backpack tank, which is rigid or collapsible. They are available from various suppliers (see appendix 6) and through the *GSA Wildfire Protection Equipment and Supplies Catalog*.



- Pump—Hand-operated, push-pull action, single- or double-acting, carried on backpack tank.
- Performance—Variable, depending on operator action (approximately 0.75 gal/min).
- Tank capacity—4 to 5 gal.
- Construction and material—
 - Pump, brass
 - Tank, galvanized stainless steel or synthetic coated fabric
 - Hose, Federal specification ZZ-H-601; Grade 3 cadmium-plated, quick-connect fittings
 - Straps, nylon, padded carrying straps.
- Written materials—Specifications are available from various fire equipment suppliers (appendix 6) and:

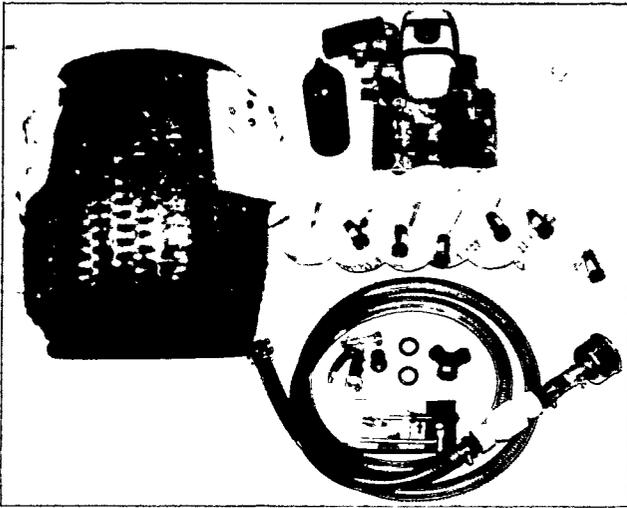
USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267.

WATER PUMPING EQUIPMENT

Pumps

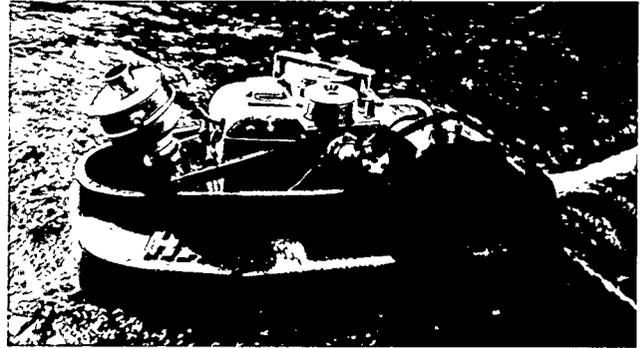
2. *Lightweight portable*

These pumps weigh up to 60 lb and are designed to be carried by one person. They are designed for light-duty initial attack—in remote locations by helicopter or smoke jumper operations—or any other situation where weight and/or space limitations are a consideration. Minimum performance is 9 gpm at 150 psi. Engine, rope starter, pump, controls, fittings, and other accessories are included as a complete assembly. Fuel tank and fuel hose with primer are carried separately from the engine and pump (appendix 1).



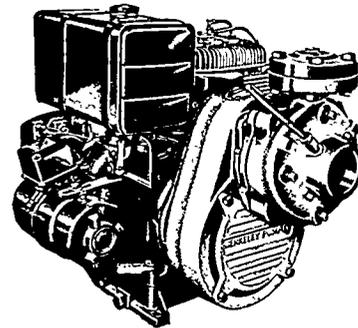
4. *Floatable*

These pumps can be carried by one person and are floatable on water while pumping a minimum of 20 gpm at 150 psi. Included in a complete assembly are an engine, fuel tank, rope starter, pump, controls, fittings, floating collar, strainer, and other accessories (appendix 1).



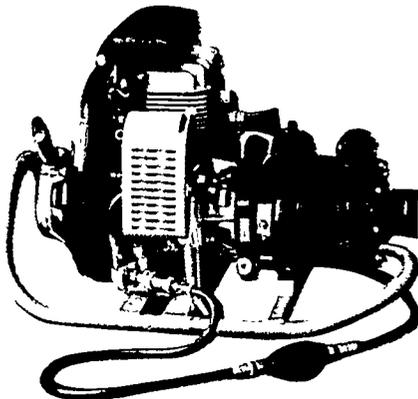
5. *Mountable*

These pumps are normally mounted on wildland fire engines and vary in weight between 140 and 360 lb. Minimum performance is 40 gpm at 150 psi. Engine, electric or rope starter, fuel tank, pump, controls, and other accessories are included as a complete assembly (appendix 1).



3. *Portable*

These pumps are heavier than 60 lb; mounting and carrying frames may be included, depending on the purpose. Minimum performance is 10 gpm at 150 psi. Engine, electric, or rope starter, fuel tank, pump, controls, fittings, and other accessories are included as a complete assembly (appendix 1).

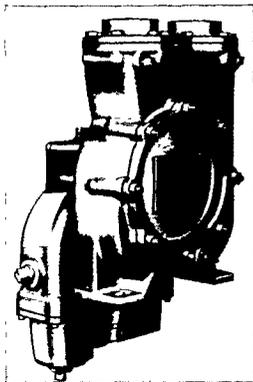


WATER PUMPING EQUIPMENT

Pumps

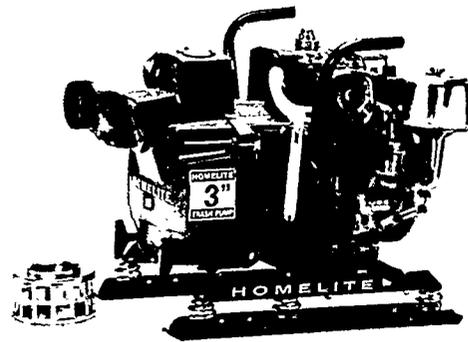
6. *Engine-driven*

These pumps are driven by the vehicle engine. They may be coupled to the engine by a pto, hydraulic drive, V-belts, or chain drives. They are generally used where large volumes or high pressures are needed.



7. *Volume*

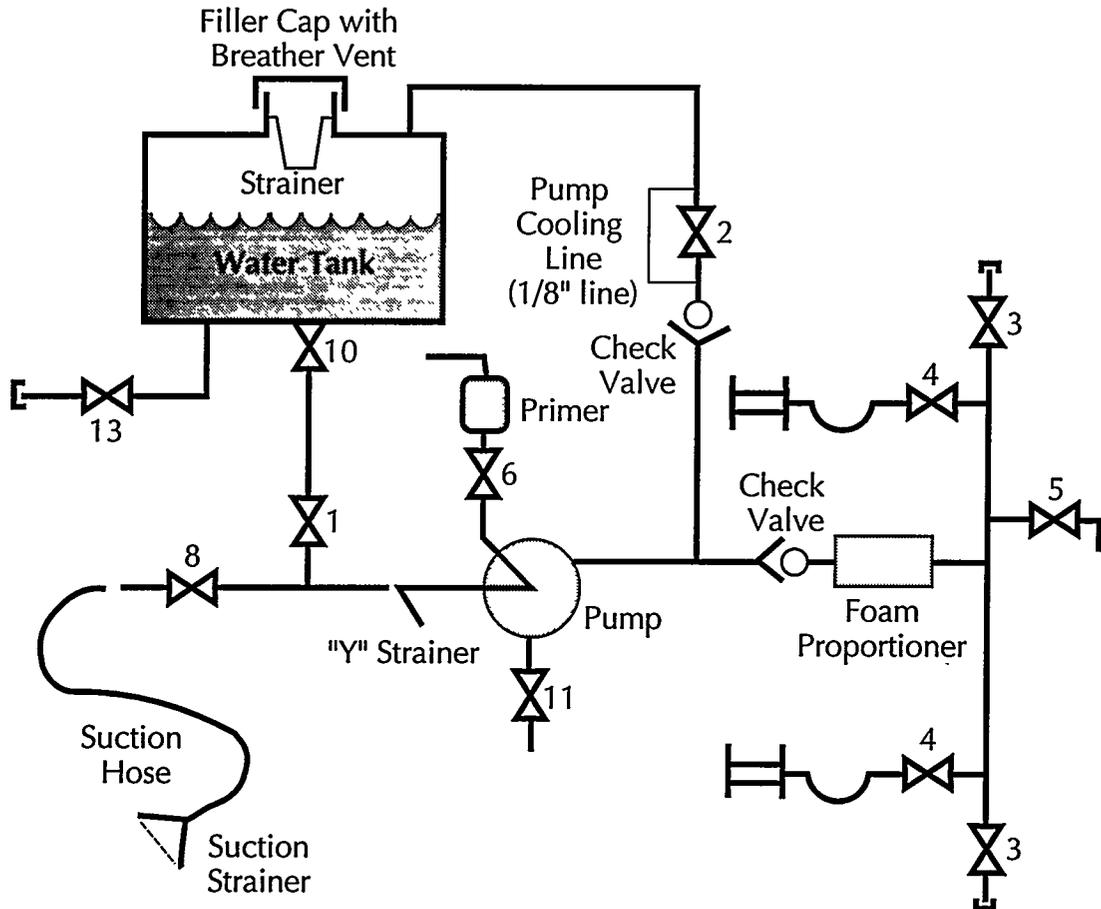
These pumps are designed for moving large volumes of water at low pressure to fill engines or water tenders.



B. Plumbing

1. Typical engine plumbing diagram (centrifugal)

Valves No. 7, 9, and 12 not used and not shown



(Use of Foot Valve not recommended)
(Use of Foot Valve not required when check valves
are used in pump discharge line)

2. Valve numbering system

The following is recommended valve numbering system for engines. This system has been widely accepted and references to it are found throughout this publication.

- | | |
|--|--|
| No. 1 from tank to pump | No. 8 from overboard suction to pump |
| No. 2 from pump to tank | No. 9 reserve supply from tank to pump |
| No. 3 from pump to overboard discharge | No. 10 tank to piping shut-off valve |
| No. 4 from pump to hose reel or basket discharge | No. 11 pump to piping drain valve |
| No. 5 from pump to small auxiliary discharge | No. 12 pump coolant clean-out |
| No. 6 from pump to primer | No. 13 gravity tank drain |
| No. 7 adjustable pressure relief valve | |

WATER PUMPING EQUIPMENT

Engine Matrix

C. Fire Engines

Sheet No.	ICS Type	Gal	Pump Drive	Model Designation	Agency
1	2	1,250	Front crank shaft	Front mount pump	Georgia For Com
2	2	1,250	Aux. eng.	8	California Dept For
3	2	1,100	Aux. eng.	11	California Dept For
4	2	650	Aux. eng.	9	California Dept For
5	3	500	Aux. eng. & pto	1 and 5	California Dept For
6	3	500	Aux. eng.	10 and 12	California Dept For
7	4	1,250	Aux. eng.	Deck gun truck	Georgia For Com
8	4	1,000	Aux. eng.	Fastack III	Florida Div For
9	4	1,000	pto	F-5	Oregon Dept For
10	4	1,000	pto	80	USDA FS (R-6)
11	4	950	Aux. eng.	Fireknocker	Georgia For Com
12	4	900	Aux. eng.	2-1/2 ton	Maine For Serv
13	4	850	Aux. eng.	850 gal	Wisconsin DNR
14	4	750	Aux. eng	52	USDA FS (R-1)
15	4	600	Aux. eng.	Great Basin Std	USDI BLM
16	4-6	200-1,000	Aux. eng.	Brushbreaker	Massachusetts Bur FC
17	5	850	Aux. eng.	850 gal	Minnisota DNR
18	5	700	Hydraulic	Attack Unit	Eagle Fire Dept
19	5	700	Aux. eng.	Fiberglass Heavy	USDI BIA
20	5	625	Aux. eng.	H5S	Washington DNR
21	5	600	Aux. eng.	Tank Truck	Maine For Serv
22	5	600	pto	70 & 71	USDA FS (R-3)
23	5	500	Aux. eng.	500 ga	Florida Div For
24	5	500	pto	F-3	Oregon Dept For
25	5	500	pto	60 & 61	USDA FS (R-5)
26	5	500	pto	75	USDA FS (R-6)
27	6	1,000	Aux. eng.	1,000 Low-profile	Michigan DNR
29	6	700	Aux. eng.	700 gal	Florida Div For
30	6	500	Aux. eng.	500 Low-profile	Michigan DNR
31	6	400	Aux. eng.	900 Unimog	USDI BLM
32	6	300	Aux. eng	300 gal	Florida Div For
33	6	300	Aux. eng.	Hummer	Michigan DNR
34	6	300	pto	46	USDA FS (R-3)
35	6	300	Aux. eng	43	USDA FS (R-4)
36	6	300	Aux. eng.	51	USDA FS (R-5)
37	6	285	pto	42	USDA FS (R-5)

WATER PUMPING EQUIPMENT Engine Matrix

Sheet No.	ICS Type	Gal	Pump Drive	Model Designation	Agency
38	6	275	pto	Fastack I	Florida Div For
39	6	250	Aux. eng.	Initial Attack	New Jersey For Fire Serv
40	6	240	Aux. eng.	A1S/A1R.	Washington DNR
41	6	240	Briggs & Stratton	Ever 6	USDI NPS
42	6	225	Aux. eng.	Fastack IV	Florida Div For
43	6	200	Aux. eng.	W-200	Michigan DNR
44	6	200	Aux. eng.	M-715	Michigan DNR
45	6	200	Aux. eng.	M-715 Low-profile	Michigan DNR
46	6	200	Aux. eng.	200 gal	Minnesota DNR
47	6	200	pto	F-2	Oregon Dept For
48	6	200	Aux. eng.	52	USDA FS (R-1)
49	6	200	Briggs & Stratton	22	USDA FS (R-3)
50	6	200	pto	43	USDA FS (R-3)
51	6	200	pto	45	USDA FS (R-6)
52	6	200	Aux. eng.	1-200	USDI BLM
53	6	75	Aux. eng.	20 & 21	USDA FS (R-5)
54	6	75	pto	41	USDA FS (R-5)
55	6-7	75	Aux. eng.	30	USDA FS
56	7	150	Aux. eng.	F-1	Oregon Dept For
57	7	150	Engine V-belt	Integral	Wisconsin DNR
58	Other	90	Aux. eng.	Midrange	Indiana DNR
59	Other	80	Electric motor	Aqua-dak	Florida
60	Other	66	Aux. eng.	M-38	Michigan DNR
61	Other	50	Aux. eng.	10	USDA FS

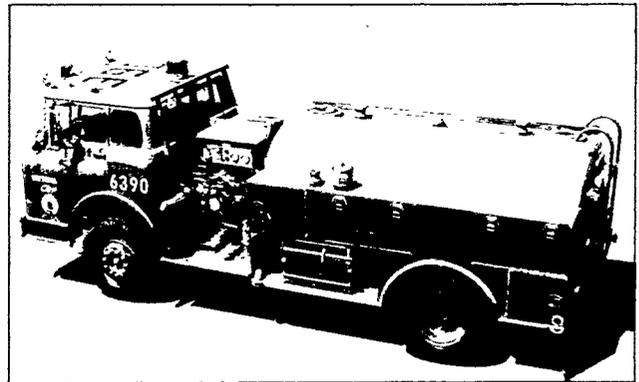
WATER PUMPING EQUIPMENT Engine Data Sheet No.2

Agency: California Dept. of Forestry & Fire Protection

Equipment Designator: Model 8

ICS Type: 2

Summary: *Tank Capacity* - 1,250 gal
Pump Rating - 500 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The single pump is auxiliary driven, which permits mobile attack or stationary pumping. A crew of three rides in the cab. The engine carries two live reels at the fender level, just forward of the rear wheels. Direct outlets from the pump are 2-1/2 in. The principal pump controls are outside but, some are duplicated in the cab. Compartments are available for fire tools, self-contained breathing apparatus, suction hose, hose fittings and nozzles, and other miscellaneous equipment.

Pump:

Make: Hale **Model:** 40FA-C318
Type: Single-stage centrifugal
Performance: —
Primer Type: Electric, Hale SMV

Tank:

Material: Mild, or 304 stainless, steel
Construction: Removable Top - Yes
Baffles —
Fill Spout —

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke —	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle —
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 2; Size, 1-1/2- & 2-1/2-in
Suction - Number, 2; Size, 4- & 2-1/2-in
Hose Reel, two
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: Ford
GVW Rating: —
Transmission Type: Allison MT 40 w/retarder

Cab/Axle: —
Power Plant: 391 CID V-8 gasoline
Brake Type: Air

Written Materials:

Specifications and drawings are available from:
California Department of Forestry and Fire Protection
Equipment Manager, Davis Equipment Facility
5950 Chiles Road
Davis, CA 95616
Telephone: 916/322-5684

WATER PUMPING EQUIPMENT

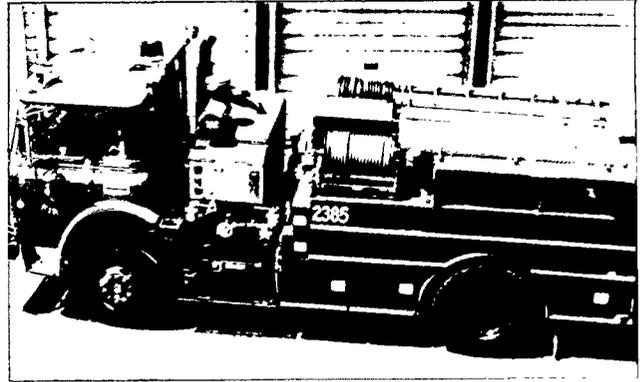
Engine Data Sheet No. 3

Agency: California Dept. of Forestry & Fire Protection

Equipment Designator: Model 11

ICS Type: 2

Summary: *Tank Capacity* - 1,100 gal
Pump Rating - 500 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Model 11 carries a crew of three and is a conventional drive, all-diesel heavy fire engine. It will eventually replace CDF's Model 8. The single pump is driven by its own separate motor, which permits the engine to be used for either mobile attack or stationary pumping. Two live reels are carried at the front of and on top of the tank. Three 2-1/2-in outlets, four 1-1/2-in outlets, and two 2-1/2-in suction inlets are provided. All are gated. The 4-in main pump suction is capped. The principal pump controls are outside, but some are duplicated in the cab. Compartments for fire tools, self-contained breathing apparatus, suction hose, hose fittings and nozzles, and other miscellaneous equipment—including a hose roller—form the body around the tank.

Pump:

Make: Waterous **Model:** CGNT
Type: Single-stage centrifugal
Performance: —
Primer Type: Electric, Hale SMV

Tank:

Material: 304 stainless steel
Construction: Removable Top —
 Baffles —
 Fill Spout —

Controls and Gauges:

Throttle Priming Valve Handle
 Choke — Water Level —
 Pressure Gauge Engine Temperature —
 Vacuum Gauge Discharge Valve Handle
 Tachometer Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank Adjustable Pressure Relief —
 Overboard Discharge - Number — Size — Tank-to-Plumbing Shut-Off —
 Suction - Number — Size — Pump and Plumbing Drain —
 Hose Reel — Gravity Tank Drain/Dump —

Chassis:

Manufacturer: IHC (Model DT 466-210) **Cab/Axle:** —
GVW Rating: — **Power Plant:** Six-cylinder diesel
Transmission Type: Allison MT 653 **Brake Type:** Air

Written Materials:

Specifications and drawings are available from:
 California Department of Forestry and Fire Protection
 Equipment Manager, Davis Equipment Facility
 5950 Chiles Road
 Davis, CA 95616
 Telephone: 916/322-5684

WATER PUMPING EQUIPMENT

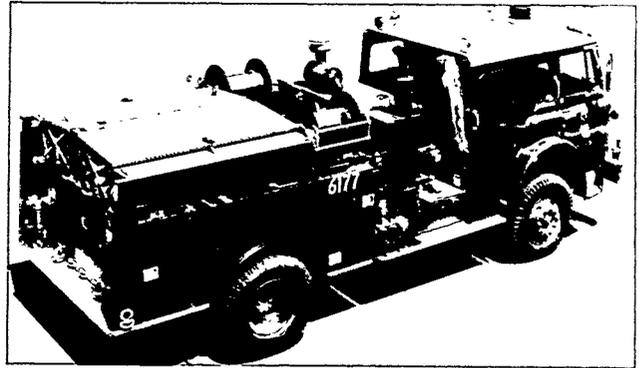
Engine Data Sheet No. 4

Agency: California Dept. of Forestry & Fire Protection

Equipment Designator: Model 9

ICS Type: 2

Summary: *Tank Capacity* - 650 gal
Pump Rating - 500 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Model 9 carries a crew of six and is a conventional drive, all-diesel heavy fire engine. Three crewmembers ride in a backwards-facing compartment immediately behind the cab. In an emergency, the compartment can be closed off with a sliding curtain. The single pump is driven by an auxiliary engine. The principal pump controls are outside, but some are duplicated in the cab. Compartments for fire tools, self-contained breathing apparatus, suction hose, hose fittings and nozzles, and other miscellaneous equipment form the body around the tank.

Pump:

Make: Waterous **Model:** CGNT
Type: Single-stage centrifugal
Performance: —
Primer Type: Electric, Hale SMV

Tank:

Material: 304 stainless steel
Construction: Removable Top - Yes
 Baffles —
 Fill Spout —

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge <input checked="" type="checkbox"/>	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>	Adjustable Pressure Relief —
Overboard Discharge - Number, 7; Size, three-2-1/2-in & four-1-1/2-in		Tank-to-Plumbing Shut-Off —
Suction - Number, 3; Size, one-4-in & two-2-1/2-in		Pump and Plumbing Drain —
Hose Reel —		Gravity Tank Drain/Dump —

Chassis:

Manufacturer: IHC	Cab/Axle: —
GVW Rating: —	Power Plant: Six-cyl, turbo-diesel or V-8 gasoline
Transmission Type: Allison MT 650	Brake Type: Air

Written Materials:

Specifications and drawings are available from:
 California Department of Forestry and Fire Protection
 Equipment Manager, Davis Equipment Facility
 5950 Chiles Road
 Davis, CA 95616
 Telephone: 916/322-5684

WATER PUMPING EQUIPMENT

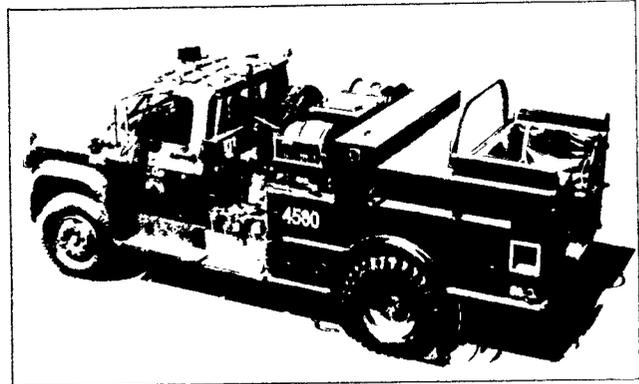
Engine Data Sheet No. 5

Agency: California Dept. of Forestry & Fire Protection

Equipment Designator: Models 1 and 5

ICS Type: 3

Summary: *Tank Capacity* - 500 gal
Pump Rating - 300 gpm @ 150 psi
Pump Drive - Auxiliary Engine & PTO
Running Attack Capability - Yes



General Description:

The conventional drive Model 1 and the four-wheel drive Model 5 are classified as heavy fire engines and carry a crew of six. For all engines, power is first delivered to an Allison 600 Series transmission. On conventional drive units, power is directed through a split-shaft transmission or power divider to either the driving wheels or to the main pump. On four-wheel drive engines, this function is handled by a transfer case, with pump power taken through a pto. For either model, the main pump can only be used for stationary pumping.

The auxiliary pump is driven by its own engine and is used for mobile attack. The four-person crew compartment is at the rear and features two fire blankets rolled up in canisters. The engine carries two live reels, along with 1-, 1-1/2-, and 2-1/2-in water outlets. The principal pump control panel is outside with a second set of controls for the auxiliary located in the cab. Compartments for fire tools, self-contained breathing apparatus, suction hose for both pumps, hose fittings, nozzles, and other miscellaneous equipment, including a hose roller, form the body around the tank.

Pump:

Make: Waterous **Model:** CPK-2
Type: Single-stage centrifugal
Performance: 350 gpm (max) at free flow;
 200 gpm @ max psi = 250
Primer Type: Electric, Hale SMV

Tank:

Material: Mild steel
Construction: Removable Top - Yes
 Baffles - Yes
 Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature <input checked="" type="checkbox"/>
Vacuum Gauge <input checked="" type="checkbox"/>	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>	Adjustable Pressure Relief —
Overboard Discharge - Number, 5; Size, three-1-1/2-in & two-2-1/2-in	Suction - Number, 2 Size 3-in	Tank-to-Plumbing Shut-Off —
Hose Reel, two		Pump and Plumbing Drain —
		Gravity Tank Drain/Dump —

Chassis:

Manufacturer: Various	Cab/Axle: —
GVW Rating: —	Power Plant: V-8 diesel or gasoline
Transmission Type: Allison MT 653 or MT 640	Brake Type: Air

Written Materials:

Specifications and drawings are available from:
 California Department of Forestry and Fire Protection
 Equipment Manager, Davis Equipment Facility
 5950 Chiles Road
 Davis, CA 95616
 Telephone: 916/322-5684

WATER PUMPING EQUIPMENT

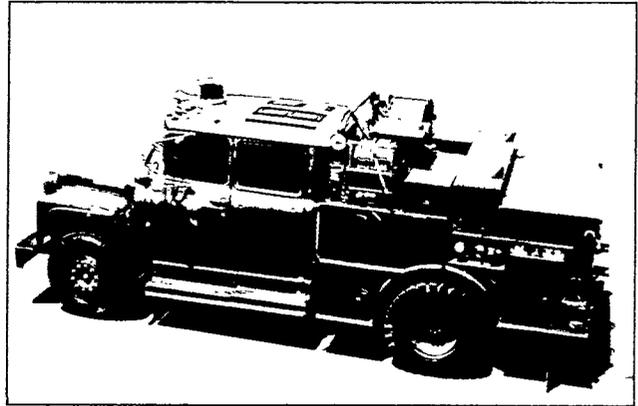
Engine Data Sheet No. 6

Agency: California Dept. of Forestry & Fire Protection

Equipment Designator: Models 10 and 12

ICS Type: 3

Summary: **Tank Capacity** - 500 gal
Pump Rating - 300 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The four-wheel drive Model 10 and the conventional drive Model 12 are classified as heavy fire engines. Each carries a crew of five in a fully enclosed cab. The single fire pump and its motor are aligned longitudinally and are mounted in a separate compartment at the back of the engine. The engine is capable of mobile attack or stationary pumping. Two live reels are carried at the front of and on top of the tank plus five 1-1/2-in gated outlets. The principal pump controls are outside, but some are duplicated in the cab. The body is built partly around the tank and contains compartments for fire tools, self-contained breathing apparatus, suction hose, hose fittings, nozzles, miscellaneous equipment (including a hose roller), and the fire pump and its motor.

Pump:

Make: Hale **Model:** FS30F104
Type: Single-stage centrifugal
Performance: —
Primer Type: Electric, Hale SMV

Tank:

Material: 304 stainless steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge <input checked="" type="checkbox"/>	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>	Adjustable Pressure Relief —
Overboard Discharge - Number, 4; Size, 1-1/2-in		Tank-to-Plumbing Shut-Off —
Suction - Number, 2 Size 2-1/2-in		Pump and Plumbing Drain —
Hose Reel, two		Gravity Tank Drain/Dump —

Chassis:

Manufacturer: IHC	Cab/Axle: —
GVW Rating: —	Power Plant: V-8 gasoline
Transmission Type: Allison MT 640 and MT 650	Brake Type: Air

Written Materials:

Specifications and drawings are available from:
California Department of Forestry and Fire Protection
Equipment Manager, Davis Equipment Facility
5950 Chiles Road
Davis, CA 95616
Telephone: 916/322-5684

WATER PUMPING EQUIPMENT

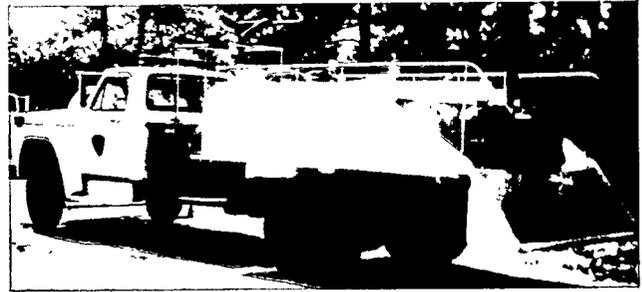
Engine Data Sheet No. 7

Agency: Georgia Forestry Commission

Equipment Designator: Deck Gun Truck

ICS Type: 4

Summary: **Tank Capacity** - 1,250 gal
Pump Rating - 120 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

Large truck with a midrange auxiliary pump, deck gun mount, and safety operator cage. Can be used as a mobile attack unit, with Class A foam.

Pump:

Make: Hale **Model:** 30RD-B42
Type: Single-stage centrifugal
Performance: —
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 8 in

Controls and Gauges:

Throttle Priming Valve Handle
Choke Water Level
Pressure Gauge Engine Temperature —
Vacuum Gauge — Discharge Valve Handle
Tachometer — Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank —
Overboard Discharge - Number, 1; Size, 3-in
Suction - Number, 1; Size, 2-1/2-in
Hose Reel —

Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain
Gravity Tank Drain/Dump ; Size, 10-in

Chassis:

Manufacturer: Chevrolet
GVW Rating: 24,500
Transmission Type: 5-speed

Cab/Axle: 102 in
Power Plant: V-8 gasoline
Brake Type: Hydraulic

Written Materials:

Specifications and drawings are available from:

Georgia Forestry Commission
Box 819
Macon, GA 31298-4599
Telephone: 912/744-3253

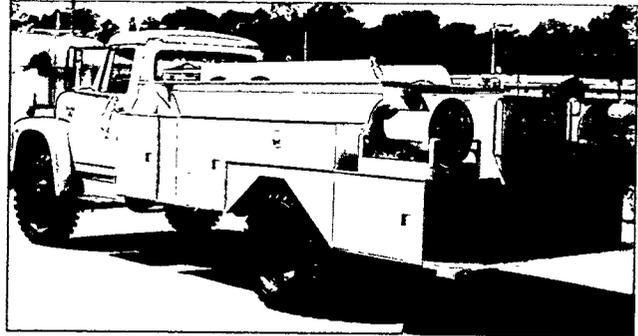
WATER PUMPING EQUIPMENT
Engine Data Sheet No.8

Agency: Florida Division of Forestry

Equipment Designator: Fastack III

ICS Type: 4

Summary: *Tank Capacity* - 1,000 gal
Pump Rating - 90 gpm @ 100 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Fastack III 1,000-gal unit is built on a 2-1/2-ton, 4 x 4 chassis with a conventional cab. It consists of an auxiliary engine centrifugal pump, two hose reels, and internal storage compartments.

Pump:

Make: Hale **Model:** 30-FB-B25
Type: Single-stage centrifugal
Performance: 300 gpm (max) at free flow;
10 gpm @ max psi = 150
Primer Type: Manual

Tank:

Material: Mild steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle Priming Valve Handle —
Choke Water Level —
Pressure Gauge Engine Temperature —
Vacuum Gauge — Discharge Valve Handle
Tachometer — Suction Valve Handle —

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 2-1/2-in
Suction - Number, 1; Size, 2-1/2-in
Hose Reel, two
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: User option **Cab/Axle:** —
GVW Rating: 25,000 **Power Plant:** —
Transmission Type: Manual **Brake Type:** Air

Written Materials:

Specifications and drawings are available from:

Florida Division of Forestry
Fire Control Bureau
3125 Conner Boulevard
Tallahassee, FL 32399-1650
Telephone: 904/488-4244

WATER PUMPING EQUIPMENT

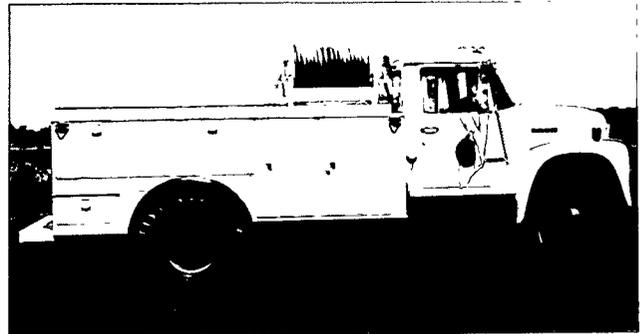
Engine Data Sheet No.9

Agency: Oregon Department of Forestry

Equipment Designator: F-5

ICS Type: 4

Summary: **Tank Capacity** - 1,000 gal
Pump Rating - 100 gpm @ 150 psi
Pump Drive - PTO
Running Attack Capability - Yes



General Description:

The F-5 is effective for initial attacks (especially in heavier fuels), and for water resupply or extensive mop-up.

Pump:

Make: Gorman Rupp **Model:** 02F1
Type: Single-stage centrifugal
Performance: 160 gpm (max) at free flow;
130 gpm @ max psi = 375
Primer Type: Self-priming

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle Priming Valve Handle —
Choke Water Level
Pressure Gauge Engine Temperature
Vacuum Gauge — Discharge Valve Handle
Tachometer Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 2; Size, 1-1/2-in
Suction - Number, 2; Size, 2-in
Hose Reel, two
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: User option **Cab/Axle:** 84 in
GVW Rating: 25,500 **Power Plant:** V-8 gasoline
Transmission Type: 5-speed manual **Brake Type:** Hydraulic power assist, air optional

Written Materials:

Specifications and drawings are available from:
Oregon Department of Forestry
Fire Equipment Specialist
2600 State Street
Salem, OR 97310
Telephone: 503/378-2531

WATER PUMPING EQUIPMENT Engine Data Sheet No.10

Agency: USDA Forest Service (Pacific Northwest
Region, R-6)

Equipment Designator: Model 80

ICS Type: 4

Summary: *Tank Capacity* - 1,000 gal
Pump Rating - 300 gpm @ 150 psi
Pump Drive - PTO
Running Attack Capability - Yes



General Description:

The Model 80 is built on a truck chassis with a conventional cab. It consists of a transmission pto, centrifugal pump, two live reels, control panel, and 1,000-gal tank built into a body with hose and accessory storage compartments.

Pump:

Make: Hale **Model:** CBP Series
Type: Single-stage centrifugal
Performance: 350 gpm (max) at free flow;
200 gpm @ max psi = 400
Primer Type: Electric

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle Priming Valve Handle
Choke Water Level
Pressure Gauge Engine Temperature
Vacuum Gauge — Discharge Valve Handle
Tachometer Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 2; Size, 1-1/2-in
Suction - Number, 2; Size, 2-1/2-in
Hose Reel, two
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain
Gravity Tank Drain/Dump ; Size, 4-in

Chassis:

Manufacturer: Various
GVW Rating: 32,000
Transmission Type: Allison MTB-653DR

Cab/Axle: 102 in
Power Plant: Diesel
Brake Type: Air

Written Materials:

Specifications and drawings are available from:

USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

WATER PUMPING EQUIPMENT

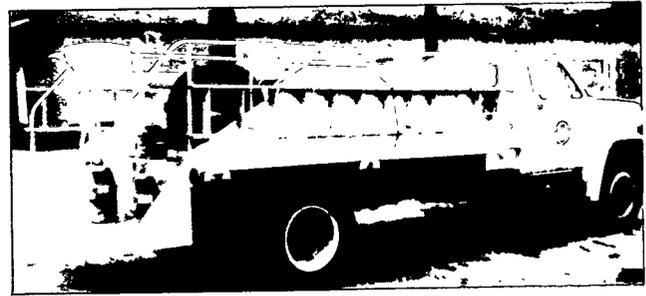
Engine Data Sheet No.11

Agency: Georgia Forestry Commission

Equipment Designator: 950 Fireknocker

ICS Type: 4

Summary: *Tank Capacity* - 950 gal
Pump Rating - 95 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Fireknocker is a self-contained, low-profile unit designed to be mounted on a 2-ton civilian or 6 x 6 military cargo truck.

Pump:

Make: Berkeley **Model:** B1-1/2 x QBS-18
Type: Single-stage centrifugal
Performance: 110 gpm (max) at free flow;
17 gpm @ max psi = 300
Primer Type: Hand

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge <input checked="" type="checkbox"/>	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number — Size —
Suction - Number — Size —
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: User option	Cab/Axle: 102 in
GVW Rating: 21,000	Power Plant: —
Transmission Type: —	Brake Type: —

Written Materials:

Specifications and drawings are available from:

Georgia Forestry Commission
Box 819
Macon, GA 31298-4599
Telephone: 912/744-3253

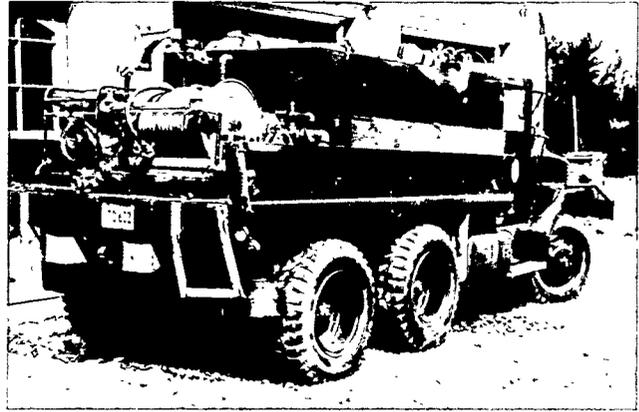
WATER PUMPING EQUIPMENT
Engine Data Sheet No.12

Agency: Maine Forest Service

Equipment Designator: Maine 2-1/2 Ton

ICS Type: 4

Summary: *Tank Capacity* - 900 gal
Pump Rating - Varies
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Maine 2-1/2-ton slip-on unit is primarily intended for use with the M-45 Reo 6 x 6 military truck, but is easily adaptable to other vehicles in this class. This system consists of a tank, a pump, and plumbing suited to the needs of users .

Pump:

Make: Pacific **Model:** Mark III
Type: Four-stage centrifugal
Performance: 90 gpm (max) at free flow;
12 gpm @ max psi = 275
Primer Type: Hand

Tank:

Material: Mild steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number — Size —
Suction - Number — Size —
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: Military 2-1/2 ton	Cab/Axle: —
GVW Rating: —	Power Plant: —
Transmission Type: —	Brake Type: —

Written Materials:

Specifications and drawings are available from:
Roscommon Equipment Center
c/o Forest Fire Experiment Station
P.O. Box 68
Roscommon, MI 48653
Telephone: 517/275-5211

WATER PUMPING EQUIPMENT

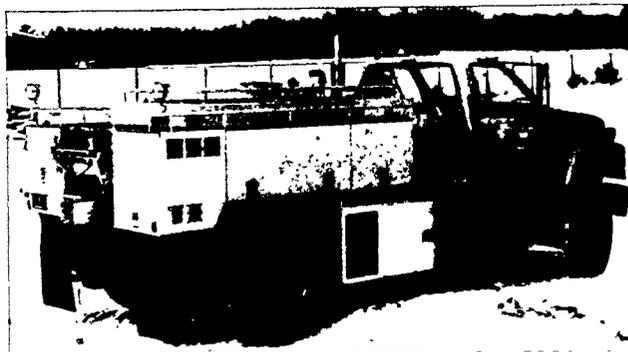
Engine Data Sheet No.13

Agency: Wisconsin Department of Natural Resources

Equipment Designator: 850-gal

ICS Type: 4

Summary: **Tank Capacity** - 850 gal
Pump Rating - 300 gpm @ 45 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Wisconsin 850-gal integral unit is constructed with hand tool equipment storage compartments on three sides. The truck pulls a tiltbed trailer loaded with a John Deere 450 crawler tractor with mounted fire plow and water tanks.

Pump:

Make: Darley **Model:** 2BE-18-B&S
Type: Single-stage centrifugal
Performance: 300 gpm (max) at free flow;
100 gpm @ max psi = 150
Primer Type: Hand

Tank:

Material: Low-carbon, hot rolled steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 10 in

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle —

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>
Overboard Discharge - Number, 1; Size, 2-1/2-in	
Suction - Number, 1; Size, 2-1/2-in	
Hose Reel, one	
Adjustable Pressure Relief —	
Tank-to-Plumbing Shut-Off —	
Pump and Plumbing Drain —	
Gravity Tank Drain/Dump —	

Chassis:

Manufacturer: User option
GVW Rating: 32,200
Transmission Type: 5-speed auto; 2-speed rear axle

Cab/Axle: 101 in
Power Plant: Diesel
Brake Type: —

Written Materials:

Specifications and drawings are available from:
Wisconsin Department of Natural Resources
Equipment and Training Center
518 West Somo Avenue
Tomahawk, WI 54487
Telephone: 715/453-2188

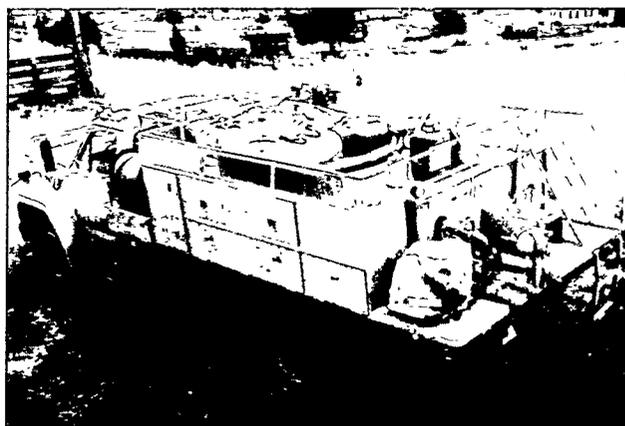
WATER PUMPING EQUIPMENT Engine Data Sheet No.14

Agency: USDA Forest Service (Northern Region, R-1)

Equipment Designator: Model 52

ICS Type: 4

Summary: *Tank Capacity* - 750 or 1,000 gal
Pump Rating - 90 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

Midsized engine for the Forest Service Northern Region and other agencies, used for initial/extended attack on wildland fires. Has exposed plumbing and 10-in dump valve. Includes around-the-pump foam system.

Pump:

Make: Wajax **Model:** BB-4
Type: Centrifugal
Performance: 110 gpm (max) at free flow;
15 gpm @ max psi = 400
Primer Type: —

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Five
Fill Spout - 6 in
(front & rear)

Controls and Gauges:

Throttle Priming Valve Handle —
Choke Water Level Option
Pressure Gauge Engine Temperature —
Vacuum Gauge Discharge Valve Handle
Tachometer — Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 3; Size, 1-in & 1-1/2-in
Suction - Number, 1; Size, 2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain (1-1/2-in)
Gravity Tank Drain/Dump, two; Size, 10-in & 1-1/2-in

Chassis:

Manufacturer:	User option	Cab/Axle:	84 in
GVW Rating:	24,500 to 33,000	Power Plant:	Gasoline; diesel
Transmission Type:	5-speed manual; 2-speed rear axle	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Aerial Fire Depot, Interagency Engine Program
Box 6, Airport Terminal
Missoula, MT 59802
Telephone: 406/329-4884

WATER PUMPING EQUIPMENT

Engine Data Sheet No.15

Agency: USDI Bureau of Land Management

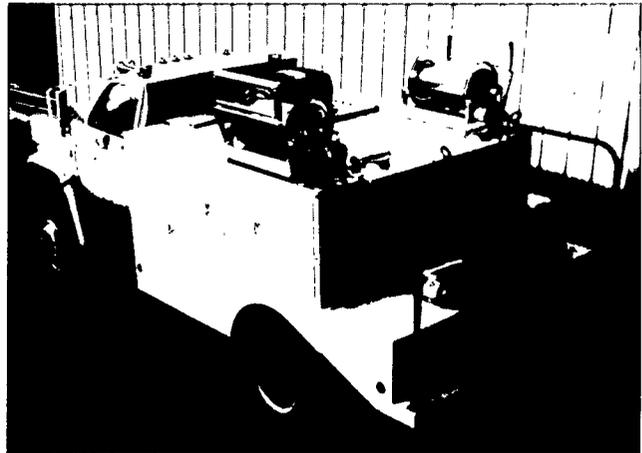
Equipment Designator: BLM Great Basin Standard

ICS Type: 4

Summary: **Tank Capacity** - 600 to 850 gal
Pump Rating - 87 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes

General Description:

This heavy duty unit is mounted on a 31,500 GVW 4 x 4 chassis. The unit consists of tank, pump, engine, two live reels, appropriate plumbing (including retardant capability), and other accessories to match the plumbing equipment and tank size.



Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 94 gpm (max) at free flow;
30 gpm @ max psi = 275
Primer Type: Hand

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge <input checked="" type="checkbox"/>	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 3; Size, 1-1/2-in
Suction - Number, 2; Size, 2-in
Hose Reel, two
Adjustable Pressure Relief
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump ; Size, 10-in

Chassis:

Manufacturer:	Navstar	Cab/Axle:	84 in
GVW Rating:	31,500	Power Plant:	Diesel
Transmission Type:	Allison MT 653	Brake Type:	Air

Written Materials:

Specifications and drawings are available from:
National Interagency Fire Center
Fire Equipment Specialist
3905 Vista Avenue
Boise, ID 83705
Telephone: 208/389-2431

WATER PUMPING EQUIPMENT

Engine Data Sheet No.17

Agency: Minnesota Department of Natural Resources

Equipment Designator: Minnesota 850

ICS Type: 5

Summary: **Tank Capacity** - 850 gal
Pump Rating - 100 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The State of Minnesota 850-gal unit is a multipurpose truck. It is equipped to (1) be a tender for wildfires that require large volumes of water to suppress, (2) protect endangered structures, and (3) transport a crawler tractor plow unit or other large suppression equipment. The unit features a large clamp-down inspection cover, 10-in top fill port, 2-1/2-in plumbing, compartments on three sides, 1-in backcan filler, portable centrifugal pump, a rear 7- x 10-in dump valve, tank protection, live hose reel, preconnected 1-1/2- or 2-1/2-in discharge line, compartment lights, and compartment space for backcans, shovels, Pulaskis, chain saws, axes, swats, and a spare pump. There are enough tools for 20 persons; also available are foam capabilities (the Foam Pro proportioning system).

Pump:

Make: Darley **Model:** 2 BE 18B
Type: Centrifugal
Performance: 300 gpm (max) at free flow;
100 gpm @ max psi = 130
Primer Type: Hand

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 10 in

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge <input checked="" type="checkbox"/>	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>	Adjustable Pressure Relief <input checked="" type="checkbox"/>
Overboard Discharge - Number, 1; Size, 2-1/2-in	Suction - Number, 1; Size, 2-1/2-in	Tank-to-Plumbing Shut-Off <input checked="" type="checkbox"/>
Hose Reel, one		Pump and Plumbing Drain <input checked="" type="checkbox"/>
		Gravity Tank Drain/Dump, two; Size, 7- & 10-in

Chassis:

Manufacturer: User option	Cab/Axle: 84 in
GVW Rating: 35,000	Power Plant: Diesel
Transmission Type: 13-speed manual	Brake Type: Air

Written Materials:

Specifications and drawings are available from:
Minnesota Department of Natural Resources
Field Services
1201 East Highway 2
Grand Rapids, MN 55744
Telephone: 218/327-4443

WATER PUMPING EQUIPMENT
Engine Data Sheet No.18

Agency: Eagle Fire Department

Equipment Designator: Attack Unit

ICS Type: 5

Summary: *Tank Capacity* - 700 gal
Pump Rating - 87 gpm @ 150 psi
Pump Drive - Hydraulic
Running Attack Capability - Yes

General Description:

The Eagle Attack unit is 6 x 4 heavy fire engine. The design allows for equipment to be powered hydraulically for running attack at all speeds in forward and reverse. The unit has a fiberglass service body and is equipped with a compressed air foam system and proportioning unit.

Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 94 gpm (max) at free flow;
30 gpm @ max psi = 275
Primer Type: Electric

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 6 in

Controls and Gauges:

Throttle —	Priming Valve Handle <input checked="" type="checkbox"/>
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature <input checked="" type="checkbox"/>
Vacuum Gauge <input checked="" type="checkbox"/>	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 3; Size, 1-1/2-in
Suction - Number, 2; Size, 2-in
Hose Reel, two
Adjustable Pressure Relief
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain
Gravity Tank Drain/Dump ; Size, 2-in

Chassis:

Manufacturer:	User option	Cab/Axle:	84 in
GVW Rating:	28,000	Power Plant:	V-8 gasoline
Transmission Type:	5-speed manual	Brake Type:	Air

Written Materials:

Specifications and drawings are available from:
National Interagency Fire Center
Fire Equipment Specialist
3905 Vista Avenue
Boise, ID 83705
Telephone: 208/389-2431

WATER PUMPING EQUIPMENT

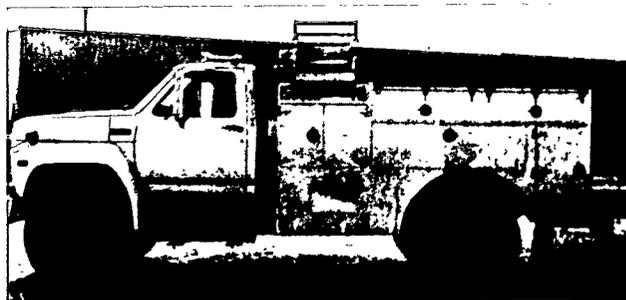
Engine Data Sheet No. 19

Agency: USDI Bureau of Indian Affairs

Equipment Designator: Fiberglass Heavy

ICS Type: 5

Summary: *Tank Capacity* - 700 gal
Pump Rating - 87 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 94 gpm (max) at free flow;
30 gpm @ max psi = 275
Primer Type: Hand

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 6 in

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 3; Size, 1-1/2-in
Suction - Number, 2; Size, 2-in
Hose Reel, two
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	84 in
GVW Rating:	28,000	Power Plant:	V-8 gasoline
Transmission Type:	5-speed manual	Brake Type:	Air

Written Materials:

Specifications and drawings are available from:
National Interagency Fire Center
Fire Equipment Specialist
3905 Vista Avenue
Boise, ID 83705
Telephone: 208/389-2431

WATER PUMPING EQUIPMENT
Engine Data Sheet No.20

Agency: Washington Department of Natural Resources

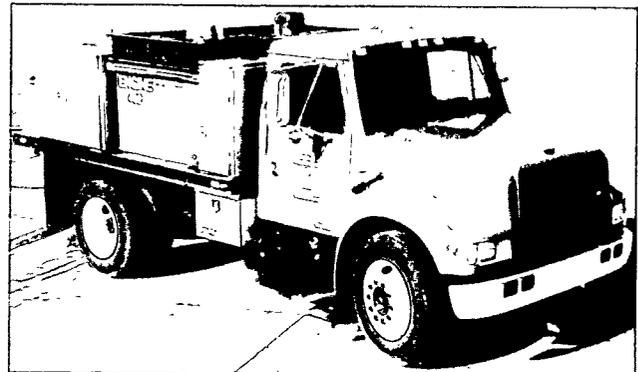
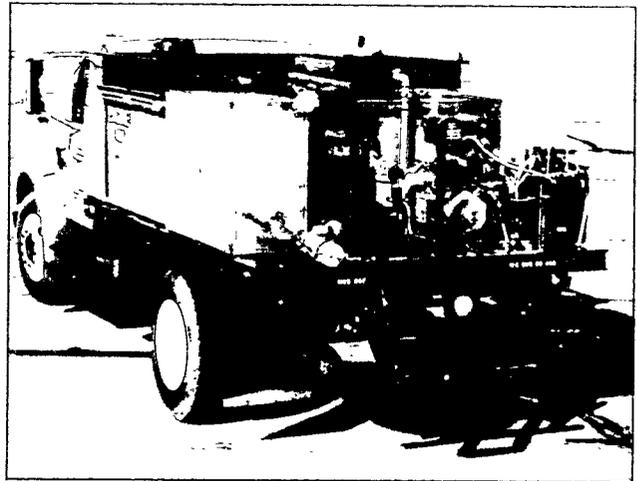
Equipment Designator: H5S

ICS Type: 5

Summary: *Tank Capacity* - 625 gal
Pump Rating - 87 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes

General Description:

The H5S 625-gal unit is designed to provide a cost-effective firefighting unit that includes ease and safety of operation. The unit consists of a tank, pump, engine, appropriate plumbing, and accessories. Criteria used to standardize the design were that a crew from any part of the State could operate the engine, have standardized compartments, carry pumps that could be field serviced in 2 hr, and can be operated from the ground level.



Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 94 gpm (max) at free flow;
 30 gpm @ max psi = 275
Primer Type: Hand

Tank:

- Material: Fiberglass
Construction: Removable Top - Yes Baffles - Yes Fill Spout - Yes

Controls and Gauges:

Throttle Vacuum Gauge — Water Level Suction Valve Handle
 Choke Tachometer — Engine Temperature —
 Pressure Gauge Priming Valve Handle — Discharge Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank Hose Reel, one Pump and Plumbing Drain —
 Overboard Discharge - Number, 3; Size, 1-1/2-in Adjustable Pressure Relief Gravity Tank Drain/Dump —
 Suction - Number, 1; Size, 2-in Tank-to-Plumbing Shut-Off —

Chassis:

Manufacturer: User option **Cab/Axle:** —
GVW Rating: 25,000 **Power Plant:** V-8 diesel
Transmission Type: 5-speed manual **Brake Type:** Hydraulic

Written Materials:

Specifications and drawings are available from:
 State of Washington
 Operations Forester, Southeast Area
 713 East Bowers Road
 Ellensburg, WA 98926
 Telephone: 509/925-6131

WATER PUMPING EQUIPMENT

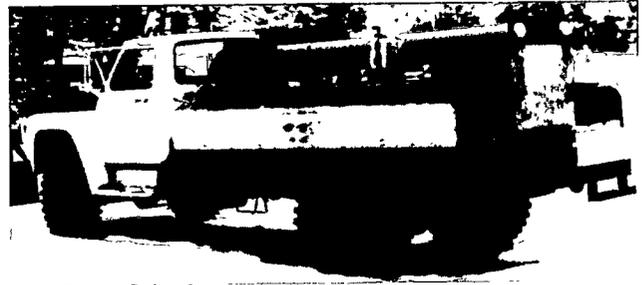
Engine Data Sheet No.21

Agency: Maine Forest Service

Equipment Designator: Tank Truck

ICS Type: 5

Summary: **Tank Capacity** - 600 gal
Pump Rating - 150 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

Capable of forest fire attack with water and foam using a Flow Mix 500 proportioner.

Pump:

Make: Wajax **Model:** Mark III
Type: Centrifugal
Performance: 92 gpm (max) at free flow;
13 gpm @ max psi = 275
Primer Type: Hand

Tank:

Material: Steel
Construction: Removable Top —
Baffles - One
Fill Spout - 5 in
(top front)

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge —	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle —
Tachometer —	Suction Valve Handle —

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 3/4-in
Suction - Number, 1; Size, 2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain
Gravity Tank Drain/Dump, two; Size, 2-in

Chassis:

Manufacturer:	User option	Cab/Axle:	168 in
GVW Rating:	21,000	Power Plant:	361 CID gasoline
Transmission Type:	5-speed manual; 2-speed rear axle	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
Roscommon Equipment Center
c/o Forest Fire Experiment Station
P.O. Box 68
Roscommon, MI 48653
Telephone: 517/275-5211

WATER PUMPING EQUIPMENT

Engine Data Sheet No.22

Agency: USDA Forest Service
(Southwestern Region, R-3)

Equipment Designator: Model 70 & 71

ICS Type: 5

Summary: **Tank Capacity** - 600 gal
Pump Rating - 250 gpm @ 150 psi
Pump Drive - PTO
Running Attack Capability - Yes

General Description:

The Model 70 has a conventional cab and the Model 71 has a six-person cab. They utilize a transmission pto, centrifugal pump, two hose reels, plumbing, control panel, a 600-gal tank, and a body with hose and accessory storage compartments.

Pump:

Make: Hale **Model:** CBP
Type: Single-stage centrifugal
Performance: 350 gpm (max) at free flow;
220 gpm @ max psi = 400
Primer Type: Electric Hale SMV

Tank:

Material: Steel
Construction: Removable Top - Yes Baffles - Yes Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

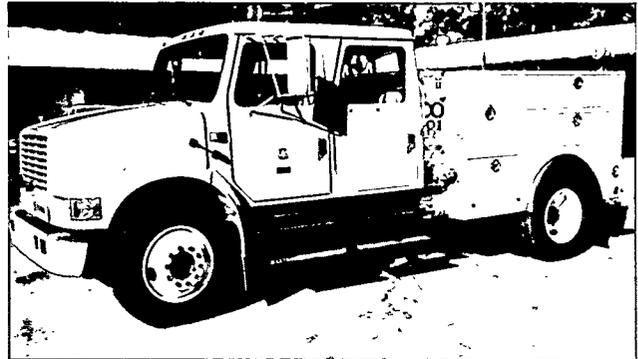
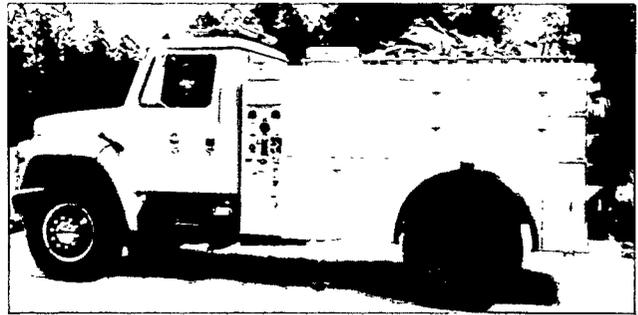
Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>	Adjustable Pressure Relief <input checked="" type="checkbox"/>
Overboard Discharge - Number, 3; Size, 1-1/2-in		Tank-to-Plumbing Shut-Off <input checked="" type="checkbox"/>
Suction - Number, 3; Size, 2-1/2-in		Pump and Plumbing Drain <input checked="" type="checkbox"/>
Hose Reel, two		Gravity Tank Drain/Dump —

Chassis:

Manufacturer: Various	Cab/Axle: 72 in
GVW Rating: 25,500	Power Plant: V-8 gasoline or diesel
Transmission Type: 5-speed manual; 2-speed rear axle	Brake Type: Air

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Southwestern Region
517 Gold Avenue, S.W.
Albuquerque, NM 87102
Telephone: 505/842-3862



WATER PUMPING EQUIPMENT

Engine Data Sheet No.23

Agency: Florida Division of Forestry

Equipment Designator: 500-gal

ICS Type: 5

Summary: *Tank Capacity* - 500 gal
Pump Rating - 30 gpm @ 100 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes

General Description:

The Florida 500-gal is built on a truck chassis with a conventional cab. It consists of an auxiliary engine, centrifugal pump, one hose reel, and a 500-gal tank. Priming is by means of pump or truck manifold vacuum.



Pump:

Make: Hale **Model:** 30FD-25
Type: Single-stage centrifugal
Performance: 300 gpm (max) at free flow;
 25 gpm @ max psi = 115
Primer Type: Manifold vacuum

Tank:

Material: Steel
Construction: Removable Top - Yes
 Baffles - Yes
 Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
 Overboard Discharge - Number — Size —
 Suction - Number, 1; Size, 2-1/2-in
 Hose Reel, one
 Adjustable Pressure Relief —
 Tank-to-Plumbing Shut-Off —
 Pump and Plumbing Drain —
 Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	—	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
 Florida Division of Forestry
 Fire Control Bureau
 3125 Conner Boulevard
 Tallahassee, FL 32399-1650
 Telephone: 904/488-4244

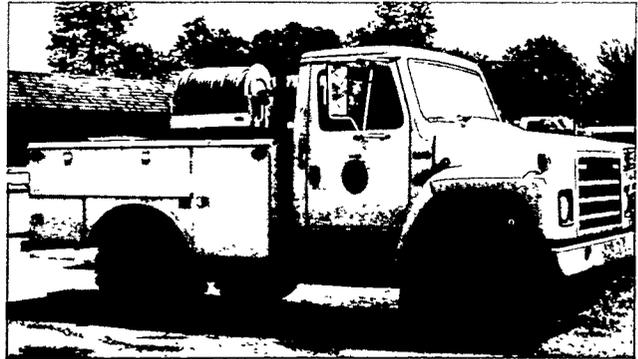
WATER PUMPING EQUIPMENT
Engine Data Sheet No.24

Agency: Oregon Department of Forestry

Equipment Designator: F-3

ICS Type: 5

Summary: *Tank Capacity* - 500 gal
Pump Rating - 100 gpm @ 150 psi
Pump Drive - PTO
Running Attack Capability - Yes



General Description:

The F-3 is a primary initial attack engine with speed and mobility approximately equal to the 4 x 4 F-2 engine. It has the universal booster-type pumping system and is capable of strong sustained attacks as required by fire problem areas or backup limitations. The unit consists of a service body, fiberglass tank, two hose reels, pto pump, manifold plumbing, and standardized controls.

Pump:

Make: Gormann Rupp **Model:** 02F1
Type: Single-stage centrifugal
Performance: 160 gpm (max) at free flow;
130 gpm @ max psi = 375
Primer Type: Self-priming

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge <input checked="" type="checkbox"/>	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>	Adjustable Pressure Relief —
Overboard Discharge - Number, 2; Size, 1-1/2-in		Tank-to-Plumbing Shut-Off —
Suction - Number, 2; Size, 2-in		Pump and Plumbing Drain —
Hose Reel, one		Gravity Tank Drain/Dump —

Chassis:

Manufacturer: User option	Cab/Axle: 60 in
GVW Rating: 21,000	Power Plant: V-8 gasoline
Transmission Type: 5-speed manual	Brake Type: Hydraulic, power assist

Written Materials:

Specifications and drawings are available from:

Oregon Department of Forestry
Fire Equipment Specialist
2600 State Street
Salem, OR 97310
Telephone: 503/378-2531

WATER PUMPING EQUIPMENT

Engine Data Sheet No.25

Agency: USDA Forest Service
(Pacific Southwest Region, R-5)

Equipment Designator: Model 60/61

ICS Type: 5

Summary: *Tank Capacity* - 500 gal
Pump Rating - 300 gpm @ 150 psi
Pump Drive - PTO
Running Attack Capability - Yes

General Description:

The Model 60 is built onto a truck chassis with a six-person crew cab. The Model 61 is built on a conventional cab truck chassis with a six-person cab built onto the truck body. It consists of a transmission pto, centrifugal pump, two live reels, control panel, and 500-gal tank built into a body with hose and accessory storage compartments.



Pump:

Make: Hale **Model:** CBP-4
Type: Single-stage centrifugal
Performance: 350 gpm (max) at free flow;
200 gpm @ max psi = 400
Primer Type: Hand

Tank:

Material: Galvanized steel
Construction: Removable Top - Yes Baffles - Yes **Fill spout - Yes**

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature <input checked="" type="checkbox"/>
Vacuum Gauge <input checked="" type="checkbox"/>	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>	Adjustable Pressure Relief —
Overboard Discharge - Number, 2; Size, 1-1/2-in		Tank-to-Plumbing Shut-Off <input checked="" type="checkbox"/>
Suction - Number, 1; Size, 2-1/2-in		Pump and Plumbing Drain <input checked="" type="checkbox"/>
Hose Reel, two		Gravity Tank Drain/Dump —

Chassis:

Manufacturer: Various	Cab/Axle: —
GVW Rating: 26,000 to 30,000	Power Plant: Diesel
Transmission Type: 5-speed manual; 2-speed rear axle	Brake Type: Air

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

WATER PUMPING EQUIPMENT Engine Data Sheet No.26

Agency: USDA Forest Service
(Pacific Northwest Region, R-6)

Equipment Designator: Model 75

ICS Type: 5

Summary: *Tank Capacity* - 500 gal
Pump Rating - 300 gpm @ 150 psi
Pump Drive - PTO
Running Attack Capability - Yes



General Description:

The Model 75 is built onto a truck chassis with a conventional cab. It consists of a transmission pto, centrifugal pump, two live reels, control panel, and 500-gal tank built into a body with hose and accessory storage compartments.

Pump:

Make: Hale **Model:** CBP series
Type: Single-stage centrifugal
Performance: 350 gpm (max) at free flow;
200 gpm @ max psi = 400
Primer Type: Electric

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle Priming Valve Handle
Choke Water Level
Pressure Gauge Engine Temperature
Vacuum Gauge — Discharge Valve Handle
Tachometer Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 2; Size, 1-1/2-in
Suction - Number, 2; Size, 2-1/2-in
Hose Reel, two
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain
Gravity Tank Drain/Dump, ; Size, 4-in

Chassis:

Manufacturer:	Various	Cab/Axle:	72 in
GVW Rating:	26,000 to 30,000	Power Plant:	Diesel
Transmission Type:	Allison MTB-653DR	Brake Type:	Air

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

WATER PUMPING EQUIPMENT

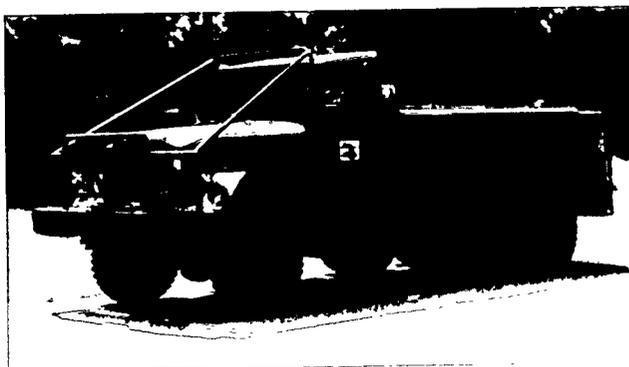
Engine Data Sheet No.27

Agency: Michigan Department of Natural Resources

Equipment Designator: 6 x 6 Super Unit

ICS Type: 6

Summary: *Tank Capacity* - 1,500 gal
Pump Rating - 57 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

Super-heavy integral unit mounted on a military 5-ton, 6 x 6 vehicle. The basic unit consists of tank, pump, and two live reels. The truck is heavily armored for off-road service, some units are equipped with hydraulic plow units.

Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 85 gpm (max) at free flow;
0 gpm @ max psi = 300
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle —
Tachometer —	Suction Valve Handle —

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-in
Hose Reel, two
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain
Gravity Tank Drain/Dump ; Size, 6-in

Chassis:

Manufacturer: Military	Cab/Axle: —
GVW Rating: 5 ton	Power Plant: Gasoline/diesel/multifuel
Transmission Type: Manual	Brake Type: —

Written Materials:

Specifications and drawings are available from:
Roscommon Equipment Center
c/o Forest Fire Experiment Station
P.O. Box 68
Roscommon, MI 48653
Telephone: 517/275-5211

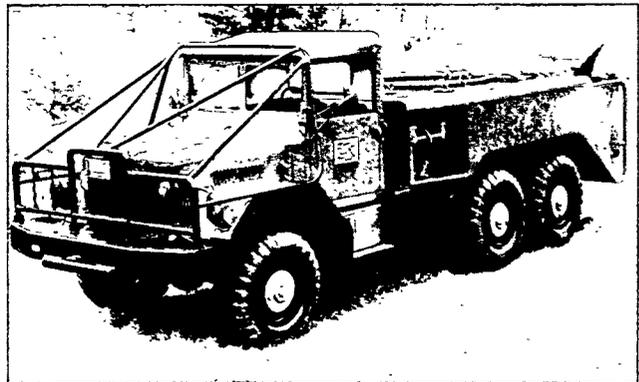
WATER PUMPING EQUIPMENT
Engine Data Sheet No.28

Agency: Michigan Department of Natural Resources

Equipment Designator: 1,000 Low-Profile

ICS Type: 6

Summary: *Tank Capacity* - 1,000 gal
Pump Rating - 56 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The 1,000-gal, low-profile integral unit is readily mounted on a commercial 6 x 6 truck. The complete unit consists of a tank, pump, engine, intake and discharge valves, hose reels, and appropriate plumbing to effectively handle the pumping operations. The engine is heavily armored against brush damage, and is intended to be used in off-road service. A hydraulically operated fireline plow is standard with the unit.

Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 85 gpm (max) at free flow;
0 gpm @ max psi = 300
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 6 in

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain —
Gravity Tank Drain/Dump ; Size, 4-in

Chassis:

Manufacturer: User option
GVW Rating: 22,000
Transmission Type: Manual

Cab/Axle: 58 in
Power Plant: Gasoline/diesel/multifuel
Brake Type: —

Written Materials:

Specifications and drawings are available from:
Roscommon Equipment Center
c/o Forest Fire Experiment Station
P.O. Box 68
Roscommon, MI 48653
Telephone: 517/275-5211

WATER PUMPING EQUIPMENT
Engine Data Sheet No.29

Agency: Florida Division of Forestry

Equipment Designator: 700-gal

ICS Type: 6

Summary: *Tank Capacity* - 700 gal
Pump Rating - 50 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

This wildland unit is on a conventional cab chassis. It consists of an auxiliary engine, centrifugal pump, hose reel, and a 700-gal tank mounted on a low-profile body.

Pump:

Make: Hale **Model:** 30-FD-B25
Type: Single-stage centrifugal
Performance: —
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
 Baffles - Yes
 Fill Spout - Yes

Controls and Gauges:

Throttle Priming Valve Handle
 Choke Water Level —
 Pressure Gauge Engine Temperature —
 Vacuum Gauge — Discharge Valve Handle
 Tachometer — Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
 Overboard Discharge - Number, 1; Size, 1-1/2-in
 Suction - Number, 1; Size, 1-1/2-in
 Hose Reel, one
 Adjustable Pressure Relief —
 Tank-to-Plumbing Shut-Off —
 Pump and Plumbing Drain —
 Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	27,000 4 x 4	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
 Florida Division of Forestry
 Fire Control Bureau
 3125 Conner Boulevard
 Tallahassee, FL 32399-1650
 Telephone: 904/488-4244

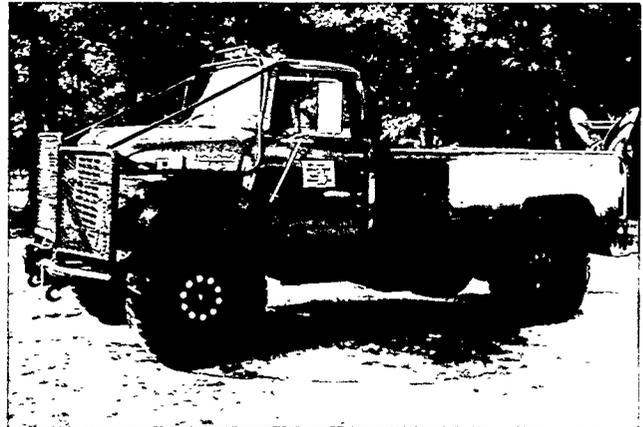
WATER PUMPING EQUIPMENT
Engine Data Sheet No.30

Agency: Michigan Department of Natural Resources

Equipment Designator: 500 Low-Profile

ICS Type: 6

Summary: *Tank Capacity* - 500 gal
Pump Rating - 57 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

This 500-gal unit is readily mounted on a 4 x 4 truck. It consists of a tank, pump, engine, intake and discharge couplings, live reels, and appropriate plumbing that effectively handle pumping operations. The engine is heavily armored against brush damage; the unit is intended for off-road use. A hydraulically operated fireline plow comes standard with this engine.

Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 85 gpm (max) at free flow;
0 gpm @ max psi = 300
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 6 in

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain —
Gravity Tank Drain/Dump ; Size, 4-in

Chassis:

Manufacturer: User option	Cab/Axle: —
GVW Rating: —	Power Plant: —
Transmission Type: —	Brake Type: —

Written Materials:

Specifications and drawings are available from:
Roscommon Equipment Center
c/o Forest Fire Experiment Station
P.O. Box 68
Roscommon, MI 48653
Telephone: 517/275-5211

WATER PUMPING EQUIPMENT
Engine Data Sheet No.32

Agency: Florida Division of Forestry

Equipment Designator: 300-gal

ICS Type: 6

Summary: *Tank Capacity* - 300 gal
Pump Rating - —
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes

General Description:

The Florida 300-gal unit is built on a 1-ton truck chassis with conventional cab. It consists of an auxiliary engine centrifugal pump, hose reel, and a 300-gal steel tank. Priming is done by means of pump or truck manifold vacuum.



Pump:

Make: Hale **Model:** 30-FD-25
Type: Single-stage centrifugal
Performance: —
Primer Type: Manifold vacuum

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 1-1/2-in
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: Various
GVW Rating: 10,000
Transmission Type: —

Cab/Axle: —
Power Plant: —
Brake Type: —

Written Materials:

Specifications and drawings are available from:
Florida Division of Forestry
Fire Control Bureau
3125 Conner Boulevard
Tallahassee, FL 32399-1650
Telephone: 904/488-4244

WATER PUMPING EQUIPMENT
Engine Data Sheet No.33

Agency: Michigan Department of Natural Resources

Equipment Designator: Hummer

ICS Type: 6

Summary: *Tank Capacity* - 300 gal
Pump Rating - 57 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Hummer has central tire inflation (CTI), foam proportioner, and a suspended water tank.

Pump:

Make: Wajax **Model:** BB-4
Type: Centrifugal
Performance: 85 gpm (max) at free flow;
0 gpm @ max psi = 300
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Eight
Fill Spout -
6 in (right rear)

Controls and Gauges:

Throttle Priming Valve Handle
Choke Water Level —
Pressure Gauge Engine Temperature —
Vacuum Gauge — Discharge Valve Handle
Tachometer — Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain —
Gravity Tank Drain/Dump ; Size, 2-in

Chassis:

Manufacturer:	User option	Cab/Axle:	57 in
GVW Rating:	10, 300	Power Plant:	6.2 L diesel
Transmission Type:	3-speed automatic	Brake Type:	Hydraulic

Written Materials:

Specifications and drawings are available from:
Roscommon Equipment Center
c/o Forest Fire Experiment Station
P.O. Box 68
Roscommon, MI 48653
Telephone: 517/275-5211

WATER PUMPING EQUIPMENT
Engine Data Sheet No.34

Agency: USDA Forest Service
(Southwestern Region, R-3)

Equipment Designator: Model 46

ICS Type: 6

Summary: *Tank Capacity* - 300 to 600 gal
Pump Rating - 175 gpm @ 150 psi
Pump Drive - PTO
Running Attack Capability - Yes



General Description:

This unit is considered to be a "slip-on," since tank and boxes are bolted to a flat bed. Vehicle has a pto pump that remains on the unit. A separate foam tank is molded into the tank; it has a capacity of approximately 7 gal, which is plumbed into the system on the suction side—just behind the No. 8 valve. The foam line has a 1/4-turn valve at the outlet of the foam reservoir.

Pump:

Make: Gorman Rupp Model: 02F1
Type: Centrifugal
Performance: 180 gpm (max) at free flow;
70 gpm @ max psi = 200
Primer Type: Self-priming

Tank:

Material: Fiberglass
Construction: Removable Top—Yes
Baffles—Yes
Fill Spout—6 in

Controls and Gauges:

Throttle Priming Valve Handle —
Choke Water Level
Pressure Gauge Engine Temperature —
Vacuum Gauge — Discharge Valve Handle
Tachometer Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 2; Size, 1-1/2-in
Suction - Number, 1; Size, 1-1/2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	61 to 84 in
GVW Rating:	16,000 to 27,000	Power Plant:	Gasoline and diesel
Transmission Type:	Manual	Brake Type:	Air

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Southwestern Region
517 Gold Avenue, S.W.
Albuquerque, NM 87102
Telephone: 505/842-3862

WATER PUMPING EQUIPMENT

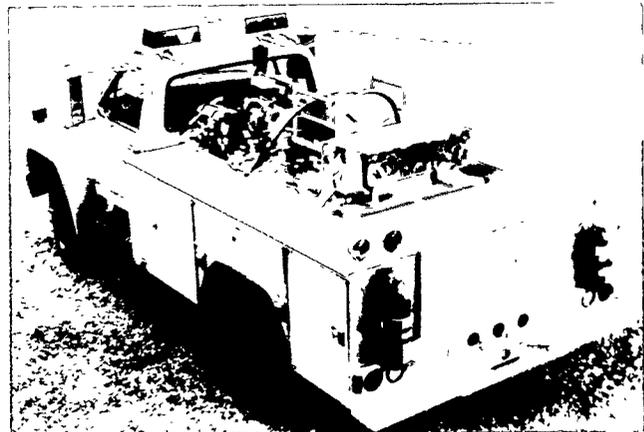
Engine Data Sheet No.35

Agency: USDA Forest Service
(Intermountain Region, R-4)

Equipment Designator: Model 43

ICS Type: 6

Summary: *Tank Capacity* - 300 gal
Pump Rating - 63 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Model 43 is a medium-range, quick-attack unit crewed with three people. Equipment storage is provided with a standard service bed. The unit is mounted on a 16,000 GVW or larger chassis. The unit has one hose reel and a fiberglass tank.

Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 94 gpm (max) at free flow;
30 gpm @ max psi = 275
Primer Type: Hand

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 4 in

Controls and Gauges:

Throttle Priming Valve Handle
Choke Water Level
Pressure Gauge Engine Temperature
Vacuum Gauge Discharge Valve Handle
Tachometer — Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 3; Size, 1-1/2-in
Suction - Number, 1; Size, 2-1/2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain
Gravity Tank Drain/Dump ; Size, 1-1/2-in

Chassis:

Manufacturer: User option **Cab/Axle:** 72 in
GVW Rating: 16,000 **Power Plant:** V-8 gasoline
Transmission Type: User option **Brake Type:** User option

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Southwestern Region
517 Gold Avenue, S.W.
Albuquerque, NM 87102
Telephone: 505/842-3862

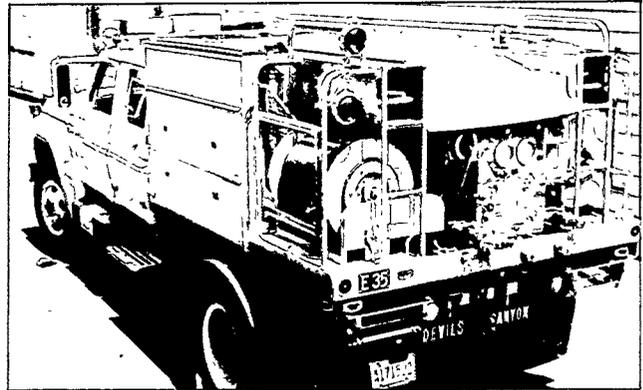
WATER PUMPING EQUIPMENT
Engine Data Sheet No.36

Agency: USDA Forest Service
(Pacific Southwest Region, R-5)

Equipment Designator: Model 51

ICS Type: 6

Summary: *Tank Capacity* - 300 gal
Pump Rating - 95 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Model 51 is a slip-on unit designed to fit on a flatbed truck. It consists of a compartment unit, tank, pump, and two hose reels.

Pump:

Make: Berkeley **Model:** B1-1/2 x QBS-18
Type: Single-stage centrifugal
Performance: 110 gpm (max) at free flow;
17 gpm @ max psi = 300
Primer Type: Hand

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes

Controls and Gauges:

Throttle Priming Valve Handle
Choke Water Level
Pressure Gauge Engine Temperature —
Vacuum Gauge — Discharge Valve Handle
Tachometer — Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-1/2-in
Hose Reel, two
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	—	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

WATER PUMPING EQUIPMENT

Engine Data Sheet No.37

Agency: USDA Forest Service
(Pacific Southwest Region, R-5)

Equipment Designator: Model 42

ICS Type: 6

Summary: **Tank Capacity** - 285 gal
Pump Rating - 90 gpm @ 150 psi
Pump Drive - PTO
Running Attack Capability - Yes



General Description:

The Model 42 integral unit is attached to a truck chassis with a three-person conventional cab. It consists of a transmission pto, pump, hose reel or hose basket, plumbing, control panel, and 285-gal tank on a low-profile body.

Pump:

Make: Gorman Rupp **Model:** 02F1
Type: Single-stage centrifugal
Performance: 180 gpm (max) at free flow;
15 gpm @ max psi = 250
Primer Type: Self-priming

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 3; Size, 1-1/2-in
Suction - Number, 1; Size, 2-1/2-in
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: Various
GVW Rating: 16,000
Transmission Type: —

Cab/Axle: 72 in
Power Plant: —
Brake Type: —

Written Materials:

Specifications and drawings are available from:

USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

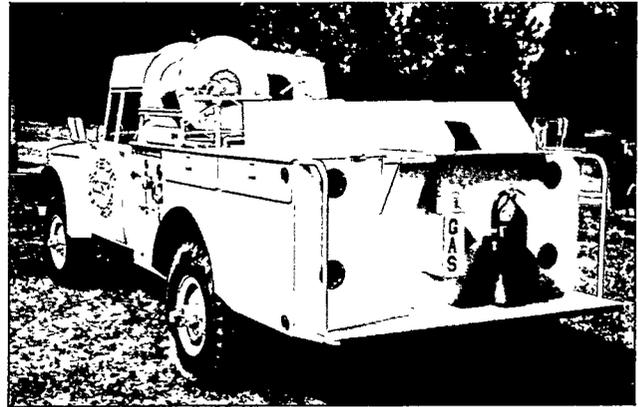
WATER PUMPING EQUIPMENT
Engine Data Sheet No.38

Agency: Florida Division of Forestry

Equipment Designator: Fastack I

ICS Type: 6

Summary: *Tank Capacity* - 275 gal
Pump Rating - 135 gpm @ 100 psi
Pump Drive - PTO
Running Attack Capability - Yes



General Description:

The Fastack I is a 275-gal unit with an integral tank and compartments built on a 5/4-ton, M-715 chassis. The system consists of a tank, pump, hose reel, hose bed, and accessories.

Pump:

Make: Viking **Model:** L125
Type: Positive displacement
Performance: —
Primer Type: Self-priming

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle Priming Valve Handle —
Choke — Water Level —
Pressure Gauge Engine Temperature
Vacuum Gauge — Discharge Valve Handle
Tachometer Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-1/2-in
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	Military M-715	Cab/Axle:	50 in
GVW Rating:	8,900	Power Plant:	Gasoline
Transmission Type:	Manual	Brake Type:	Hydraulic

Written Materials:

Specifications and drawings are available from:
Florida Division of Forestry
Fire Control Bureau
3125 Conner Boulevard
Tallahassee, FL 32399-1650
Telephone: 904/488-4244

WATER PUMPING EQUIPMENT

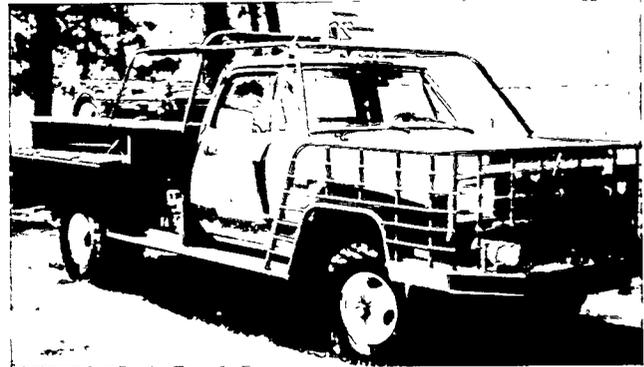
Engine Data Sheet No.39

Agency: New Jersey Forest Fire Service

Equipment Designator: Initial Attack

ICS Type: 6

Summary: **Tank Capacity** - 250 gal
Pump Rating - 47 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

This unit consists of a low-profile service body, 250-gal steel tank, hose reel, and plumbing. The truck is reinforced front, rear, and both sides for protection from trees and rocks.

Pump:

Make: Hale **Model:** 20FD-B25
Type: Single-stage centrifugal
Performance: 85 gpm (max) at free flow;
10 gpm @ max psi = 275
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 2; Size, 1-1/2-in
Suction - Number, 2; Size, 1-1/2-in
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain
Gravity Tank Drain/Dump ; Size, 1-1/2-in

Chassis:

Manufacturer:	Various	Cab/Axle:	60 in
GVW Rating:	11,000	Power Plant:	Gasoline
Transmission Type:	Standard	Brake Type:	Vacuum

Written Materials:

Specifications and drawings are available from:
New Jersey Forest Fire Service
CNHOH 501 East State Street
Trenton, NJ 08625
Telephone: 609/984-3854

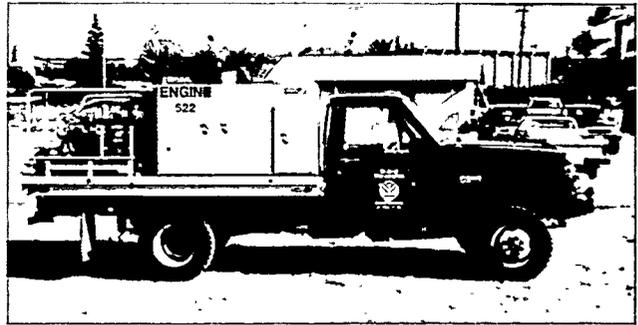
WATER PUMPING EQUIPMENT
Engine Data Sheet No.40

Agency: Washington Department of Natural Resources

Equipment Designator: A1S/A1R

ICS Type: 6

Summary: *Tank Capacity* - 240 gal
Pump Rating - 65 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The unit consists of a fiberglass tank, service body, Wajax Pacific B2-11 pump, and plumbing mounted on either a 1-ton 4 x 4 chassis (A1S) or 4 x 2 chassis (A1R).

Pump:

Make: Wajax **Model:** B2-11
Type: Two-stage centrifugal
Performance: 65 gpm (max) at free flow;
0 gpm @ max psi = 160
Primer Type: Hand

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 1-1/2-in
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: User option	Cab/Axle: —
GVW Rating: —	Power Plant: —
Transmission Type: —	Brake Type: —

Written Materials:

Specifications and drawings are available from:

Washington State Department of Natural Resources
8410 Martin Way East
Olympia, WA 98504
Telephone: 509/925-6131

WATER PUMPING EQUIPMENT

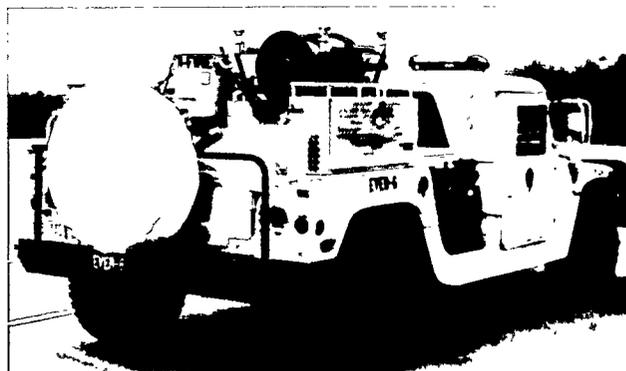
Engine Data Sheet No.41

Agency: USDI National Park Service

Equipment Designator: Ever-6

ICS Type: 6

Summary: *Tank Capacity* - 240 gal
Pump Rating - 44 gpm @ 150 psi
Pump Drive - Briggs & Stratton
Running Attack Capability - Yes



General Description:

This unit is designed for off-road running attack. It has a fiberglass and aluminum body, built on an AM General Hummer chassis.

Pump:

Make: Wajax **Model:** BB1-11
Type: Centrifugal
Performance: 58 gpm (max) at free flow;
5 gpm @ max psi = 250
Primer Type: Hand

Tank:

Material: Aluminum
Construction: Removable Top - No
Baffles - Four
Fill Spout - 8 in (two)

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle —
Tachometer —	Suction Valve Handle —

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 2-in
Suction - Number, 1; Size, 2-in
Hose Reel
Adjustable Pressure Relief
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain
Gravity Tank Drain/Dump ; Size, 3-in

Chassis:

Manufacturer: AM General	Cab/Axle: —
GVW Rating: 10,300	Power Plant: 6.2 L diesel
Transmission Type: 3-speed automatic	Brake Type: Hydraulic

Written Materials:

Specifications and drawings are available from:
AM General
105 North Niles Avenue
P.O. Box 7025
South Bend, IN 46634-7025

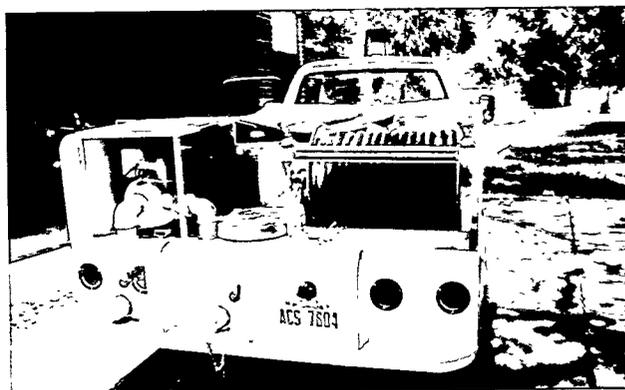
WATER PUMPING EQUIPMENT
Engine Data Sheet No.42

Agency: Florida Division of Forestry

Equipment Designator: Fastack IV

ICS Type: 6

Summary: *Tank Capacity* - 225 gal
Pump Rating - 25 gpm @ 115 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Florida 225-gal Fastack IV is built on a 1-ton truck chassis with a conventional cab. It consists of an auxiliary engine, centrifugal pump, hose reel, and 225-gal steel tank.

Pump:

Make: Hale **Model:** 30-FD-B25
Type: Single-stage centrifugal
Performance: —
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-1/2-in
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	Various	Cab/Axle:	56 in
GVW Rating:	9,000	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
Florida Division of Forestry
Fire Control Bureau
3125 Conner Boulevard
Tallahassee, FL 32399-1650
Telephone: 904/488-4244

WATER PUMPING EQUIPMENT

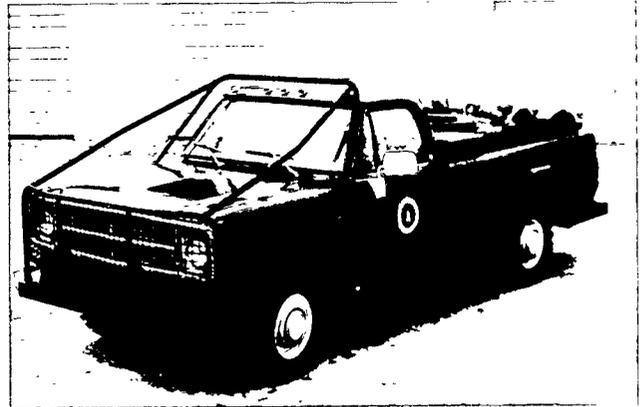
Engine Data Sheet No.43

Agency: Michigan Department of Natural Resources

Equipment Designator: Model W-200

ICS Type: 6

Summary: **Tank Capacity** - 200 gal
Pump Rating - 57 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Model W-200 was originally designed to be use on military 5/4-ton class vehicles. The unit consists of a steel tank, pump, live reel, and appropriate plumbing and accessories to make a completely self-contained unit.

Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 85 gpm (max) at free flow;
0 gpm @ max psi = 300
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle —
Tachometer —	Suction Valve Handle —

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-in
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	—	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
Roscommon Equipment Center
c/o Forest Fire Experiment Station
P.O. Box 68
Roscommon, MI 48653
Telephone: 517/275-5211

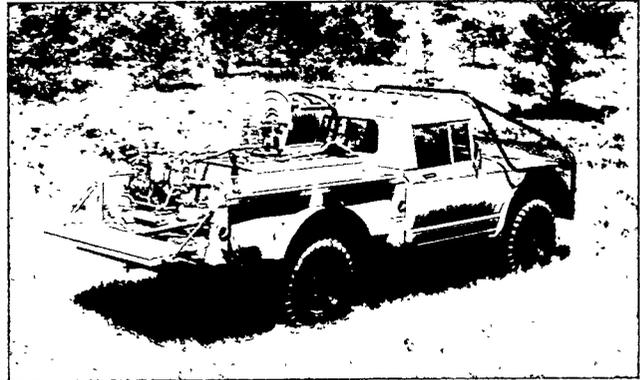
WATER PUMPING EQUIPMENT
Engine Data Sheet No.44

Agency: Michigan Department of Natural Resources

Equipment Designator: M-715

ICS Type: 6

Summary: *Tank Capacity* - 200 gal
Pump Rating - 57 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The M-715 unit is built around the military 5/4-ton, 4 x 4 truck with added armor for off-road service. The unit consists of a tank, pump, hose reel, and appropriate plumbing and accessories to make a completely self-contained unit.

Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 85 gpm (max) at free flow;
0 gpm @ max psi = 300
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-in
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain —
Gravity Tank Drain/Dump ; Size, 1-1/2-in

Chassis:

Manufacturer: Military M-715	Cab/Axle: 50 in
GVW Rating: 8,900	Power Plant: Gasoline
Transmission Type: Manual	Brake Type: Hydraulic

Written Materials:

Specifications and drawings are available from:
Roscommon Equipment Center
c/o Forest Fire Experiment Station
P.O. Box 68
Roscommon, MI 48653
Telephone: 517/275-5211

WATER PUMPING EQUIPMENT

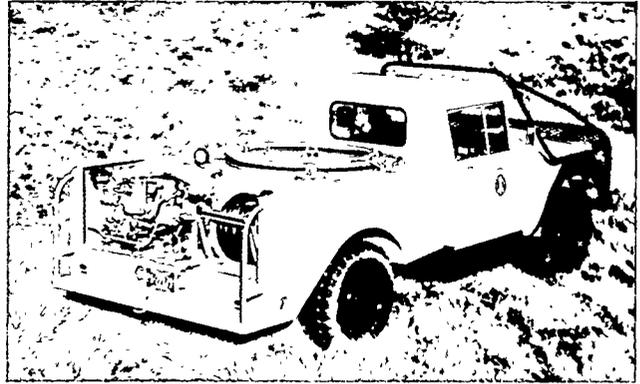
Engine Data Sheet No.45

Agency: Michigan Department of Natural Resources

Equipment Designator: M-715 Low-Profile

ICS Type: 6

Summary: **Tank Capacity** - 200 gal
Pump Rating - 57 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The M-715 integral unit is constructed on the military 5/4-ton, 4 x 4 truck, and is designed for off-road service with armor protection against brush damage.

Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 85 gpm (max) at free flow;
0 gpm @ max psi = 300
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 6 in

Controls and Gauges:

Throttle Priming Valve Handle
Choke Water Level —
Pressure Gauge Engine Temperature —
Vacuum Gauge — Discharge Valve Handle
Tachometer — Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain —
Gravity Tank Drain/Dump ; Size, 1-1/2-in

Chassis:

Manufacturer: Military M-715 **Cab/Axle:** 50 in
GVW Rating: 8,900 **Power Plant:** Gasoline
Transmission Type: Manual **Brake Type:** Hydraulic

Written Materials:

Specifications and drawings are available from:
Roscommon Equipment Center
c/o Forest Fire Experiment Station
P.O. Box 68
Roscommon, MI 48653
Telephone: 517/275-5211

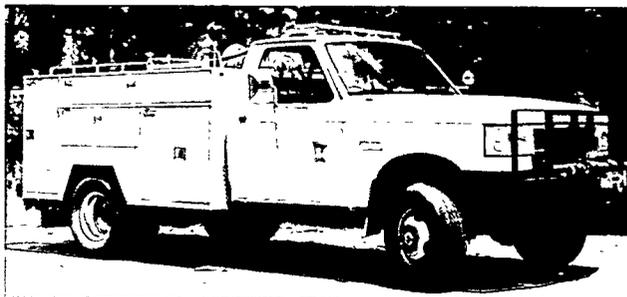
WATER PUMPING EQUIPMENT Engine Data Sheet No.46

Agency: Minnesota Department of Natural Resources

Equipment Designator: Minnesota 200

ICS Type: 6

Summary: *Tank Capacity* - 200 gal
Pump Rating - 48 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The State of Minnesota 200-gal unit has hand tool compartments on two sides, and its cab seats two; the truck overall features a low-profile design. There is a 6-in clamp-down cover located at the rear of the vehicle. The 200-gal tank and pump system is a slip-on unit which is bolted to the bed of a utility body. The truck carries a brush guard, chainsaw, drip torch, backpack pumps, Pulaskis, shovels, fire rakes, and McLeod fire tools.

Pump:

Make: Wajax **Model:** B1-11
Type: Single-stage centrifugal
Performance: 65 gpm (max) at free flow;
0 gpm @ max psi = 280
Primer Type: Hand

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 6 in

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge <input checked="" type="checkbox"/>	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 1-1/2-in
Hose Reel, one
Adjustable Pressure Relief
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain
Gravity Tank Drain/Dump ; Size, 1-1/2-in

Chassis:

Manufacturer:	User option	Cab/Axle:	60 in
GVW Rating:	11,000	Power Plant:	Gasoline
Transmission Type:	Automatic	Brake Type:	Hydraulic

Written Materials:

Specifications and drawings are available from:
Minnesota Department of Natural Resources
Field Services
1201 East Highway 2
Grand Rapids, MN 55744
Telephone: 218/327-4443

WATER PUMPING EQUIPMENT

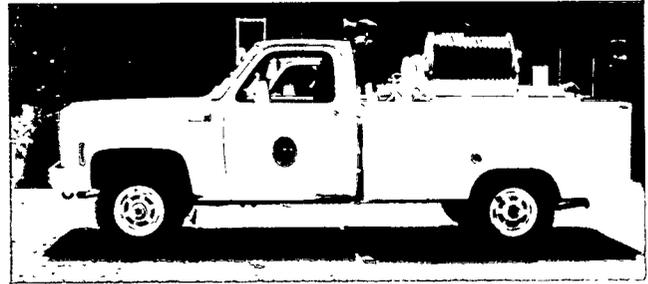
Engine Data Sheet No.47

Agency: Oregon Department of Forestry

Equipment Designator: F-2

ICS Type: 6

Summary: *Tank Capacity* - 200 gal
Pump Rating - —
Pump Drive - PTO
Running Attack Capability - Yes



General Description:

The F-2 is a key in the Department's initial attack system. It is quick both on and off the road. The pumping system is standardized with the larger F-3 and F-5 engines. It may be operated by one crewperson. The unit consists of a service body, fiberglass tank, and one hose reel.

Pump:

Make: Gorman Rupp **Model:** 02F1
Type: Single-stage centrifugal
Performance: 180 gpm (max) at free flow;
15 gpm @ max psi = 250
Primer Type: Self-priming

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 2; Size, 1-1/2-in
Suction - Number, 2; Size, 2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	56 in
GVW Rating:	9,000	Power Plant:	—
Transmission Type:	Standard	Brake Type:	Hydraulic

Written Materials:

Specifications and drawings are available from:
Oregon Department of Forestry
Fire Equipment Specialist
2600 State Street
Salem, OR 97310
Telephone: 503/378-2531

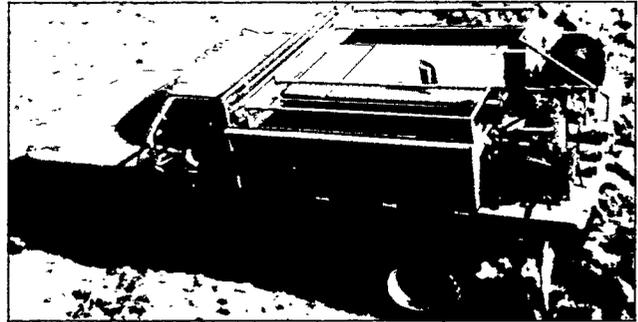
WATER PUMPING EQUIPMENT
Engine Data Sheet No.48

Agency: USDA Forest Service (Northern Region, R-1)

Equipment Designator: Model 52

ICS Type: 6

Summary: *Tank Capacity* - 200 to 300 gal
Pump Rating - 63 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Model 52 is designed to fit on an 8- or 9-ft flatbed truck. The unit consists of a fiberglass tank, pump, hose reel, storage compartments, and appropriate plumbing. The unit can easily be removed from the vehicle.

Pump:

Make: Wajax **Model:** BB-4
Type: Single-stage centrifugal
Performance: 79 gpm (max) at free flow;
11 gpm @ max psi = 250
Primer Type: Hand

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 1-1/2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: User option	Cab/Axle 60 in:
GVW Rating: 12,000 to 14,500	Power Plant: Gasoline
Transmission Type: 5-speed	Brake Type: User option

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Aerial Fire Depot, Interagency Engine Program
Box 6, Airport Terminal
Missoula, MT 59802
Telephone: 406/329-4884

WATER PUMPING EQUIPMENT

Engine Data Sheet No.49

Agency: USDA Forest Service
(Southwestern Region, R-3)

Equipment Designator: Model 22

ICS Type: 6

SUMMARY: Tank Capacity - 200 GAL
 Pump Rating - 70 gpm @ 150 psi
 Pump Drive - 18-hp Briggs & Stratton
 Running Attack Capability - Yes



General Description:

This unit features a frame-mounted engine, pump, live reel, plumbing, and control panel; the tank is mounted separately. The entire package is mounted on a flatbed and uses commercially available storage boxes.

Pump:

Make: Hale **Model:** 20FS-B42
Type: Centrifugal
Performance: 70 gpm (max) at free flow;
 30 gpm @ max psi = 340
Primer Type: Hand

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
 Baffles - Six
 Fill Spout -
 6 in (left front)

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
 Overboard Discharge - Number, 1; Size, 1-1/2-in
 Suction - Number, 1; Size, 1-1/2-in
 Hose Reel
 Adjustable Pressure Relief
 Tank-to-Plumbing Shut-Off
 Pump and Plumbing Drain
 Gravity Tank Drain/Dump ; Size, 2-in

Chassis:

Manufacturer:	User option	Cab/Axle :	60 in
GVW Rating:	11,000	Power Plant:	454 CID gasoline
Transmission Type:	4-speed manual	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
 USDA Forest Service
 Southwestern Region
 517 Gold Avenue, S.W.
 Albuquerque, NM 87102
 Telephone: 505/842-3862

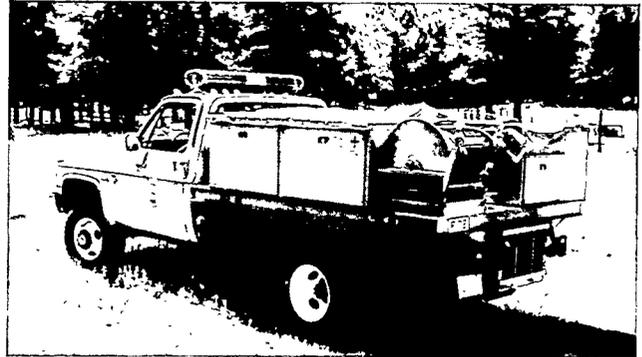
WATER PUMPING EQUIPMENT
Engine Data Sheet No.50

Agency: USDA Forest Service (
Southwestern Region, R-3)

Equipment Designator: Model 43

ICS Type: 6

Summary: *Tank Capacity* - 200 gal
Pump Rating - 90 gpm @ 150 psi
Pump Drive - PTO
Running Attack Capability - Yes



General Description:

This unit is a slip-on that fits on a 1-ton flatbed truck. A pto pump is mounted on the truck frame and attaches to the slip-on unit with quick couplings. The unit can be easily removed to allow the truck to be used for other purposes.

Pump:

Make: Gorman Rupp **Model:** 02F1
Type: Single-stage centrifugal
Performance: 180 gpm (max) at free flow;
15 gpm @ max psi = 250
Primer Type: Self-priming

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature <input checked="" type="checkbox"/>
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 3; Size, 1-1/2-in
Suction - Number, 1; Size, 2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: User option
GVW Rating: 11,000
Transmission Type: Standard

Cab/Axle: 72 in
Power Plant: Various
Brake Type: Hydraulic

Written Materials:

Specifications and drawings are available from:

USDA Forest Service
Southwestern Region
517 Gold Avenue, S.W.
Albuquerque, NM 87102
Telephone: 505/842-3862

WATER PUMPING EQUIPMENT

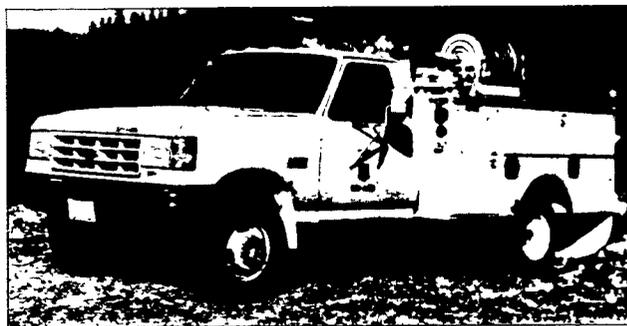
Engine Data Sheet No.51

Agency: USDA Forest Service
(Pacific Northwest Region, R-6)

Equipment Designator: Model 45

ICS Type: 6

Summary: *Tank Capacity* - 200 gal
Pump Rating - —
Pump Drive - PTO
Running Attack Capability - Yes



General Description:

The Model 45 is attached to a truck chassis with a two-person cab. It consists of a transmission pto and a self-priming centrifugal pump, two hose reels, plumbing, control panel, and 200-gal tank on a service body.

Pump:

Make: Gorman Rupp **Model:** 02F1
Type: Single-stage centrifugal
Performance: 180 gpm (max) at free flow;
15 gpm @ max psi = 250
Primer Type: Electric

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 2; Size, 1-1/2-in
Suction - Number, 2; Size, 2-1/2-in
Hose Reel, two
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	72 in
GVW Rating:	14,000	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

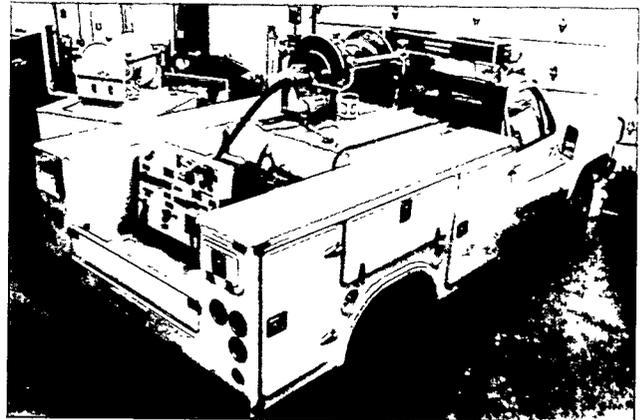
WATER PUMPING EQUIPMENT
Engine Data Sheet No.52

Agency: USDI Bureau of Land Management

Equipment Designator: I-200

ICS Type: 6

Summary: *Tank Capacity* - 200 gal
Pump Rating - Varies
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The I-200 unit consist of a fiberglass tank, pump, hose reel, appropriate plumbing, and accessories. The tank and reel are a separate module from the pump and controls. This allows the pumps to be interchanged quickly for repairs and servicing.

Pump Options:

<u>Make</u>	<u>Model</u>	<u>Performance</u>
Western Fire	14270	43 gpm @ 150 psi
Wajax	B1-11	44 gpm @ 150 psi
Wajax	BB-4	72 gpm @ 150 psi

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>
Overboard Discharge - Number, 1; Size, 1-1/2-in	
Suction - Number, 1; Size, 1-1/2-in	
Hose Reel, one	
Adjustable Pressure Relief —	
Tank-to-Plumbing Shut-Off <input checked="" type="checkbox"/>	
Pump and Plumbing Drain —	
Gravity Tank Drain/Dump —	

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	—	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
National Interagency Fire Center
Fire Equipment Specialist
3905 Vista Avenue
Boise, ID 83705
Telephone: 208/389-2431

WATER PUMPING EQUIPMENT

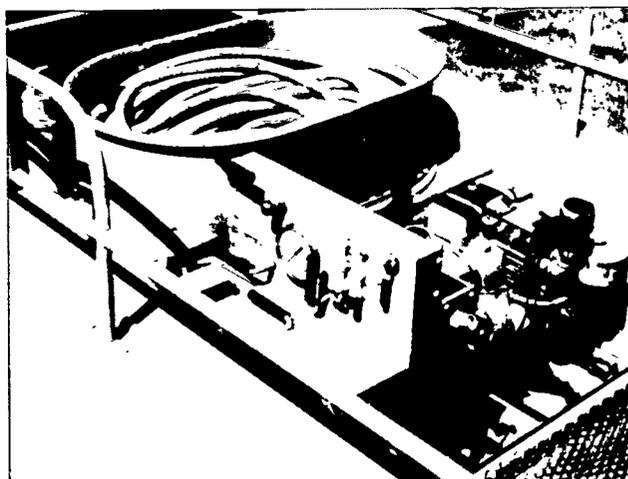
Engine Data Sheet No.53

Agency: USDA Forest Service
(Pacific Southwest Region, R-5)

Equipment Designator: Models 20 & 21

ICS Type: 6

Summary: **Tank Capacity** - 75 to 200 gal
Pump Rating - Varies
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Model 20 consists of an engine, pump, live hose reel or hose basket, plumbing, and control panel mounted on a 75-, 125-, or 200-gal tank and slips onto a pickup truck. The Model 21 differs from the Model 20 in tank dimensions to facilitate dual rear wheel vehicles.

Pump Options:

Make	Model	Performance
Berkeley	B1-1/2xQBS-11	40 gpm @ 150 psi
Valley Tool	14270	43 gpm @ 150 psi
Wajax	B1-11	44 gpm @ 150 psi
Wajax	BB-4	72 gpm @ 150 psi
Hale	20FD-B25	54 gpm @ 150 psi
Edwards	TSD-25	37 gpm @ 150 psi

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 4 in

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>	Adjustable Pressure Relief —
Overboard Discharge - Number, 1; Size, 1-1/2-in		Tank-to-Plumbing Shut-Off <input checked="" type="checkbox"/>
Suction - Number, 1; Size, 1-1/2-in		Pump and Plumbing Drain <input checked="" type="checkbox"/>
Hose Reel, one		Gravity Tank Drain/Dump <input checked="" type="checkbox"/> ; Size, 1-1/2-in

Chassis:

Manufacturer:	User option	Cab/Axle:	60 in
GVW Rating:	—	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

WATER PUMPING EQUIPMENT

Engine Data Sheet No.54

Agency: USDA Forest Service
(Pacific Southwest Region, R-5)

Equipment Designator: Model 41

ICS Type: 6

Summary: **Tank Capacity** - 75, 125, and 200 gal
Pump Rating - Varies
Pump Drive - PTO
Running Attack Capability - Yes



General Description:

The Model 41 unit is attached to a truck chassis with a two-person cab. It consists of a transmission pto, centrifugal pump, hose reel or hose basket, plumbing, control panel, and a 75-, 125-, or 200-gal tank on a low-silhouette service body.

Pump:

Make: Gorman Rupp **Model:** 02F1
Type: Single-stage centrifugal
Performance: 180 gpm (max) at free flow;
15 gpm @ max psi = 250
Primer Type: Self-priming

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke —	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-1/2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	72 in
GVW Rating:	8,500 to 11,000	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

WATER PUMPING EQUIPMENT

Engine Data Sheet No.55

Agency: USDA Forest Service

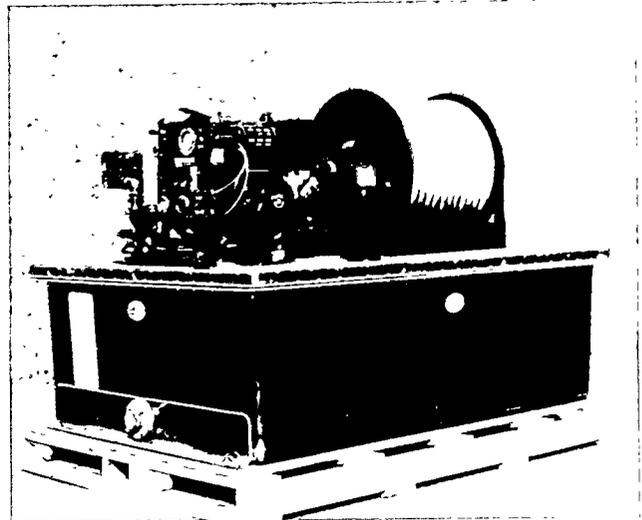
Equipment Designator: Model 30

ICS Type: 6-7

Summary: **Tank Capacity** - 75, 125, and 200 gal
Pump Rating - Varies
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes

General Description:

The Model 30 slip-on unit consists of an engine, pump, hose reel, plumbing, and fiberglass tank.



Pump Options:

Tank:

<u>Make</u>	<u>Model</u>	<u>Performance</u>
Berkeley	B1-1/2xQBS-11	40 gpm @ 150 psi
Western Fire	14270	43 gpm @ 150 psi
Wajax	B1-11	44 gpm @ 150 psi
Wajax	BB-4	72 gpm @ 150 psi
Hale	20FD-B25	54 gpm @ 150 psi
Edwards	TSD-25	37 gpm @ 150 psi

Material: Fiberglass
Construction: Removable Top - Yes
 Baffles - Yes
 Fill Spout - 4 in

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
 Overboard Discharge - Number, 1; Size, 1-1/2-in
 Suction - Number, 1; Size, 1-1/2-in
 Hose Reel, one
 Adjustable Pressure Relief w/positive displacement pump
 Tank-to-Plumbing Shut-Off —
 Pump and Plumbing Drain
 Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	—	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
 USDA Forest Service
 Technology and Development Center
 444 East Bonita Avenue
 San Dimas, CA 91773
 Telephone: 909/599-1267

WATER PUMPING EQUIPMENT

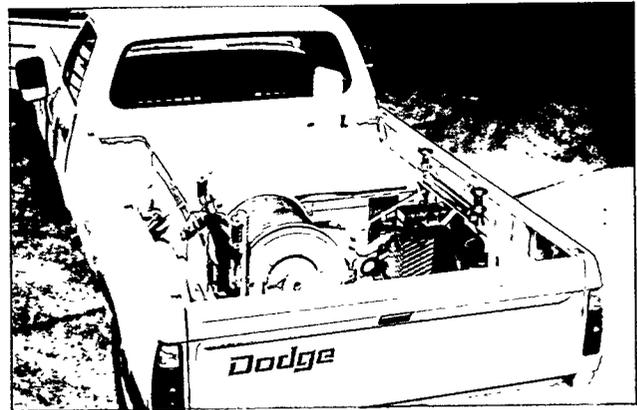
Engine Data Sheet No.56

Agency: Oregon Department of Forestry

Equipment Designator: F-1

ICS Type: 7

Summary: *Tank Capacity* - 150 gal
Pump Rating - 60 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The purpose of the unit is to provide optimum water support to forest firefighter. The F-1 system expands the availability of tank and vehicle combinations. It provides multifunction pumping capability in a self-contained engine-driven module that is ideal for deck mounting behind various tank sizes. The pumping module has a standardized, multifunctional piping system with one-step readiness capability. It activates by starting the engine. The pump has direct suction and discharge conduits valved at the tank connections. Basic outlets are a 1-1/2-in discharge and a 1-in hose reel supply. Engine controls, start button, kill button, choke and throttle are accessible from the rear ground level. Pumping controls, valve handle extensions, gauge and exhaust primer controls are also accessible from the ground.

Pump:

Make: Hale **Model:** 20-FD-B32
Type: Single-stage centrifugal
Performance: 100 gpm (max) at free flow;
 10 gpm @ max psi = 360
Primer Type: Exhaust

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
 Baffles - Yes
 Fill Spout - 4 in

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>	Adjustable Pressure Relief <input checked="" type="checkbox"/>
Overboard Discharge - Number, 1; Size, 1-1/2-in		Tank-to-Plumbing Shut-Off —
Suction - Number, 1; Size, 2-in		Pump and Plumbing Drain <input checked="" type="checkbox"/>
Hose Reel, one		Gravity Tank Drain/Dump —

Chassis:

Manufacturer: User option	Cab/Axle: —
GVW Rating: —	Power Plant: —
Transmission Type: —	Brake Type: —

Written Materials:

Specifications and drawings are available from:
 Oregon Department of Forestry
 Fire Equipment Specialist
 2600 State Street
 Salem, OR 97310
 Telephone: 503/378-2531

WATER PUMPING EQUIPMENT

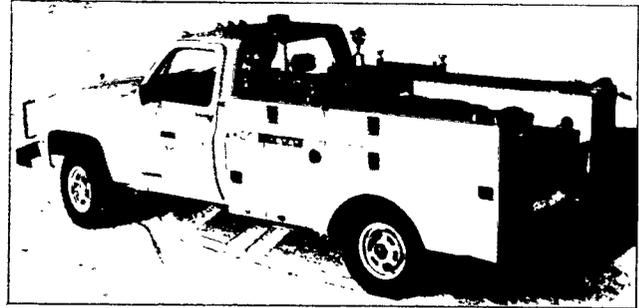
Engine Data Sheet No.57

Agency: Wisconsin Department of Natural Resources

Equipment Designator: Wisconsin Integral

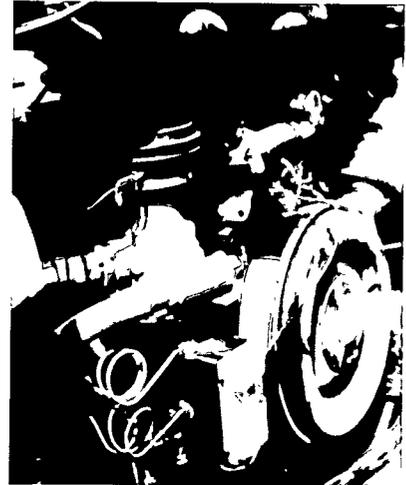
ICS Type: 7

Summary: **Tank Capacity** - 150 gal
Pump Rating - 20 gpm @ 100 psi
Pump Drive - Engine V-belt
Running Attack Capability - Yes



General Description:

The Wisconsin 150-gal, 4 x 4 Forest Ranger Initial Attack unit is designed as an integral unit. The pump is mounted under the hood, a 150-gal tank is mounted in the front of the pickup box, a hose reel is between the storage boxes. The unit is plumbed with 1-in pipe with the suction connection just outside of the front grill.



Pump:

Make: Viking **Model:** HL-432
Type: Rotary, positive displacement
Performance: 20 gpm (max) at free flow;
20 gpm @ max psi = 200
Primer Type: Self-priming

Tank:

Material: Steel
Construction:
Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke —	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-in
Suction - Number, 1; Size, 1-in
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	Various	Cab/Axle:	—
GVW Rating:	8,500	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:

Wisconsin Department of Natural Resources
Equipment and Training Center
518 West Somo Avenue
Tomahawk, WI 54487
Telephone: 715/453-2188

WATER PUMPING EQUIPMENT

Engine Data Sheet No.58

Agency: Indiana Department of Natural Resources

Equipment Designator: Midrange

ICS Type: Other

Summary: **Tank Capacity** - 90 gal
Pump Rating - 47 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

This unit is designed for a mid-range pickup, such as the Chevrolet S-10 or Ford Ranger. It consists of a pump, hose reel, plumbing, and control panel mounted on a 90-gal aluminum tank.

Pump:

Make: Hale **Model:** 20-FD-B25
Type: Single-stage centrifugal
Performance: 60 gpm (max) at free flow;
10 gpm @ max psi = 275
Primer Type: Exhaust

Tank:

Material: Aluminum
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 1-1/2-in
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	Various	Cab/Axle:	56 in
GVW Rating:	5,000	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:

Indiana Department of Natural Resources
Fire Control Headquarters
6220 Forest Road
Martinsville, IN 46151
Telephone: 317/342-4701

WATER PUMPING EQUIPMENT

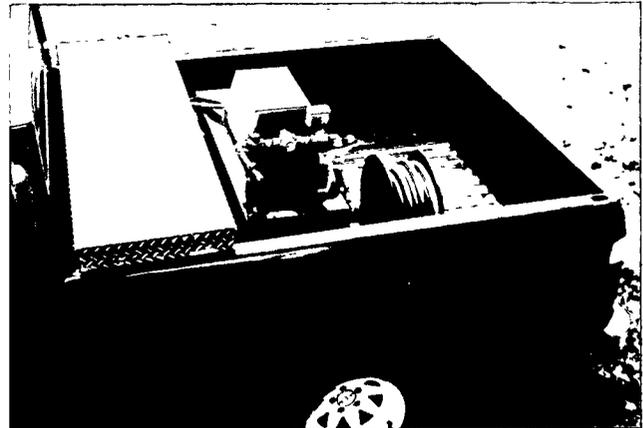
Engine Data Sheet No.59

Agency: Florida Division of Forestry

Equipment Designator: Aqua-dak

ICS Type: Other

Summary: *Tank Capacity* - 80 gal
Pump Rating - 8 gpm @ 65 psi
Pump Drive - Electric Motor
Running Attack Capability - Yes



General Description:

The 80-gal tank with electric pump is designed for use in 5,600 to 8,500 GVW vehicles.

Pump:

Make: Aqua-dak **Model:** Hypro 4001N
Type: Positive displacement
Performance: 8 gpm (max) at free flow;
 3.2 gpm @ max psi = 150
Primer Type: Self-priming

Tank:

Material: Steel
Construction: Removable Top - No
 Baffles - No
 Fill Spout - Yes

Controls and Gauges:

Throttle — Priming Valve Handle —
 Choke — Water Level —
 Pressure Gauge — Engine Temperature —
 Vacuum Gauge — Discharge Valve Handle —
 Tachometer — Suction Valve Handle —

Valves:

Tank-to-Pump — Pump-to-Tank —
 Overboard Discharge - Number, 1; Size, 1-in
 Suction - Number — Size —
 Hose Reel —
 Adjustable Pressure Relief —
 Tank-to-Plumbing Shut-Off —
 Pump and Plumbing Drain —
 Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	Various	Cab/Axle:	—
GVW Rating:	—	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
 Florida Division of Forestry
 Fire Control Bureau
 3125 Conner Boulevard
 Tallahassee, FL 32399-1650
 Telephone: 904/488-4244

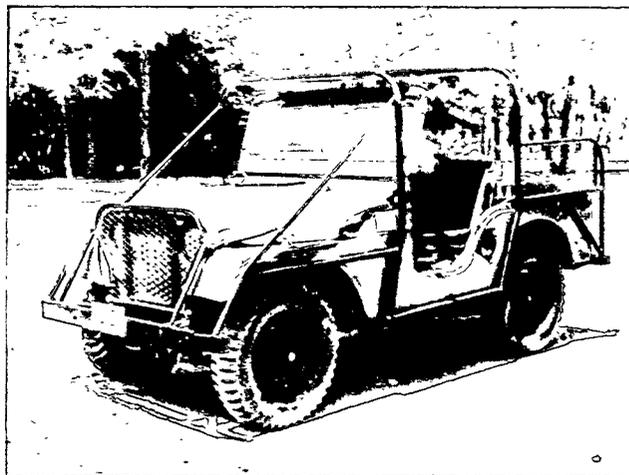
WATER PUMPING EQUIPMENT Engine Data Sheet No.60

Agency: Michigan Department of Natural Resources

Equipment Designator: M-38

ICS Type: Other

Summary: *Tank Capacity* - 66 gal
Pump Rating - 11 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The M-38 Jeep unit consist of a T-shaped steel tank and a nylon roller-type pump. The engine is equipped with a fixed hose and hand hangers, front out-rigged spray nozzles, hose and hose nozzle, brush protection system, emergency light, and siren.

Pump Options:

<u>Make</u>	<u>Model</u>	<u>Performance</u>
Edwards	EBE	10 gpm @ 150 psi
Wajax Pacific	BE	11 gpm @ 150 psi

Tank:

Material:	Steel
Construction:	Removable Top - Yes Baffles - Yes Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>
Overboard Discharge - Number, 1; Size, 1-in	
Suction - Number, 1; Size, 1-in	
Hose Reel <input checked="" type="checkbox"/>	
Adjustable Pressure Relief —	
Tank-to-Plumbing Shut-Off —	
Pump and Plumbing Drain —	
Gravity Tank Drain/Dump —	

Chassis:

Manufacturer:	Military	Cab/Axle:	—
GVW Rating:	—	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
 Roscommon Equipment Center
 c/o Forest Fire Experiment Station
 P.O. Box 68
 Roscommon, MI 48653
 Telephone: 517/275-5211

WATER PUMPING EQUIPMENT

Engine Data Sheet No.61

Agency: USDA Forest Service

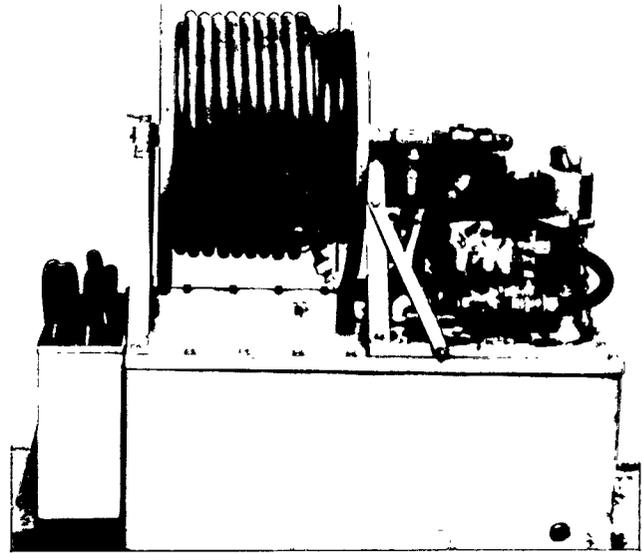
Equipment Designator: Model 10

ICS Type: Other

Summary: **Tank Capacity** - 50 gal
Pump Rating - 11 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes

General Discription:

The Model 10 slip-on unit consists of an engine, pump, hose reel, and plumbing mounted on a 50-gal tank and slips on a pickup. The overall package dimensions are 26-1/2-in wide by 43-in long and 41-in high.



Pump Options:

<u>Make</u>	<u>Model</u>	<u>Performance</u>
Edwards	EBE	10 gpm @ 150 psi
Wajax Pacific	BE	11 gpm @ 150 psi

Tank:

Material: Steel
Construction: Removable Top - Yes
 Baffles - Yes
 Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level <input type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature <input type="checkbox"/>
Vacuum Gauge <input type="checkbox"/>	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump <input checked="" type="checkbox"/>	Pump-to-Tank <input checked="" type="checkbox"/>	Adjustable Pressure Relief <input checked="" type="checkbox"/>
Overboard Discharge - Number, 1; Size, 1-in		Tank-to-Plumbing Shut-Off <input type="checkbox"/>
Suction - Number, 1; Size, 1-in		Pump and Plumbing Drain <input type="checkbox"/>
Hose Reel, one		Gravity Tank Drain/Dump <input type="checkbox"/>

Chassis:

Manufacturer: Various	Cab/Axle: <input type="checkbox"/>
GVW Rating: <input type="checkbox"/>	Power Plant: <input type="checkbox"/>
Transmission Type: <input type="checkbox"/>	Brake Type: <input type="checkbox"/>

Written Materials:

Specifications and drawings are available from:
 USDA Forest Service
 Technology and Development Center
 444 East Bonita Avenue
 San Dimas, CA 91773
 Telephone: 909/599-1267

WATER PUMPING EQUIPMENT Water Tender Matrix

D. Water Tenders

Water tenders are designed to transport large quantities of water, and are categorized by the capacity and pumping capabilities.

Sheet No.	ICS Type	Gallons	Pump drive	Model Designation	Agency
1	1	6,000	Auxiliary engine	—	Florida Div For
2	2	3,000	pto	—	USDA FS (R-3)
3	2	3,000	pto	—	USDA FS (R-5)
4	2	2,800	pto	—	USDI BLM
5	2	2,800	pto	90	USDA FS (R-6)
6	2	2,550	pto	—	USDI BLM
7	3	1,500	pto	—	USDA FS (R-3)
8	3	1,500	pto	—	USDA FS (R-5)
9	3	1,300	pto	Fastack II	Florida Div For
10	3	1,250	Auxiliary engine	Mobile H2O	Georgia For Com
11	3	1,200	pto	—	N.J. For FS

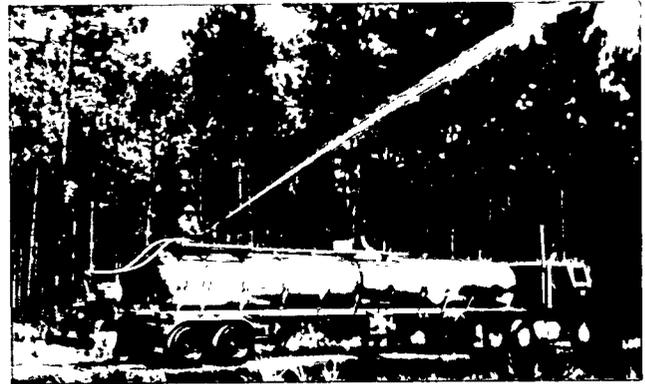
WATER PUMPING EQUIPMENT
Water Tender Data Sheet No.1

Agency: Florida Division of Forestry

Equipment Designator: 6,000-gal

ICS Type: 1

Summary: *Tank Capacity* - 6,000 gal
Pump Rating - 175 gpm @ 150 psi
Pump Drive - Auxiliary Engine



General Description:

This is a 6,000-gal stainless steel semitrailer. Sanitary baffles designed to dairy industry standards provide potable water in disaster operations. An auxiliary pump and a top-mounted deluge gun are included on the trailer.

Pump:

Make: Hale **Model:** 45FP-VW53
Type: Single-stage centrifugal
Performance: —
Primer Type: —

Tank:

Material: 304 stainless steel
Construction: Removable Top - 20-in hatch
 Baffles - Two (sanitary style)
 Fill Spout —

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke <input checked="" type="checkbox"/>	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
 Overboard Discharge - Number — Size —
 Suction - Number — Size —
 Hose Reel, two
 Adjustable Pressure Relief —
 Tank-to-Plumbing Shut-Off —
 Pump and Plumbing Drain —
 Gravity Tank Drain/Dump ; Size, 4-in

Chassis:

Manufacturer: —	Cab/Axle: —
GVW Rating: —	Power Plant: —
Transmission Type: —	Brake Type: —

Written Materials:

Specifications and drawings are available from:
 Florida Division of Forestry
 Engineering Services Bureau
 3125 Conner Boulevard
 Tallahassee, FL 32399-1650
 Telephone: 904/488-4244

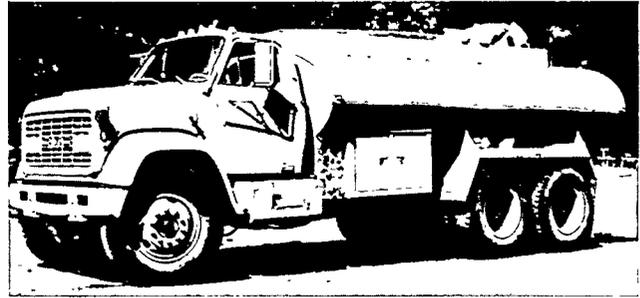
WATER PUMPING EQUIPMENT
Water Tender Data Sheet No.2

Agency: USDA Forest Service (Southwestern Region, R-3)

Equipment Designator: 3,000-gal

ICS Type: 2

Summary: Tank Capacity - 3,000 gal
Pump Rating - 350 gpm @ 150 psi
Pump Drive - PTO



General Description:

The 3,000-gal water tender is built on a 50,000-lb GVW 6 x 4 chassis equipped with a 13-speed Road Ranger transmission. The pto is engaged from the cab.

Pump:

Make: Darley **Model:** HM 350
Type: Single-stage centrifugal
Performance: 350 gpm (max) at free flow;
350 gpm @ max psi = 150
Primer Type: Electric

Tank:

Material: Steel
Construction: Removable Top - No
Baffles - Yes
Fill Spout - 24 in

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature <input checked="" type="checkbox"/>
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 2-1/2-in
Suction - Number, 2; Size, 2-1/2-in
Hose Reel —
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain
Gravity Tank Drain/Dump ; Size, 2-1/2-in

Chassis:

Manufacturer: User option
GVW Rating: 50,000
Transmission Type: 13-speed manual

Cab/Axle: 106 in
Power Plant: Diesel
Brake Type: Air

Written Materials:

Specifications and drawings are available from:

USDA Forest Service
Southwestern Region
517 Gold Avenue, S.W.
Albuquerque, NM 87102
Telephone: 505/842-3862

WATER PUMPING EQUIPMENT

Water Tender Data Sheet No.3

Agency: USDA Forest Service
(Pacific Southwest Region, R-5)

Equipment Designator: 3,000-gal

ICS Type: 2

Summary: **Tank Capacity** - 3,000 gal
Pump Rating - 300 gpm @ 80 psi
Pump Drive - PTO



General Description:

The 3,000-gal unit is attached to a 56,000-lb GVW 6 x 4 truck chassis with a conventional cab, one hose reel, 3,000-gal tank, and transmission pto pump. The pto unit is engaged from the cab.

Pump:

Make: Gorman Rupp **Model:** 0341
Type: Single-stage centrifugal
Performance: —
Primer Type: Electric

Tank:

Material: Steel; interior epoxy coat
Construction: Removable Top —
Baffles —
Fill Spout —

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature <input checked="" type="checkbox"/>
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number — Size —
Suction - Number — Size —
Hose Reel —
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	Various	Cab/Axle:	—
GVW Rating:	56,000	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Pacific Southwest Region
630 Sansome Street
San Francisco, CA 94111
Telephone: 415/705-2874

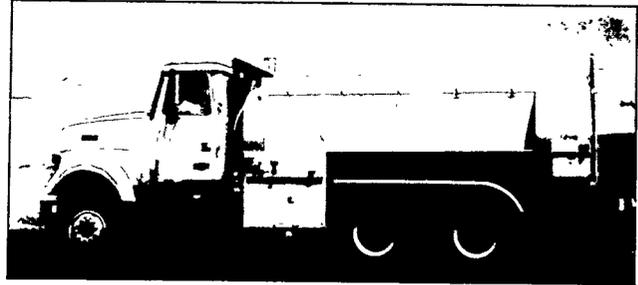
WATER PUMPING EQUIPMENT
Water Tender Data Sheet No.4

Agency: USDI Bureau of Land Management

Equipment Designator: 2,800-gal

ICS Type: 2

Summary: *Tank Capacity* - 2,800 gal
Pump Rating - 260 gpm @ 200 psi
Pump Drive - PTO



General Description:

This 2,800-gal unit is mounted on a 50,000-lb GVW chassis. The tanks are indented with hooks welded at the top of the indentations to accommodate a 1,500-gal fold-a-tank on each side. The rear bumper is made from 4 x 4 x 1/4 steel tubing and plumbed to be used as a spray bar.

Pump:

Make: Hale **Model:** CBP series
Type: Single-stage centrifugal
Performance: —
Primer Type: Electric

Tank:

Material: Steel
Construction: Removable Top —
Baffles Yes
Fill Spout —

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature <input checked="" type="checkbox"/>
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number — Size —
Suction - Number — Size —
Hose Reel —
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	50,000	Power Plant:	Diesel
Transmission Type:	—	Brake Type:	Air

Written Materials:

Specifications and drawings are available from:

National Interagency Fire Center
Fire Equipment Specialist
3905 Vista Avenue
Boise, ID 83705
Telephone: 208/389-2431

WATER PUMPING EQUIPMENT
Water Tender Data Sheet No.5

Agency: USDA Forest Service
(Pacific Northwest Region, R-6)

Equipment Designator: Model 90

ICS Type: 2

Summary: *Tank Capacity* - 2,800 gal
Pump Rating - 300 gpm @ 150 psi
Pump Drive - PTO



General Description:

The Model 90 2,800-gal unit is attached to a 6 x 4 truck chassis with conventional cab, one hose reel, 2,800-gal tank, and pto pump. The pto is engaged from the cab.

Pump:

Make: Hale Model: CBP series
Type: Single-stage centrifugal
Performance: 350 gpm (max) at free flow;
225 gpm @ max psi = 400
Primer Type: Electric

Tank:

Material: Steel; interior epoxy
Construction: Removable Top - —
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature <input checked="" type="checkbox"/>
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer <input checked="" type="checkbox"/>	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 3; Size, 1-1/2-in
Suction - Number, 2; Size, 2-1/2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump ; Size, 6-in

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	56,000	Power Plant:	Diesel
Transmission Type:	Manual	Brake Type:	Air

Written Materials:

Specifications and drawings are available from:
USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

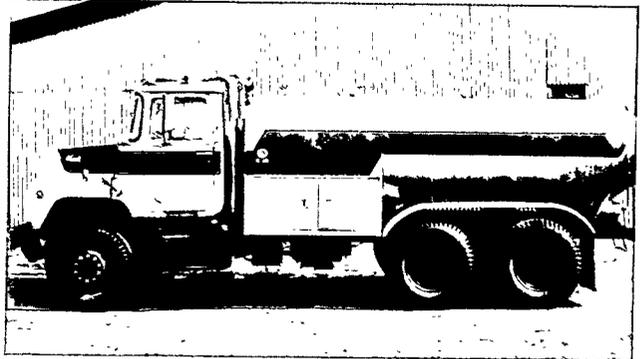
WATER PUMPING EQUIPMENT
Water Tender Data Sheet No.6

Agency: USDI Bureau of Land Management

Equipment Designator: 2,550-gal

ICS Type: 2

Summary: *Tank Capacity* - 2,550 gal
Pump Rating - 300 gpm @ 80 psi
Pump Drive - PTO



General Description:

This unit is a 2,550-gal tank mounted on a 56,000-lb GVW truck chassis. The truck is equipped with an Allison transmission and pto pump.

Pump:

Make: Gorman Rupp **Model:** 02H1-G
Type: Single-stage centrifugal
Performance: —
Primer Type: —

Tank:

Material: Steel
Construction: Removable Top —
Baffles —
Fill Spout —

Controls and Gauges:

Throttle Priming Valve Handle —
Choke — Water Level
Pressure Gauge Engine Temperature
Vacuum Gauge — Discharge Valve Handle
Tachometer Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number — Size —
Suction - Number — Size —
Hose Reel —
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	56,000	Power Plant:	Diesel
Transmission Type:	Allison	Brake Type:	Air

Written Materials:

Specifications and drawings are available from:

National Interagency Fire Center
Fire Equipment Specialist
3905 Vista Avenue
Boise, ID 83705
Telephone: 208/389-2431

WATER PUMPING EQUIPMENT
Water Tender Data Sheet No.7

Agency: USDA Forest Service
 (Southwestern Region, R-3)

Equipment Designator: 1,500-gal

ICS Type: 3

Summary: *Tank Capacity* - 1,500 gal
Pump Rating - 250 gpm @ 150 psi
Pump Drive - PTO

General Description:

The 1,500-gal, conventional cab water tender is built on a 32,000-lb GVW 4 x 2 chassis. The two 1,000- or 1,500-gal foldatanks are carried in the side compartments.



Pump:

Make: Hale **Model:** CBP-3
Type: Centrifugal
Performance: 300 gpm (max) at free flow;
 150 gpm @ max psi = 300
Primer Type: Electric

Tank:

Material: Steel
Construction: Removable Top - No
 Baffles - Two
 Fill Spout -
 18 in (top middle)

Controls and Gauges:

Throttle Priming Valve Handle
 Choke — Water Level
 Pressure Gauge Engine Temperature
 Vacuum Gauge — Discharge Valve Handle
 Tachometer Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
 Overboard Discharge - Number, 3; Size, 1-1/2-in
 Suction - Number, 2; Size, 2-1/2-in
 Hose Reel —
 Adjustable Pressure Relief —
 Tank-to-Plumbing Shut-Off
 Pump and Plumbing Drain
 Gravity Tank Drain/Dump ; Size, 12-in

Chassis:

Manufacturer:	User option	Cab/Axle:	84 in
GVW Rating:	32,000	Power Plant:	Diesel
Transmission Type:	5-speed auto; 2-speed rear axle	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
 USDA Forest Service
 Southwestern Region
 517 Gold Avenue, S.W.
 Albuquerque, NM 87102
 Telephone: 505/842-3862

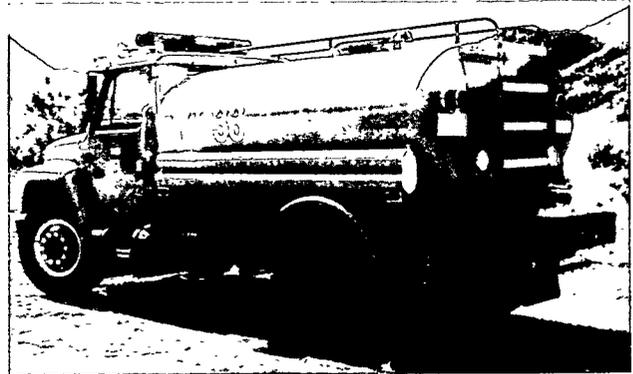
WATER PUMPING EQUIPMENT
Water Tender Data Sheet No.8

Agency: USDA Forest Service
(Pacific Southwest Region, R-5)

Equipment Designator: 1,500-gal

ICS Type: 3

Summary: *Tank Capacity* - 1,500 gal
Pump Rating - 300 gpm @ 80 psi
Pump Drive - PTO



General Description:

The 1,500-gal unit is attached to a 4 x 2 truck chassis with conventional cab, one hose reel, 1,500-gal tank, and transmission pto pump. The pto is engaged from the cab.

Pump:

Make: Gorman Rupp **Model:** 03H1-GR
Type: Single-stage centrifugal
Performance: —
Primer Type: Self-priming

Tank:

Material: Steel; interior epoxy coat
Construction: Removable Top —
Baffles Yes
Baffles Yes

Controls and Gauges:

Throttle Priming Valve Handle —
Choke — Water Level
Pressure Gauge Engine Temperature
Vacuum Gauge — Discharge Valve Handle
Tachometer Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number — Size —
Suction - Number — Size —
Hose Reel —
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	28,000	Power Plant:	Diesel
Transmission Type:	Manual	Brake Type:	Air

Written Materials:

Specifications and drawings are available from:

USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

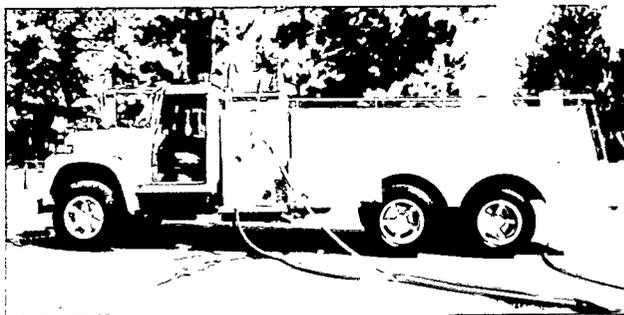
WATER PUMPING EQUIPMENT
Water Tender Data Sheet No.9

Agency: Florida Division of Forestry

Equipment Designator: Fastack II

ICS Type: 3

Summary: *Tank Capacity* - 1,300 gal
Pump Rating - 250 gpm @ 150 psi
Pump Drive - PTO



General Description:

The Fastack II 1,300-gal water tender is built on a 39,000-lb GVW tandem-axle chassis with a conventional cab. It consists of a pto-driven pump with an electric primer, two hose reels, and intergral storage compartments.

Pump:

Make: Darley **Model:** HM 250
Type: Single-stage centrifugal
Performance: 250 gpm (max) at free flow;
110 gpm @ max psi = 300
Primer Type: Electric

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke —	Water Level <input checked="" type="checkbox"/>
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature <input checked="" type="checkbox"/>
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 2-1/2-in
Suction - Number, 1; Size, 3-in
Hose Reel, two
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump ; Size, 6-in

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	39,000	Power Plant:	Diesel
Transmission Type:	Manual	Brake Type:	Air

Written Materials:

Specifications and drawings are available from:
Florida Division of Forestry
Fire Control Bureau
3125 Conner Boulevard
Tallahassee, FL 32399-1650
Telephone: 904/488-4244

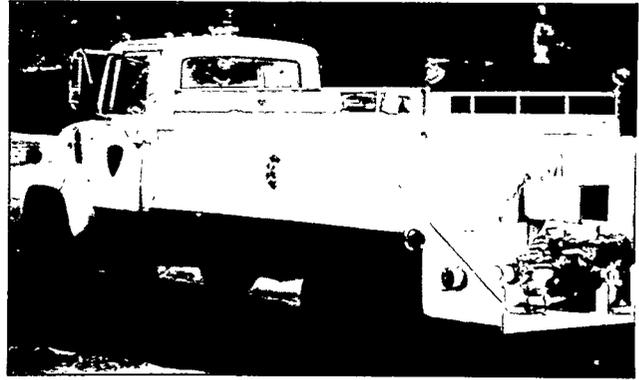
WATER PUMPING EQUIPMENT
Water Tender Data Sheet No.10

Agency: Georgia Forestry Commission

Equipment Designator: Mobile H20

ICS Type: 3

Summary: *Tank Capacity* - 1,250 gal
Pump Rating - 500 gpm @ 40 psi
Pump Drive - Auxiliary Engine



General Description:

A mobile water tender designed to accomplish the fill-up, transport, and discharge of water to support other firefighting units. Also used to move water from dry hydrant sites to other water tender and fire suppression units.

Pump:

Make: Berkeley **Model:** B2-1/2 TQMS-12D
Type: Single-stage centrifugal
Performance: —
Primer Type Exhaust

Tank:

Material: Steel
Construction: Removable Top —
Baffles - —

Controls and Gauges:

Throttle Priming Valve Handle
Choke Water Level
Pressure Gauge Engine Temperature —
Vacuum Gauge — Discharge Valve Handle
Tachometer — Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number — Size —
Suction - Number — Size —
Hose Reel —
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: User option **Cab/Axle:** 102 in
GVW Rating: — **Power Plant:** —
Transmission Type: — **Brake Type:** —

Written Materials:

Specifications and drawings are available from:

Georgia Forestry Commission
Box 819
Macon, GA 31298-4599
Telephone: 912/744-3253

WATER PUMPING EQUIPMENT
Non-Highway Equipment

E. Non-Highway Equipment

Sheet No.	Gallons	Pump drive	Model	Agency Designation
1	1,200	Hydrostatic	Wheeled ATV	Florida Div For
2	500	Aux Engine	Skidder Mtd	Michigan DNR
3	300	Aux Engine	Everglades Tracked	NPS
4	130	Hydraulic	Tractor Plow	Wisconsin DNR
5	120	Aux Engine	Tracked Unit	Minnesota DNR

F. Trailer-Mounted Equipment

1	N/A	Diesel	High Volume Irrigation	Florida Div For
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WATER PUMPING EQUIPMENT
Nonhighway Equipment Data Sheet No.2

Agency: Michigan Department of Natural Resources

Equipment Designator: Skidder-Mounted Integral Unit

Summary: *Tank Capacity* - 500 gal
Pump Rating - —
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The skidder-mounted integral unit is a unique concept in forest firefighting apparatus. Because of its excellent off-road and cross-country mobility, the skidder is a natural machine for woods use. The basic unit consists of a 500-gal tank, a hydraulic plow, a front-mounted B-blade, and operator compartment protection. The tank provides mounting space for a pump, engine, live reel, intake and discharge hoses, and appropriate plumbing.

Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 85 gpm (max) at free flow;
0 gpm @ max psi = 300
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - No
Baffles - Yes
Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 1-1/2-in
Hose Reel, one
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off
Pump and Plumbing Drain —
Gravity Tank Drain/Dump ; Size, 1-in

Chassis:

Manufacturer: User option

Power Plant: Diesel

Written Materials:

Specifications and drawings are available from:

Roscommon Equipment Center
c/o Forest Fire Experiment Station
P.O. Box 68
Roscommon, MI 48653
Telephone: 517/275-5211

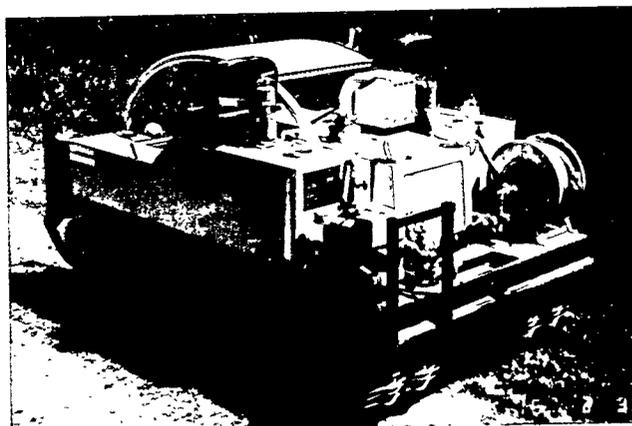
WATER PUMPING EQUIPMENT

Nonhighway Equipment Data Sheet No.3

Agency: USDI National Park Service

Equipment Designator: Everglades Tracked

Summary: *Tank Capacity* - 300 gal
Pump Rating - 50 gpm @ 50 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

The Everglades tracked unit consists of two saddle tanks, plumbing, hardline, jumpline, hose reel, pump and gasoline engine mounted on a Model 617 0979 Bombardier Muskeg Tractor. The tractor is equipped with two additional seats for crew members (plus operator), ROPS (Rollover Protection System), seatbelts, suction hose racks, complete field tool kit, drip torch containers, spare fuel, spare gasoline for pump engine, and fire extinguisher. The jumpline is a 3/4-in garden hose to provide operator with emergency nozzle capabilities. The plumbing has a 1-1/2-in ball valve discharge to permit operation of the unit as a stationary engine. The Bombardier tractor is powered by a 3-53 Detroit Diesel two-cycle, three-cyl, 159-cu in engine.

Pump:

Make: Gorman Rupp **Model:** 61 1/2 A23 DFB
Type: Single-stage centrifugal
Performance: —
Primer Type: Exhaust

Tank:

Material: Aluminum
Construction: Removable Top - No
 Baffles - Yes
 Fill Spout - Yes

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle <input checked="" type="checkbox"/>
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle <input checked="" type="checkbox"/>
Tachometer —	Suction Valve Handle <input checked="" type="checkbox"/>

Valves:

Tank-to-Pump Pump-to-Tank
 Overboard Discharge - Number, 1; Size, 1-1/2-in
 Suction - Number, 1; Size, 1-1/2-in
 Hose Reel —
 Adjustable Pressure Relief —
 Tank-to-Plumbing Shut-Off —
 Pump and Plumbing Drain —
 Gravity Tank Drain/Dump —

Chassis:

Manufacturer: Bombardier
Transmission Type: Manual

Power Plant: Diesel

Written Materials:

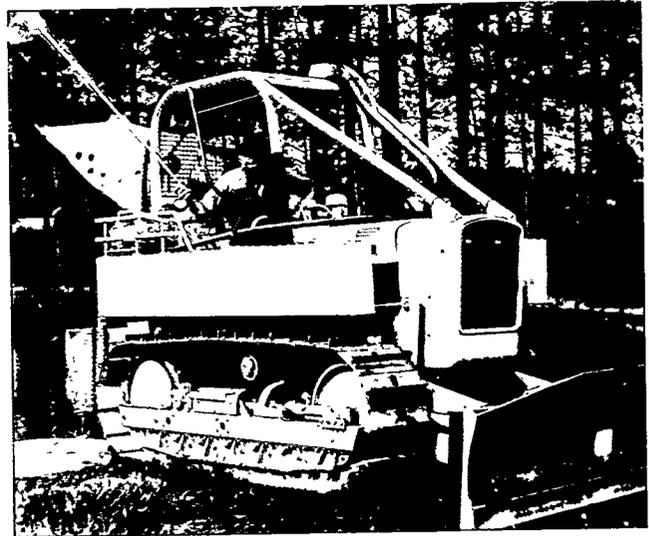
Specifications and drawings are available from:
 Everglades National Park
 P.O. Box 279
 Homestead, FL 33030

WATER PUMPING EQUIPMENT
Nonhighway Equipment Data Sheet No.4

Agency: Wisconsin Department of Natural Resources

Equipment Designator: Tractor Plow Unit

Summary: *Tank Capacity* - 130 gal
Pump Rating - 20 gpm @ 150 psi
Pump Drive - Hydraulic
Running Attack Capability - Yes



General Description:

The Wisconsin Dozer-Plow unit is designed for fireline construction with its hydraulically operated Middle Buster Fire Plow, and front-mounted six-way angling dozer blade. Water tanks are added primarily for operator protection, but do prove useful in wetting down hot spots next to the fireline during mop-up. A full-canopy water shower system is incorporated in each unit for operator protection. Two 65-gal water tanks are mounted to the tractor frame. They pivot on the rear frame, allowing access to the engine compartment. The hydraulically driven water pump is mounted behind the operator.

Pump:

Make: Viking **Model:** HL-432
Type: Positive displacement
Performance: 20 gpm (max) at free flow;
15 gpm @ max psi = 110
Primer Type: —

Tank:

Material: Steel
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 4 in

Controls and Gauges:

Throttle <input checked="" type="checkbox"/>	Priming Valve Handle —
Choke <input checked="" type="checkbox"/>	Water Level —
Pressure Gauge <input checked="" type="checkbox"/>	Engine Temperature —
Vacuum Gauge —	Discharge Valve Handle —
Tachometer —	Suction Valve Handle —

Valves:

Tank-to-Pump Pump-to-Tank —
Overboard Discharge - Number — Size —
Suction - Number — Size —
Hose Reel —
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer: User option

Written Materials:

Specifications and drawings are available from:
Wisconsin Department of Natural Resources
LeMay Forestry Center
518 West Somo Avenue
Tomahawk, WI 54487
Telephone: 715/453-2188

WATER PUMPING EQUIPMENT Trailer Mounted Equipment Data Sheet No.1

This category of water pumping equipment contains packages that are trailer-mounted.

Agency: Florida Division of Forestry

Equipment Designator: High-Volume Irrigation

Summary: *Pump Rating* - 1,110 gpm @ 150 psi
Pump Drive - Diesel Engine

General Description:

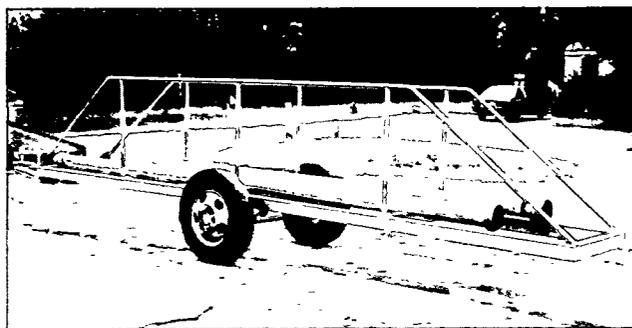
The high-volume portable agricultural irrigation set is used in situations where large volumes of water must be moved over long distances. It is particularly useful in the suppression of organic soil ("muck") fires. A typical set consists of a high-volume pump, lengths of aluminum irrigation pipe, and various distribution appliances—such as rotating sprinklers, deluge sets, and hand-lines.

Pump:

Make: Berkeley **Model:** B6J0QBL
Type: Single-stage centrifugal
Performance: 1,110 gpm (max) at free flow

Written Materials:

Specifications and drawings are available from:
Florida Division of Forestry
Engineering Services Bureau
3125 Conner Boulevard
Tallahassee, FL 32399-1650
Telephone: 904/488-4244



FOAM GENERATING EQUIPMENT

Compressed Air foam systems (CAFS)

II. FOAM GENERATING EQUIPMENT

A. Compressed Air Foam Systems (CAFS)

This category of equipment uses compressed air to expand water into a foam. These systems are also suitable for retrofit on existing water pumping equipment. There are numerous compressed air foam systems (CAFS) in use.

FOAM GENERATING EQUIPMENT
CAFS Data Sheet No.1

Agency: USDA Forest Service (Southwestern Region, R-3)

Equipment Designator: Model 21 CAFS

Summary: *Tank Capacity* - 200 gal
Pump Rating - 59 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

This engine is a Forest Service Southwestern Region (R-3) Model 21, mounted on a 1-ton flatbed truck 4 x 4. The GVW of the vehicle is 10,000 lb; load-carry capacities have been derated 15 percent for off-road use. Maximum load is 3,800 lb. The unique feature of this engine is the compressed air foam system.

Pump:

Make: Hale **Model:** 20FD B32
Type: Single-stage centrifugal
Performance: 75gpm (max) at free flow;
10 gpm @ max psi = 285
Primer Type: Hand

Tank:

Material: Fiberglass
Construction: Removable Top - Yes
Baffles - Yes
Fill Spout - 4 in

Controls and Gauges:

Throttle Priming Valve Handle
Choke Water Level
Pressure Gauge Engine Temperature —
Vacuum Gauge — Discharge Valve Handle
Tachometer — Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
Overboard Discharge - Number, 1; Size, 1-1/2-in
Suction - Number, 1; Size, 2-in
Hose Reel
Adjustable Pressure Relief —
Tank-to-Plumbing Shut-Off —
Pump and Plumbing Drain —
Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	60 in
GVW Rating:	10,000	Power Plant:	Gasoline
Transmission Type:	Manual	Brake Type:	Hydraulic

Written Materials:

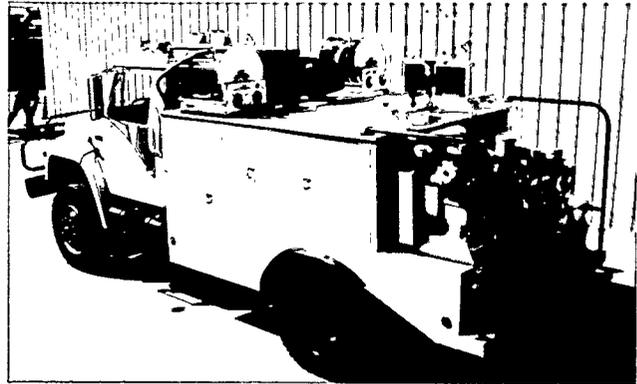
Specifications and drawings are available from:
USDA Forest Service
Southwestern Region
517 Gold Avenue, S.W.
Albuquerque, NM 87102
Telephone: 505/842-3862

FOAM GENERATING EQUIPMENT
CAFS Data Sheet No.2

Agency: USDI Bureau of Land Management

Equipment Designator: 850 WEPS

Summary: *Tank Capacity* - 850 gal
Pump Rating - 63 gpm @ 150 psi
Pump Drive - Auxiliary Engine
Running Attack Capability - Yes



General Description:

This unit is similar to the BLM standard 850-gal unit, but is equipped with a 40-cfm compressor, as well as the standard pump. It has the capability of delivering either water or foam (or both) simultaneously.

Pump:

Make: Wajax **Model:** BB-4
Type: Four-stage centrifugal
Performance: 93 gpm (max) at free flow;
 30 gpm @ max psi = 275
Primer Type: Exhaust

Tank:

Material: Steel
Construction: Removable Top - Yes
 Baffles - Yes
 Fill Spout - Yes

Controls and Gauges:

Throttle Priming Valve Handle
 Choke Water Level
 Pressure Gauge Engine Temperature —
 Vacuum Gauge — Discharge Valve Handle
 Tachometer — Suction Valve Handle

Valves:

Tank-to-Pump Pump-to-Tank
 Overboard Discharge - Number, 3; Size, 1-1/2-in
 Suction - Number, 1; Size, 1-1/2-in
 Hose Reel, two
 Adjustable Pressure Relief —
 Tank-to-Plumbing Shut-Off
 Pump and Plumbing Drain
 Gravity Tank Drain/Dump —

Chassis:

Manufacturer:	User option	Cab/Axle:	—
GVW Rating:	—	Power Plant:	—
Transmission Type:	—	Brake Type:	—

Written Materials:

Specifications and drawings are available from:
 National Interagency Fire Center
 Fire Equipment Specialist
 3905 Vista Avenue
 Boise, ID 83705
 Telephone: 208/389-2431

B. Foam Proportioners

There are a number of proportioning systems used to proportion foam concentrate into water streams for use with standard nozzles, aspirating nozzles, or compressed air foam systems (CAFS). The two basic types of foam concentrate proportioning systems are automatic regulating and manually regulated. The system that gives the most desirable results is an automatic regulating proportioning system that injects directly into the discharge side of the water pump.

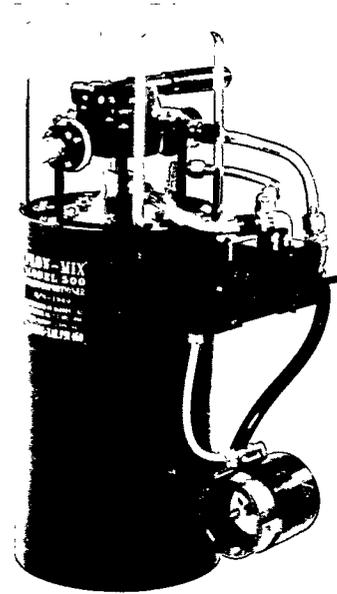
Automatic regulating proportioning systems include:

- Balanced pressure venturi systems
- Bladder tank system
- Pump systems
- Water-motor meter proportioner
- Direct injection automatic regulating proportioner

Manually regulated proportioning systems include:

- Batch mixing
- Suction-side proportioner
- In-line eductor
- Bypass eductor
- Around-the-pump proportioner
- Direct injection manually regulated

flow increases proportionately. The bladder tank proportioner has no moving parts and requires no external power. It can be portable for storage and dispensing. When the bladder is being filled on a single tank unit, concentrate flow is interrupted.

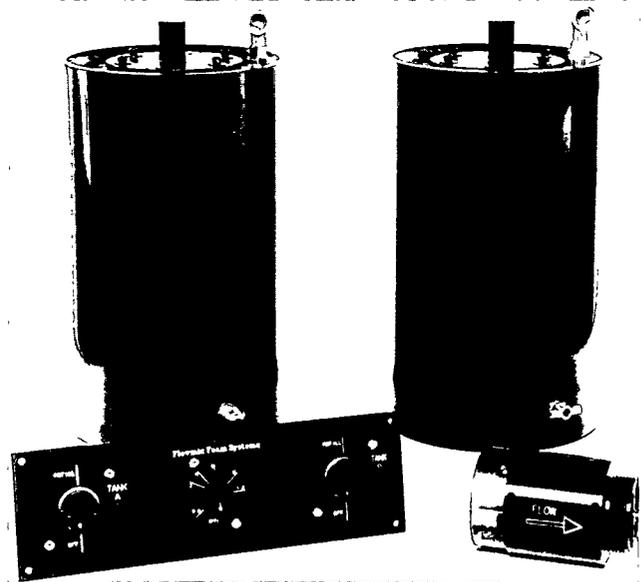


1. Automatic Regulating Proportioning Systems

Automatic regulating proportioning systems are designed to minimize the limitations of manually regulated proportioning systems. Specifically, they proportion accurately over wide ranges of water flow or pressure, adjusting automatically to changes in water flow and pressure to maintain the desired mix ratio. Foam concentrate is added on the discharge side of the pump to avoid tank and pump problems. The mix ratio can be quickly changed during operation. The proportioners place no restrictions on hose length or number of hoselays or nozzles. The automatic regulating, balanced pressure-proportioning system is in wide use—both in the bladder tank system and the pump system.

a. Balanced Pressure Bladder Tank Proportioner System

The balanced pressure bladder tank proportioner uses a small diversion of water to pressurize a tank with a bladder containing foam concentrate. The concentrate passes through a metering valve before it enters the water stream on the low pressure side of a pressure differential valve or venturi. Concentrate is added according to the difference in pressure at the differential valve or venturi. As water flow increases the difference in pressure increases and foam concentrate



Automatic regulating, balanced-pressure bladder tank proportioner system.

b. Balanced Pressure Pump Proportioner

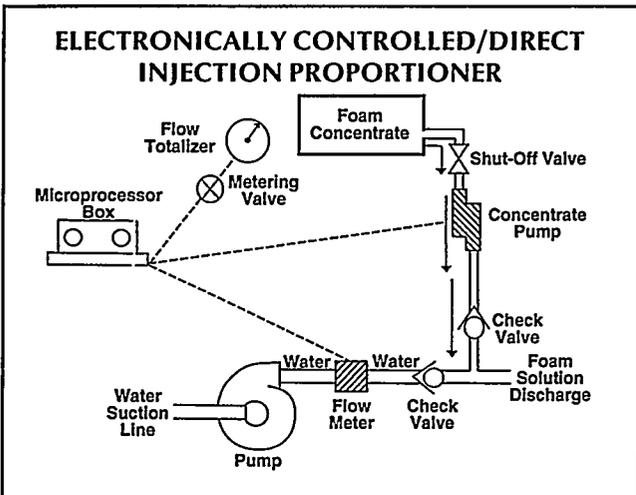
The balanced pressure pump system senses water pressure with a pilot operated relief valve. The pilot operated relief

FOAM GENERATING EQUIPMENT

Foam Nozzles

valve makes foam concentrate pressure equal to water pressure. A pump delivers concentrate to a venturi in the water line according to the pressure at the relief valve. A metering valve allows for selection or change of the desired mix ratio. If the relief valve senses 150 psi of water pressure, then the foam concentrate pressure will be 150 psi. Concentrate enters the water stream in proportion to the pressure differential across the venturi. Excess foam concentrate is relieved to the concentrate tank. Refilling the concentrate tank does not interrupt foam concentrate flow. Foam concentrate flow and pressure are provided by an externally powered pump.

AL-



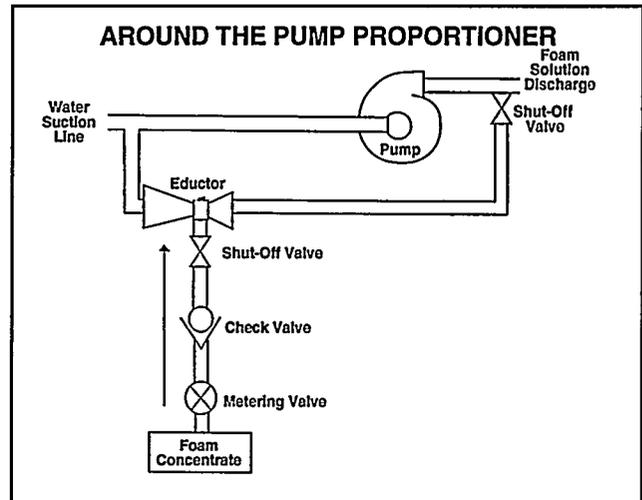
automatic regulating balanced pressure pump proportioner.

2. Manually Regulated Proportioning Systems

Manually regulated proportioners used include all listed above. The following figure shows an around-the-pump proportioner. Also in-line and by-pass foam eductors are also used. For foam eductor use:

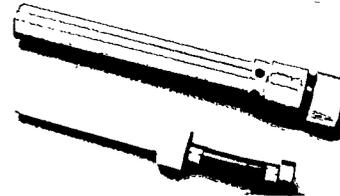
- Eductor must be matched with nozzle of equal gallon rating. This generally means only one nozzle can be used with an eductor. Two or more nozzles can be used provided the sum of their ratings is equal to or a little more than the eductor rating and all are operated.
- Only a limited amount of hose can be used from eductor to nozzle. This is generally about 300 ft.
- Elevation of nozzle (up hill) effects eductor performance.
- Optimum performance is generally with 200-psi inlet pressure, but satisfactory results can be achieved with lower pressures. However, at lower pressures a richer foam is produced unless the eductor is adjusted down.
- Generally, a well-designed eductor picks up foam concentrate whenever the pressure at the outlet is less than 65 to 70 percent of the inlet pressure and the flow is into a hoselay or directly to a nozzle and not directly out the eductor; otherwise there is generally a 30 to 35 percent pressure loss through a well-designed eductor.

- Eductors generally work properly in any position. Some eductors work best when the eductor body is in a horizontal position and the foam concentrate inlet to the body is straight up.
- The eductor and eductor metering device must be thoroughly flushed or cleaned after every use.

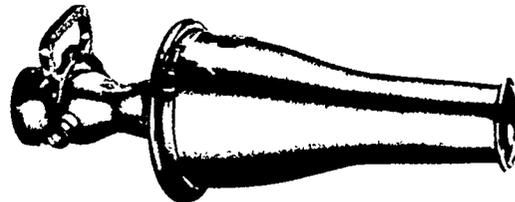


E. Foam Nozzles

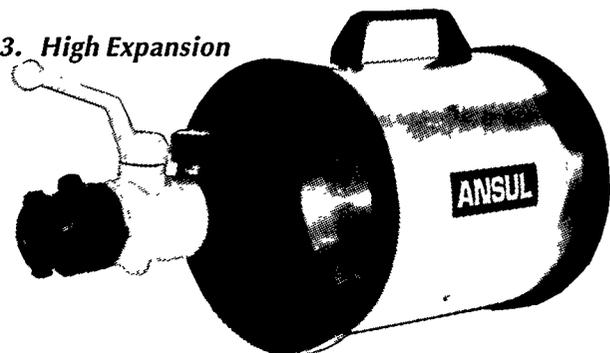
1. Low Expansion



2. Medium Expansion

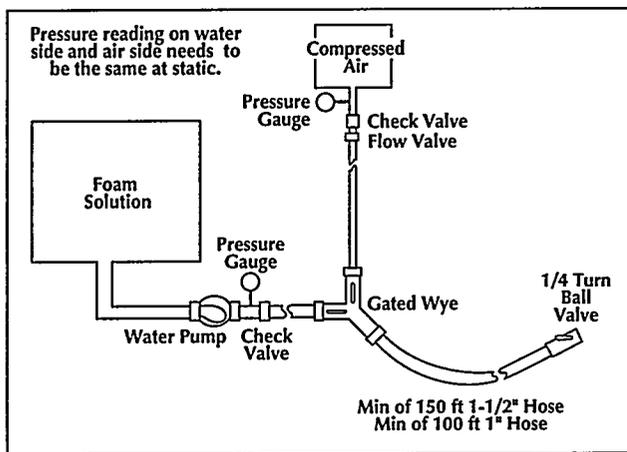
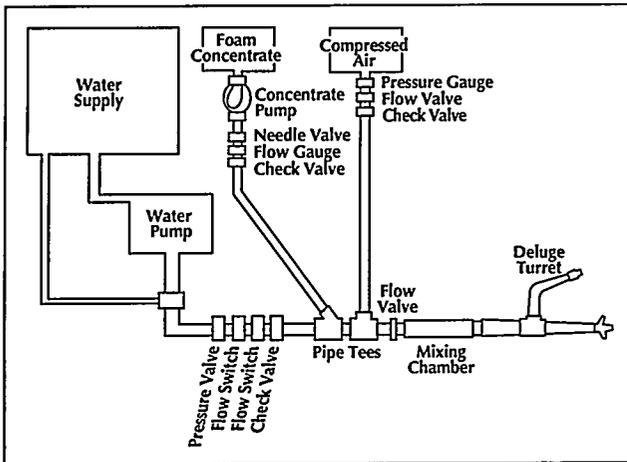
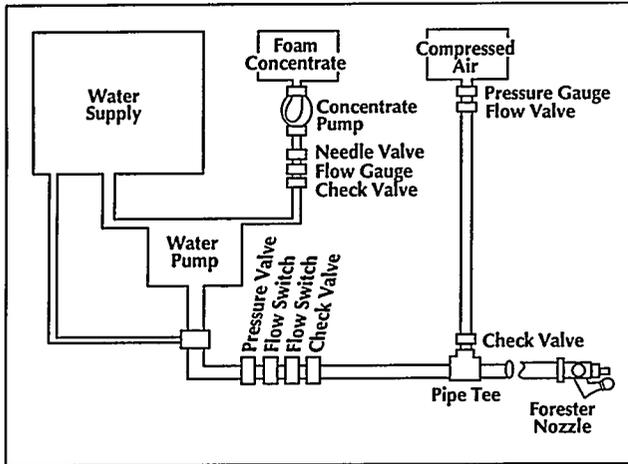


3. High Expansion



FOAM GENERATING EQUIPMENT WATER DELIVERY COMPONENTS AND ACCESSORIES

F. Typical Foam System Diagrams



For additional information on this technology, see *Foam vs. Fire, Class A Foam for Wildland Fires*, June 1992, NFES No. 2246.

III. WATER DELIVERY COMPONENTS AND ACCESSORIES

A. Hose

1. General

Fire hose provides the essential means of transporting water from a stream, lake, hydrant, or engine to the fire. The hose selected must withstand the necessary pressures involved, yet be flexible and lightweight enough to handle. Most hose in use is purchased by Federal Supply Services (GSA) under specifications developed by the Forest Service. The wildland firefighting agencies purchase approximately 2,000,000 ft of small diameter (1- and 1-1/2-in) fire hose annually.

The care and maintenance of fire hose is described in the NFPA Standard No. 1962, dated 1987. Service Test Pressures and Procedures are in Chapter 5 of this standard (see appendix 4). A review of the appropriate definitions and acronyms will be helpful when using this section on fire hose (see appendixes 7 and 8).

2. Design criteria

The nominal outside diameters of all jacketed hose furnished under Forest Service specifications are controlled. A saving thereby results, since coupling bowls for all jacketed hoses are identical and interchangeable. The OD for 1-in hose is 1-1/4-in and for 1-1/2-in hose, it is 1-3/4-in. In general fire departments practice, the ID is controlled and the OD varies with the jacket thickness, the type of liner, and other variables.

Jacketed fire hose elongates when pressurized. Most hose also twists under working pressure, and the direction of twist must be to tighten, not loosen, the couplings. Jacketed hose also tends to warp and rise. For example, a cotton synthetic jacket in a 50-ft length should not warp more than 25 in from a straight line, nor rise more than 8 in when pressurized to 450 psi. All hose is hydrostatically tested at the time of procurement—if procured by Forest Service specifications. All Forest Service hose specifications require prequalification prior to procurement by GSA.

A list of prequalified hose is available from:

USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose

3. Hose types

a. Single-cotton jacketed, rubber-lined

Standard cotton-jackets have a hydrostatic proof pressure of 300 psi. Cotton is less liable to heat and flame damage than synthetic fibers. Hot embers, however, may cause small pinholes. Cotton-jacketed hose in most agencies has been replaced with lightweight hoses (such as listed under b and c).

Type: Single-jacket fabric, rubber-lined.

Construction and material: The jacket consists of woven cotton yarn. The liner is petroleum-based thermoplastic polyester elastomer with a smooth inner surface. The jacket and liner are bonded together.

Flow rate: Friction loss relative to hose diameters are basically the same as the cotton-synthetic lined hose. Slight differences may be due to type of lining and roughness of inside surface of the lining.

Weight: 1-in has maximum weight (lb/100 ft) = 28; 1-1/2-in = 33.

Written material: Federal specification ZZ-H-451 available from General Supply Administration (GSA).

b. Single cotton-synthetic jacket, lined medium-weight

This hose is used where higher working pressures are required. It has a hydrostatic proof pressure of 450 psi. The cotton fibers run lengthwise (warp), and the synthetic fillers run crosswise, to form the weave. This combination makes a lighter, stronger jacket, but is subject to heat and flame damage. Grade A liners, capable of withstanding long periods of weather aging and high ozone conditions without checking or cracking, are also available. Combination fabric jackets come in both 1- and 1-1/2-in diameters, and are usually furnished in 50- and 100-ft lengths.

Type: Single jacket fabric, rubber lined.

Construction and materials: The jacket consists of woven cotton and polyester filler yarn. The liner is a petroleum-based thermoplastic polyester elastomer with a smooth inner surface. The jacket and liner are bonded together.

Weight: 1-in has maximum weight (lb/100 ft) = 20; 1-1/2-in = 26.

Available from GSA:

50-ft	1-in	NSN 4210-01-037-7031
50-ft	1-1/2-in	NSN 4210-01-039-4855
100-ft	1-in	NSN 4210-00-777-1591
100-ft	1-1/2-in	NSN 4210-00-777-1592

Written material: Specification 5100-186 is available from:

USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

c. Synthetic lightweight, lined hose.

Type: Single jacket fabric, lined, with a working pressure up to 450 psig, mildew resistant.

Construction and materials: The jacket consists of interwoven synthetic warp and filler yarns. The liner consists of synthetic rubber or a combination of other synthetic material with a smooth inner surface. The lining is fully bonded to the jacket.

Weight:

Size (in)	Max. weight* (lb/100 ft)
1	9
1-1/2	15

(*Weight is after mildew treatment, without the couplings.)

Available from GSA:

100 ft	1 in	FSN 4210-01-166-8122
100 ft	1-1/2 in	FSN 4210-01-165-6597

Written material: Specification 5100-00187 is available from

USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599/1267

d. Unlined (linen)

Unlined hose was originally designed for indoor standpipe use. Because of its lightweight, flexibility when dry, and relatively inexpensive construction, unlined hose is used where water is readily available. Unlined linen is stiff when wet, is subject to abrasion, and must be thoroughly washed and dried after use. Linen also requires protection from mildew. Because of seepage and friction of the tube, the hydraulic efficiency is lower than lined hose, so friction loss factors are higher. However, the water seepage through the jacket at working pressures offers good protection to the jacket from exposure to fire embers or coals. Linen is also used with portable pumps and in gravity systems for control and mop-up. It is suitable for use on engines and is practical for drills.

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose

Type: Single-jacket fabric.

Construction and materials: The hose consists of woven, pure linen yarn. The weave is uniform, allowing for expansion and seepage to moisten the outer surface and prevent burning.

Weight: 1-in has maximum weight (lb/100 ft) = 12; 1-1/2-in = 18.

Written material: Specification 5100-183g is available from:

USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

(NOTE: Both 1- and 1-1/2-in linen are no longer available from GSA.)

e. Double-jacketed hose

Double-jacketed hose is heavier and more costly than single-jacketed hose. In practice, some engines carry one or two lengths of double-jacketed hose for the first lengths in the lay, thus reducing excessive losses from bursts closer to the engine.

Type: Double-jacketed, rubber-lined.

Construction and materials: There are two jackets, one inside the other made of woven cotton and polyester filler yarn. The liner is a petroleum-based thermoplastic polyester elastomer with a smooth inner surface. The inside jacket and liner are bonded together.

Flow rate: Friction loss relative to hose diameters is basically the same as the cotton-synthetic lined hose. Slight differences may be due to type of lining and roughness of inside surface of the lining.

Weight: Weights of hoses are as follows (weights may vary depending on tolerance):

1-1/2-in has maximum weight (lb/100 ft) = 38; 2-in = 68.

Written material: Federal specification ZZ-H-451 is available from General Services Administration (GSA).

f. High pressure

Rubber-lined, rubber-covered, high-pressure hose (also called booster hose) is used as "hardline" on engine live reels. Forest Service specifications require a heavy-duty, noncollapsible water hose of braided and molded construction. This hose is designed for use on hot fire lines with little possibility of damage. The hose can be wiped off with a dry rag after use. Abrasion resistance is high, and the exterior covering

is not readily damaged by usual solvents. High-pressure hose (3/4-in ID) is available in 50-ft coupled lengths.

Type: Compound rubber cover, multiple plies yarn reinforcement, and rubber-inner lining.

Construction and materials: Multiple layers of braided or knit piles of cotton or synthetic yarn are embedded in rubber compound cover. The inner lining consists of a tube of rubber. The lining and cover are bonded together.

Weight: 3/4-in has maximum weight (lb/100 ft) = 55.

Available from GSA: 50-ft 3/4-in ID NSN 4210-00-595-1838.

Written material: Fire equipment suppliers (see appendix 6). Specification 5100-185 is available from: USDA Forest Service

Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

g. Relay-supply hose

A single-jacket relay-supply hose has seen increasing use in the United States by fire departments. The single-jacket, made of all-synthetic fibers, is coated inside and out with a thin protective coating. The hose is available in 3-1/2-, 4-, 4-1/2-, 5-, and 6-in diameters, and is often coupled with a lightweight aluminum alloy quick-connect coupling.

The hose is intended for supply line use only from a water source to the engine. It is *not* intended to move large volumes of water long distances, and *never* to a manifold or on the discharge side of an engine. Limited use has been made of this hose at airtanker bases for loading. Usually this hose performs poorly when subjected to a kink test.

h. Garden hose

Garden hose is *not* recommended for general fire use, even though it has been used in some areas. Difficulty in maintaining standard working pressures, and the uncertainty of buying premium products, make this use hazardous. When garden hose is pressurized, a "scissor-like" condition occurs that increases the diameter and shortens the hose significantly. This can cause coupling failures and—when on hose reels—damage in and around the reel hub attachment and also failure of some reel hubs.

Available from GSA: NSN 4210-01-167-1061.

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Dispensers and Storage

i. Suction hose

Hard-suction draft hose is used on all engines and with all portable pumps. Under Forest Service specification 5100-184b, the hose is made of a natural or synthetic-rubber tube; a jacket consisting of cotton warp yarns or other suitable yarns interwoven with a helix or helixes of round spring-temper wire and fillers of yarn; and a synthetic-rubber outer covering. The coupled hose is designed for a hydrostatic-proof pressure test of 100 psi and a vacuum of 25-in Hg without internal blistering, undue distortion, or leakage. Suction hoses are usually furnished-in 8- and 10-ft lengths. Soft suction is now widely accepted in fire department practice where engines connect directly to hydrants. The weight savings and flexibility of these 2-1/2- to 5-in diameters are significant factors.

Available from GSA:

8-ft	1-in	NSN 4210-00-165-4864
8-ft	1-1/2-in	NSN 4210-00-889-1774
10-ft	1-1/2 in	NSN 4210-00-889-1775
8-ft	2 1/2-in	NSN 4210-00-595-1839

Written material: Specification 5100-184b is available from:

USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

j. Cotton/synthetic-self-protecting (weeping) hoses

These hoses are used as replacement for linen (un-lined) hose (see c). Cotton/synthetic hoses are lightweight, treated to prevent mildew, and designed for uniform weeping, fast drying time, and high heat resistance. Synthetic hoses are designed for high working pressures, high temperatures, and abrasion-resistance; they may be lined for antifriction and hose weep control to protect the hose.

Written material: Fire equipment suppliers (see appendix 6).

k. Synthetic (Spec 5100-187)

B. Hose Dispensers and Storage

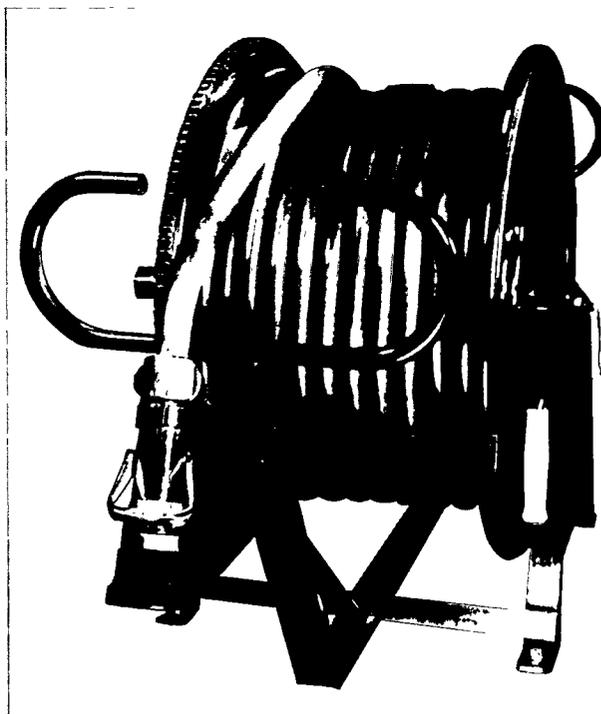
There are several methods of storing fire hose and dispensing them for wildland firefighting. Many

ingenious systems probably have been developed by fire crews to suit their own special needs. Fire equipment suppliers have some general-purpose equipment available, especially hose reels that are produced in manufacturing plants.

Rubber-lined, rubber-covered, high-pressure hose (also called booster hose) is normally stored and dispensed on live reels. Woven lined and unlined types of hose may be stored in baskets, as hose packs, on trays, or rolled and stored in compartments and are dispensed by hand. Hard suction draft hose is normally stored in a plastic or metal bin in a side compartment, or stored in tubes or trays.

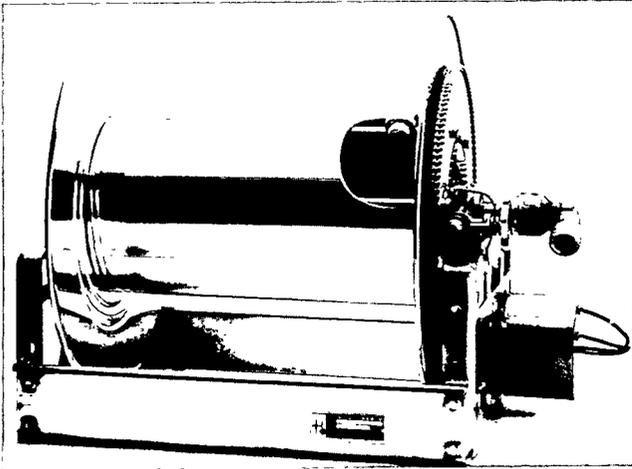
1. Reels

A hose reel basically consists of a drum, side rims, revolving joint on one end, self-aligning bearing on the other end, frame, inlet and outlet hose connections, electric or hand-crank rewind, and a brake. Various sizes are available. Rubber or fabric hoses-in 3/4-in or 1-in sizes are used on the reels that are usually connected to the pump and kept filled with water ready for use; thus considering it as a "live hose reel."



WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Dispensers and Storage



Construction and material: Constructed of steel or aluminum. Drum and rims may be open or closed. Swivel joint connection may be capable of operating at hydrostatic pressures up to 600 psi. Rewind by hand crank or electric motor, or may be by hand using side rims. Brakes maintain position of reel and hose. Hose reel information is available from equipment suppliers. Normal use is with 250-ft, 3/4-in high-pressure rubber hose.

Written material: Hose reel manufacturers (see appendix 6). Specification 5100-340 is available from:

USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

2. Baskets



Hose baskets in this Guide are those that are normally used with fire engines for wildland firefighting. They

consist of a rectangular-, circular-, or oval-shaped container. The wooden duckboard bottom keeps the hose off the metal floor and prevents mildew and abrasion damage. A water repellent fabric cover protects the hose from the elements. The hose may be connected to the pump, kept filled with water, and ready for immediate use; thus considering it as a "live hose basket."

Construction and material: Constructed of steel sides, wooden duckboards on the bottom, and water repellent-type fabric cover. Fabric type 3/4- or 1-in fire hose connected to the engine through a hole in the side of the basket. Length of hose depends on size and type. Normal use is 200-ft 1-in single cotton-synthetic jacket lined hose. Basic advantage is not to obstruct rear view of the driver besides having no moving parts.

Written material: Drawing available from:
USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Dispensers and Storage

3. Packs

Hose packs in this Guide are portable types that a firefighter can carry, usually as a backpack. They may consist of a lightweight frame or board. Straps are used to contain the hose. Usually jigs are used to fold or wind the hose for proper fit. The hose is dispensed from the container as the loose end is pulled off, or the hose-carrying individual walks away with the loose end anchored, or—if the hose is in a roll—it is rolled out. Whatever the method, rapid deployment is the main objective.

a. Commercial hose pack



Construction and material: Aluminum base with carrying straps and hose-retaining straps. Base may be shaped differently by each supplier. Usually carries 100-ft rolled hose in various sizes. Weight depends on size of hose; base without hose is 3 lb.

Written material: Fire equipment suppliers (see appendix 6).

b. Cleveland National Forest hose pack



Construction and material: Plywood packboard with carrying straps. Bungee cords and bands of tire tubes contain the hose. Two layers of 150- to 200-ft 1-1/2-in single-jacket, cotton-synthetic lined hose with a hose nozzle are assembled on the board. Approximate weight with hose is 65 lb. (Also known as San Bernardino National Forest hose pack with modification.)

Written material:

Forest Service-USDA
Cleveland National Forest
10845 Rancho Bernardo Road
San Diego, CA 92127-2107
Telephone: 619/673-6180

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Dispensers and Storage

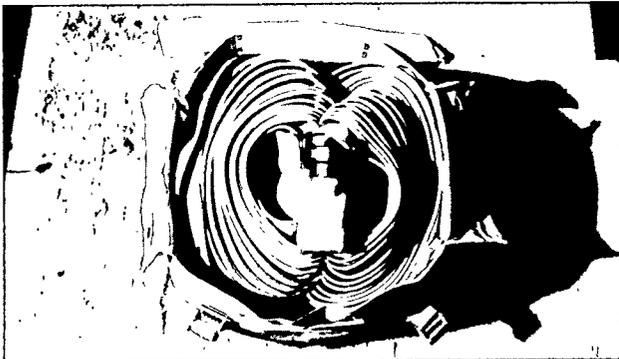
c. Forester hose pack sacks



Construction and material: Olive-drab cotton duck, with seams sewed ten stitches per inch and bound with tape. Reinforced with heavy rivets and leather washers. Shoulder straps are 2-1/4-in, heavy corded webbing with 1-in wide leather terminals and tongue buckles. Closure straps are 5/8-in wide cowhide.

Written material: Fire equipment suppliers (see appendix 6).

d. Rhode Island hose pack

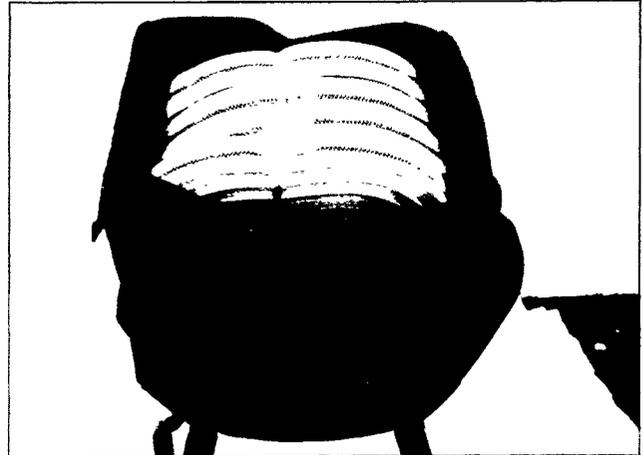


Construction and material: Hose rolled on a roll-fold machine is opened and connected in a hose bag. Hose will then lay precoupled without kinking.

Written material:

Dept. of Environmental Management
Division of Forest Environment
RFD No. 2, Box 851
North Scituate, RI 02857
Telephone: 401/647-3367

e. Firefighter's hose bag



Construction and material: This bag will hold four 100-ft lengths of 1-1/2-in lightweight hose. It measures 17-in long, 10-in wide, and 17-in deep, and is constructed of 1000 Denier Cordura nylon fabric with a polyurethane waterproof coating on the inside. Although the bag is made for wearing as a backpack, it also has heavy-duty carrying straps on each side. The lid is held in place with two 1-1/2-in polypropylene web straps and nickel/steel buckles. Shoulder straps are padded with 2-in wide and 1/4-in thick closed cell foam for comfort in carrying. This bag is extremely strong with double stitching at stress points. It is machine washable. The bag is offered with or without tool pouch, which measures 8- x 14-in.

Written material:

Hall Manufacturing Co., Inc.
Brookline, NH 03033
Telephone: 603/673-4841

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Dispensers and Storage

f. Backpack hose carrier



Construction and material: Aluminum hose container with nylon carrying harness. Has a capacity of two layers of 1-1/2-in 300-ft linen hose or 200-ft single jacket lined hose. Approximate weight, without hose, 6-1/2 lb.

Written material: Fire equipment suppliers (see appendix 6).

g. Hose pack sack



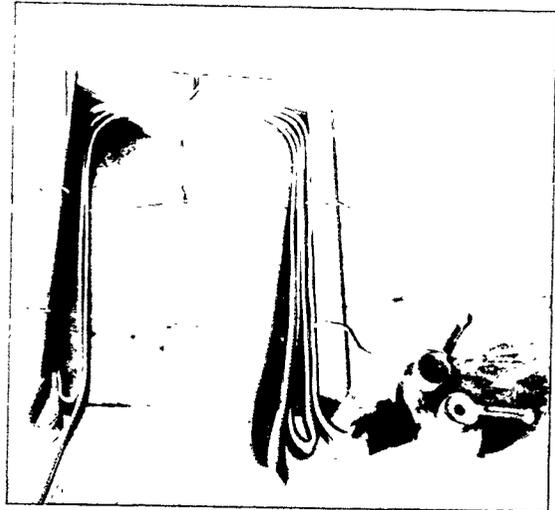
Construction and material: Aluminum backpack frame, carrying straps, and heavy fabric pack sack. Capacity is 300 to 400-ft of 1-1/2-in linen hose. Approximate weight, without hose, 2- to 4-lb. Various designs are available.

Written material: Fire equipment suppliers (see appendix 6).

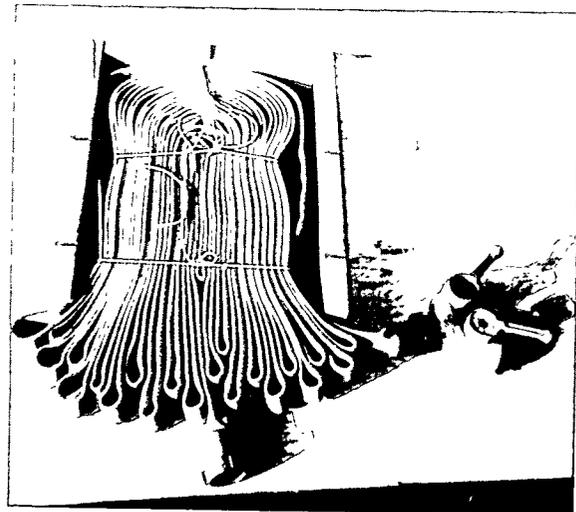
WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Dispensers and Storage

h. Gansner hose pack



Packing box with the 1st step in packing the trunkline portion of a gansner hose pack.



Packing box with a completed trunkline portion of a Gansner hose pack.

Construction and materials: Requires no packboard, stiffness of the hose is used as support. Hose is bound with tie-cords and shoulder straps are loops of hose. Capacity is 100 ft each of 1- and 1-1/2-in CJRL.

Written material:

USDA Forest Service
Pacific Southwest Region
630 Sansome Street
San Francisco, CA 94111
Telephone: 415/705-2874

4. Hose packing boxes and devices

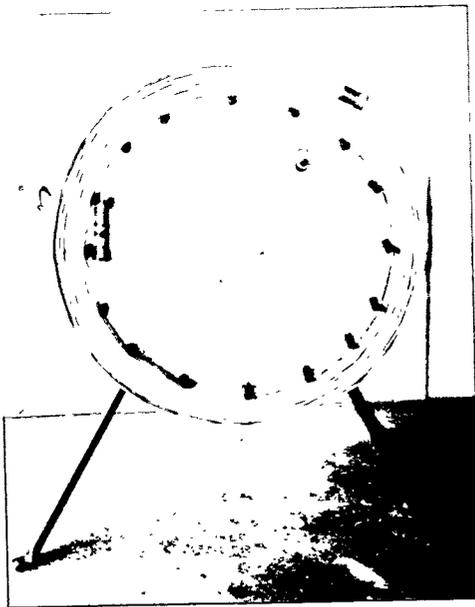
The boxes and devices seen here are used to produce the Gasner hose pack (see 3.h, above). Similar boxes are used to produce other types of hose packs. Step-by-step procedures for packing the Gasner hose pack are available.

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Dispensers and Storage



Lateral wheel with the 1st step in packing the lateral portion of a gansner hose pack.

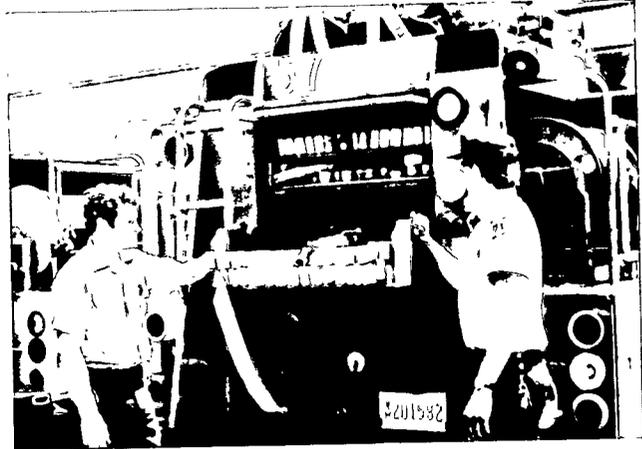


Lateral wheel with the hose ready to be tied.

Written material:

USDA Forest Service
Redmond Fire Center/Training Specialist
Airport Way
Redmond, OR 97756
Telephone: 503/548-5071

5. Trays



Hose trays are used to contain and store fire hose neatly so that when needed it can be dispensed efficiently with a minimum of time. Capacity can be up to 2,000 ft of hose—depending on the type of hose and the engine size. The trays are custom made to suit the engine. The advantages of trays are that they can be assembled before loading on the engine and additional standby trays can be made ready. Trays are usually made of wood or aluminum. Duckboard floors prevent mildew and reduce abrasion damage. In addition to hose trays on engines, hose trays can be used on specialized vehicles such as hose trucks and hose trailers. Many variations are in existence, and commercial sources are available.

6. Storage



Hard-suction draft hose is normally used on engines. The hard-suction draft hose used is usually in 8- or 10-ft lengths, and either 1-1/2- or 2-1/2-in diameter size. Exceptions in length and diameter can be found. Due to the inflexibility of the draft hose sections, storage methods vary. Draft hose normally

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Accessories

is stored within a side compartment, or placed within external tubes or trays. A plastic or metal bin may be attached to the forward end of slip-on units for rolled suction hose storage.



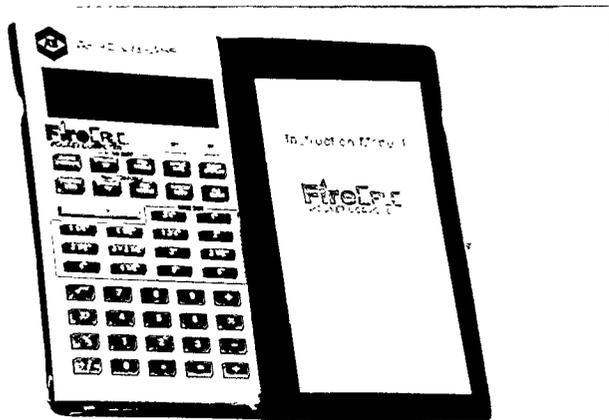
Indoor hose storage: When fire hose (particularly fabric type) is properly maintained and stored, it will have an extended life and provide dependable service on the fireline. Storage racks can be constructed to provide a neat, well-ventilated hose storage area. There are other methods which can be "homemade" and just as practical.

Written material: Commercially available (see appendix 6).

C. Hose Accessories

Miscellaneous accessories that are useful in wildland firefighting support activities include such items as hose discharge and friction loss calculators, hose shut-off clamps, mop-up kits, hose rollers, water storage tanks, hydrant wrenches, and others.

1. Discharge and friction loss calculators



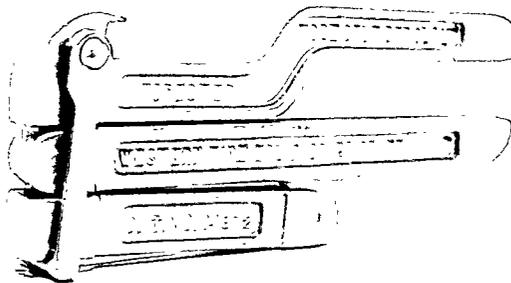
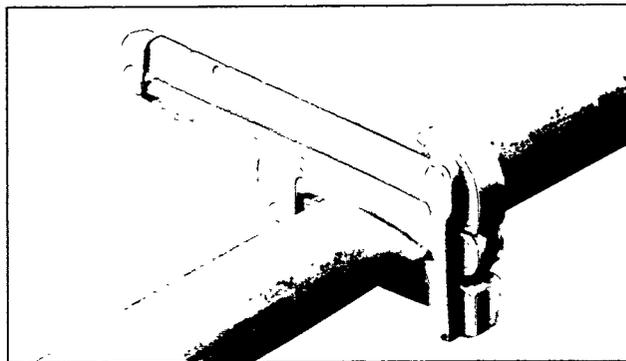
Type:...Hand held calculator

Construction and material: Pocket size, plastic.

Purpose: The FireCal is a hand-held calculator pre-programmed to solve water hydraulic problems common to firefighting.

Availability: Akron Brass 216/264-5678.

2. Hose shut-off clamp



Type: Two-piece jaws with lever arm

Construction and material: Pocket-size, hand-operated, light, corrosion-resistant alloy.

Purpose: Shut-off water in hose line to prevent loss of water when a fire hose bursts, or for other purposes—such as rapid changing of nozzles, hoses, etc.

Available from GSA: NSN 4210-00-767-7123.

Written material: Most firefighting equipment companies.

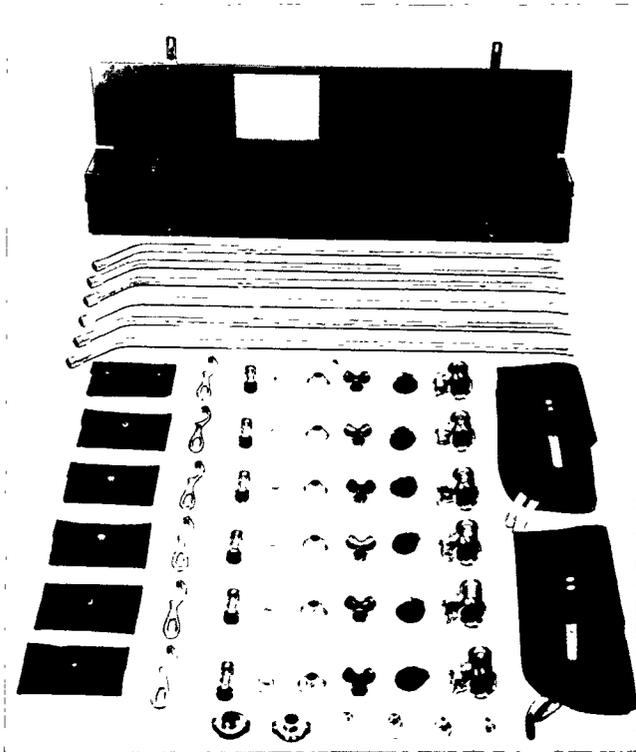
For specification 5100-245b:

USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Accessories

3. Mop-up kit, six-person



Type: Six-person, mop-up kit.

Construction and material: Kit consists of hose line tees, reducers, wyes, applicators, tips, gaskets, shut-off valves, spanners, knapsacks, pouches, and a case. Quantities sufficient for a six-person operation.

Available from GSA: NSN 4210-01-321-4206.

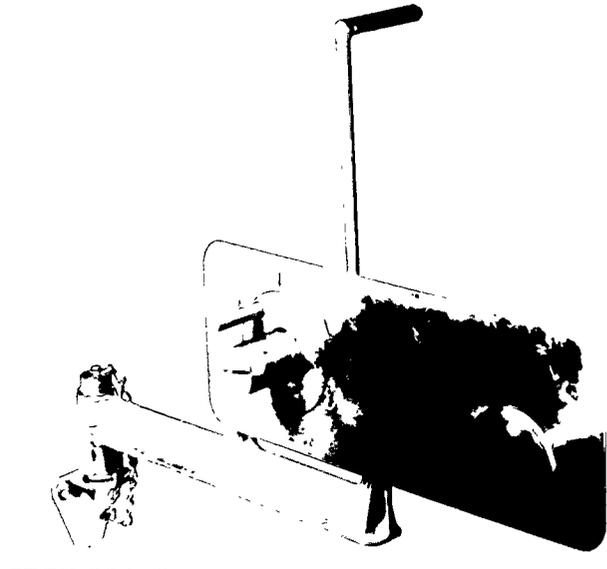
4. Hose rollers

a. Hand roller

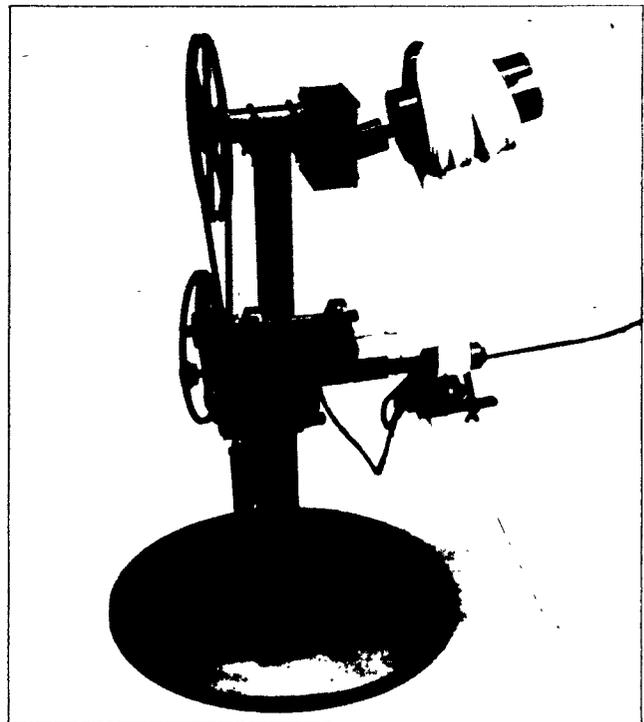
Type: Wall-mounted, hand crank.

Construction and material: Bracket mounts on wall or post with pivots on a pin; 1- or 1-1/2-in, 50- or 100-ft fire hoses capacity with quick release. Made of steel.

Availability: Fire equipment suppliers (see appendix 6).



b. Rhode Island hose roller



Type: Action roll (roll fold).

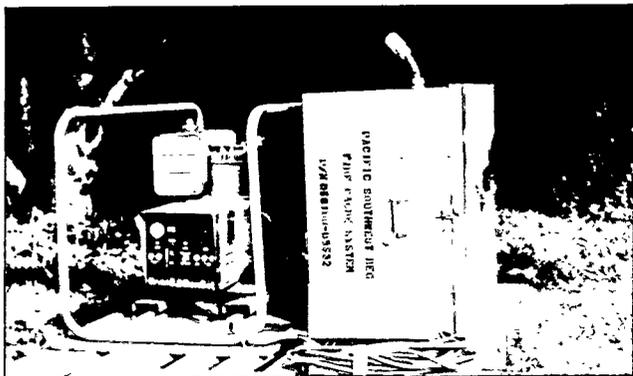
Construction: Commercially available hose roller modified by Rhode Island to operate powered by an electric motor.

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Accessories

Availability: Wajax-Pacific Fire Equipment Co. and Rhode Island Division of Forest Environment.

c. Arcadia hose roller kit



Type: Hose roller kit.

Construction and material: Uses a 3-kW generator, which powers a 15-V, 5.6-amp, 1/3-hp split-phase gear motor. The motor is controlled by a foot-activated switch. The hose roller will roll either single- or double-rolled hose. Rolling a 100-ft length of hose takes less than 1 minute. A heavy-duty rubber band is then used to retain the hose.

Purpose: The hose roller is designed to be used in the field. The intent of rolling hose in the field after a fire is to expedite hose handling.

Availability:

Forest Service-USDA
Pacific Southwest Region
South Zone Fire Cache
Arcadia, CA 91006
Telephone: 818/574-0365

d. Bear Springs hose roller



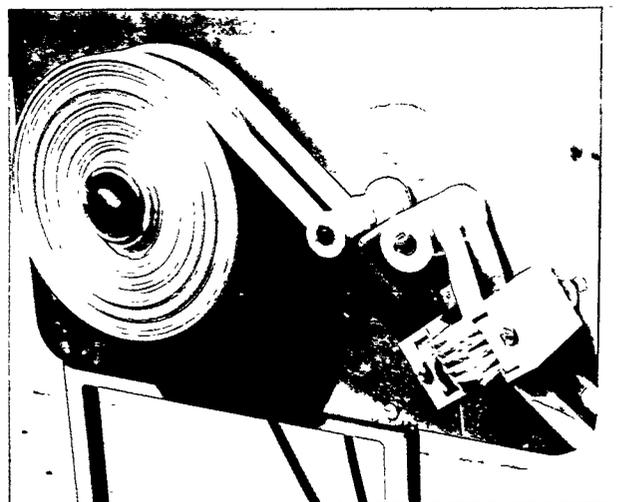
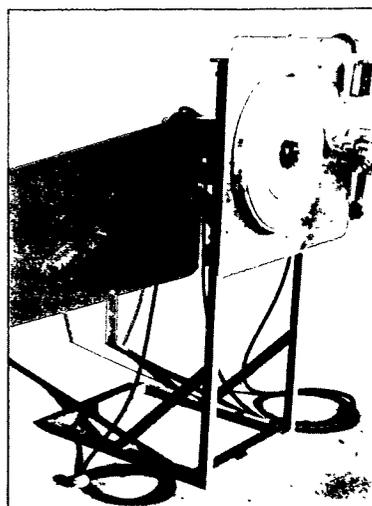
Type: Electric single roll.

Construction: 12-V electric motor with foot control remote switch.

Availability: Information and specifications available from:

Forest Service-USDA
Mt. Hood National Forest
Bear Springs Ranger District
Route 1, Box 65
Maupin, OR 97037
Telephone: 503/328-6211

e. Fire cache hose roller



Type: Electric single and double roll.

Construction and material: Motor is a 115-V, 1/3-hp gear motor. The two roller bearings provide the tension. The cleaning brushes are a standard GSA scrub brush.

WATER DELIVERY COMPONENTS AND ACCESSORIES

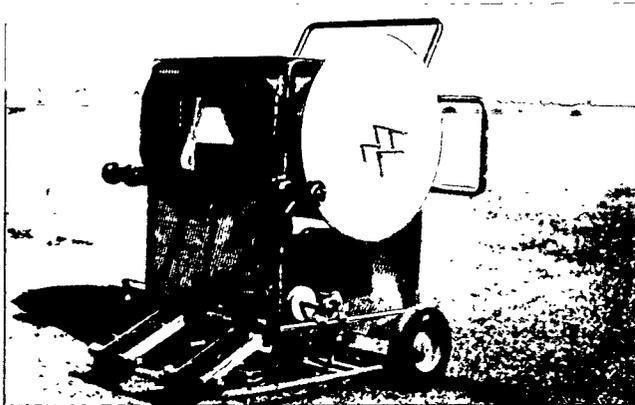
Hose Accessories

A remote button on a 25-ft cord starts and runs the motor.

Availability: Specifications available from:

USDA Forest Service
Technology and Development Center
444 East Bonita Avenue
San Dimas, CA 91773
Telephone: 909/599-1267

f. Redmond cache hose roller



Type: Gas powered.

Construction and material: A 5-hp Briggs & Stratton engine; two stations that will roll single- or double-rolled hose, with foot controls.

Availability: Specifications available from:

Forest Service-USDA
Redmond Fire Center
Airport Way
Redmond, OR 97756
Telephone: 503/548-507

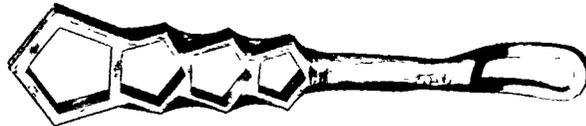
5. Hydrant and spanner wrenches

Hydrant wrenches can be obtained in various sizes to fit water hydrant stems. Spanner wrenches can be obtained in various sizes to fit any connection combination (rocker, slotted, or pin lugs). Combination wrenches are available that can handle both hydrant stems and spanner lugs.

a. Hydrant wrench

Type: Municipal fire hydrant.

Construction and material: Combination of adjustable valve stem sizes. Other optional uses for rocker pin lug spanner may be included. Made of steel or other alloy metal.



Size: 3/4-, 1-, and 1-1/2-in.

Availability: Firefighting equipment companies (see appendix 6).

b. Adjustable hydrant wrench



Type: Rocker lug, pin, or slotted.

Construction and material: Adjustable, cast or forged. Made from manganese bronze, aluminum alloy, or bronze.

Sizes: Fire coupling 3/4- to 2-in, and other sizes.

Availability: GSA and most fire equipment companies (see appendix 6).

c. Lightweight spanner wrench



Type: Pin or rocker lug.

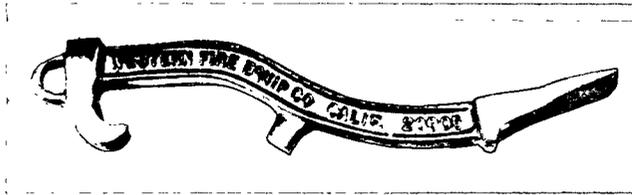
Construction and material: Combination sizes, pocket fit; Forest Service specification 5100-101b.

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Test and Maintenance Equipment

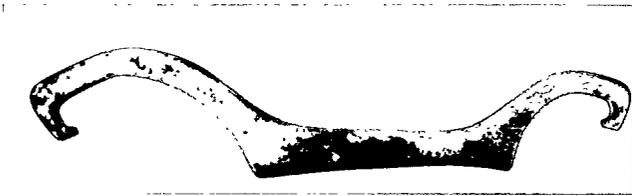
Size: 1- to 1-1/2-in.
Available from GSA: NSN 5120-00-596-1426.

d. Universal spanner



Type: Pin or rocker lug.
Construction and material: Standard type is provided with gas cock slot and pin bar at end.
Sizes: Fit pin or rocker lugs 3/4- to 3-in.
Availability: Firefighting equipment companies (see appendix 6).

e. Combination spanner



Type: Pin or rocker lug.
Construction and material: Combination sizes, pocket fit.
Size: 1- to 2-1/2-in.
Available from GSA: NSN 5120-00-596-1427.

f. Folding spanner

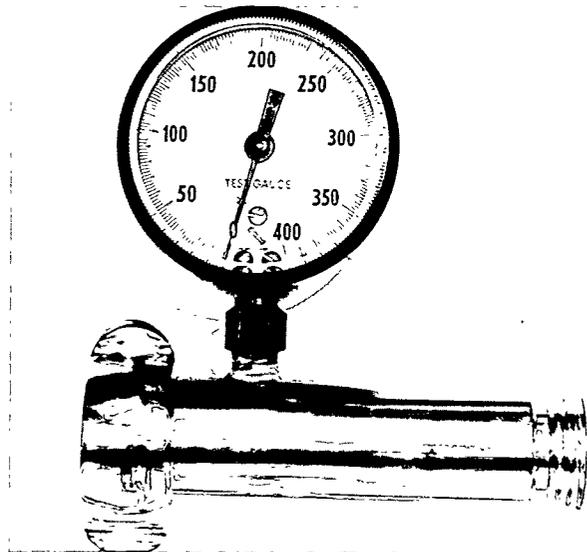


Type: Slotted or rocker lug.
Construction and material: Folding, plastic.
Sizes: 1-1/2- to 2-1/2-in.
Availability: Fire equipment companies (see appendix 6).

D. Hose Test and Maintenance Equipment

Testing and maintenance equipment for hoses and fire pumps is available from fire equipment companies. This type of equipment is useful in fire cache maintenance facilities and in fire stations. For proper maintenance, hoses should be washed, dried, and repaired. Pumps should be cleaned, adjusted, and repaired. Engines, pumps, and hoses should be pressure tested. All this requires appropriate tools and equipment.

1. In-line gauge



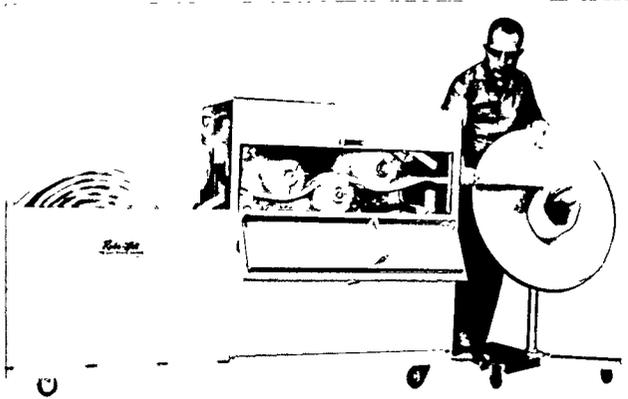
Type: In-line pump discharge pressure.
Construction and material: Short tube inlet and male outlet, and a pressure gauge on the side of the tube. Female end may be swiveled and have lugs. Hose threads are on both ends. Sizes are varied up to 2-1/2-in. Pressure gauge ranges up to 600 psi. The tube is made of steel or brass.
Purpose: Testing pump discharge and hose pressure performance.
Availability: Commercial equipment companies (see appendix 6)

WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Test and Maintenance Equipment

2. Hose washer

a. Mechanical hose washer



Type: Powered mechanical hose washer.
Construction and material: Inlet for water-source connection. Hose is self-propelled. Uniform washing, multiple scrub brushes, one-person operation. Use clear water or detergents.
Purpose: High-volume hose washing.
Availability: The Circul-Air Corp. (see appendix 6).

b. Manual hose washer



Type: Cylinder.
Construction: Cylinder with 1-1/2-in water source connection.
Action: Hose is passed through cylinder against water stream so that dislodged particles are washed away from hose.
Availability: Fire equipment companies (see appendix 6).

3. Hose dryers

a. Electric dryer



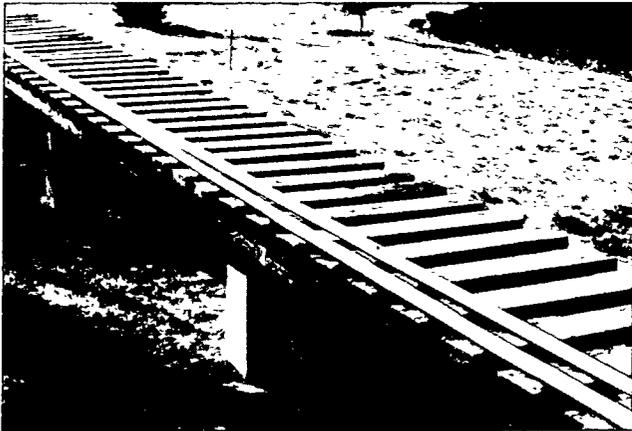
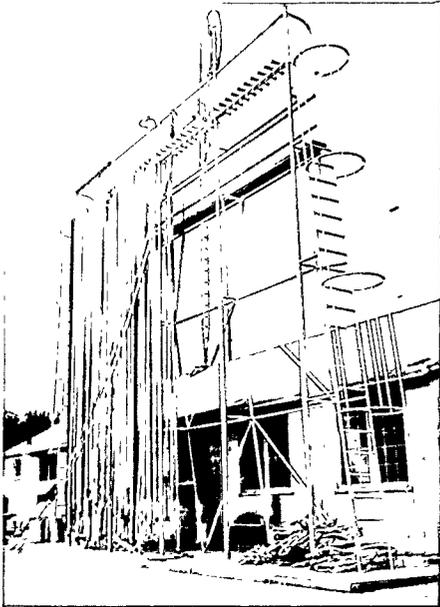
Though many fire control agencies rely on air drying fire hose, mechanical dryers are available with either gas or electric heat for fast, safe, and effective drying of fire hose as well as clothing. The systems work with prewarmed dry air circulating through the drying chamber with five to six air changes per minute.

Availability: Commercial equipment companies (see appendix 6).

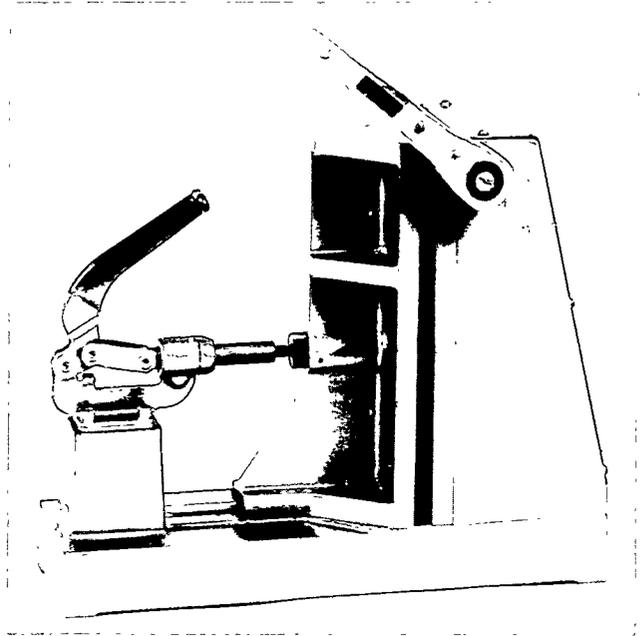
WATER DELIVERY COMPONENTS AND ACCESSORIES

Hose Test and Maintenance Equipment

b. Air dryer



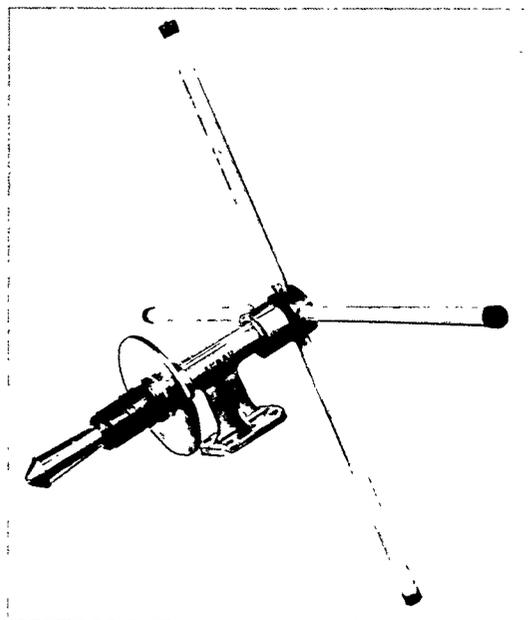
b. Expanders



Expanders, either manual or power operated, are used for attaching fire hose couplings. Expanders are available in 1- to 3-in sizes, with larger sizes available.

Availability: Fire equipment companies (see appendix 6).

(1.) Hand expander



4. *Hose cutters and coupling expanders*

a. Hose cutters

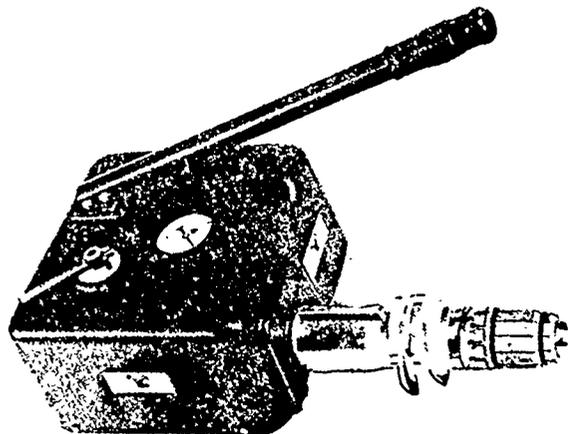
When fabric-type fire hoses are to be cut and recoupled, a reasonably accurate cutting tool should be used to produce a square and clean cut edge. The cutter illustrated above was designed to specifically cut fire hoses. It is capable of cutting hose sizes up to 2-1/2-in.

Written material: Fire equipment companies (see appendix 6).

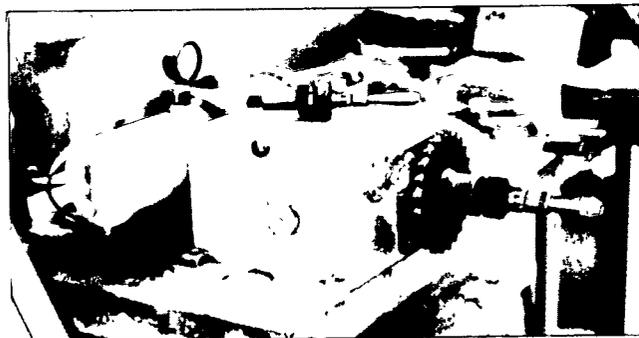
WATER DELIVERY COMPONENTS AND ACCESSORIES

Fittings and Connections

(2.) Hand-operated hydraulic expander



(3.) Power expander



Fire hose is subject to deterioration after use on fires and prolonged storage (subject to the elements of nature). A high-pressure test pump is essential for acceptance and maintenance testing of all fire hose to assure compliance with specification, determine serviceability, permit discarding or repair of defective material, and for testing the adequacy of recoupling jobs. Standard equipment usually includes a pump, suction connection, hose connection(s), pressure gauge, bypass and pressure-regulating valves, and may be hand operated or engine driven. Specific features and additional details are given in suppliers' catalogs.

E. Fittings and Connections

1. General

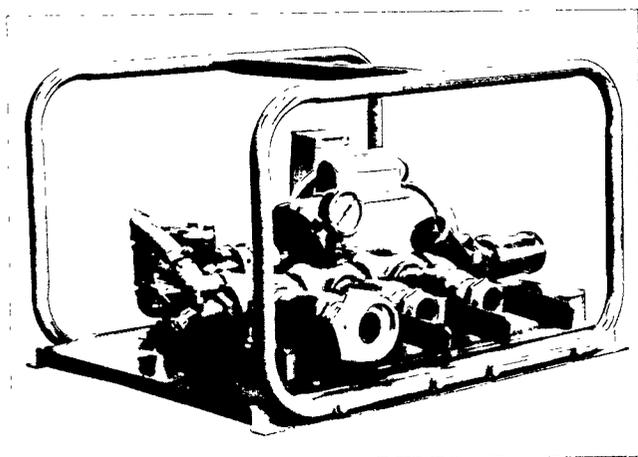
Connections and fittings considered in this Guide are those that are normally connected by hand or spanner wrenches. Threads are varied, and each fire agency has its own standards. The NFPA standards are prevalent. Construction materials are brass, aluminum, or others as specified by purchaser. Lugs are either rocker, pin, or long-handled type. Gaskets are usually located with each female hose thread connection. Some quick-connect type couplings are in service. These are limited in scope, and no standards—other than those established by local jurisdiction—exist.

2. Lugs, threads, couplings, and gaskets

a. Lugs



5. Hose testers



The photograph below illustrates the many variations found among lugs made by different manufactures. Other types of lugs include the "pin," "pin hole,"

WATER DELIVERY COMPONENTS AND ACCESSORIES

Fittings and Connections

and "long handle." A knurled, nonslip surface is often used on the base of a nozzle to assist in breaking the connection. "Hose inlet connections" and "male hose nipples," which mate up to rigid pipe, usually have a hexagon surface up to, and including, 3-in diameter. This provides a pipe-wrench grip. Two or three lugs are usually required on the swivel section of couplings, connections, valves, and wyes. They are acceptable, but not required on male coupling sections.

b. Threads

Hose threads are said to be straight or parallel; and a water seal is formed as the external thread lip seats against a recessed gasket in the internal thread section. In contrast, water-pipe threads are tapered and seal against themselves.

"NH" is an abbreviation of American National Fire hose coupling thread for garden, chemical, and fire protection hose. "NSPH" is the abbreviation for American National hose coupling threads; i.e., straight pipe threads for hose couplings and nipples. A table showing the threads used in current forestry practices follows:

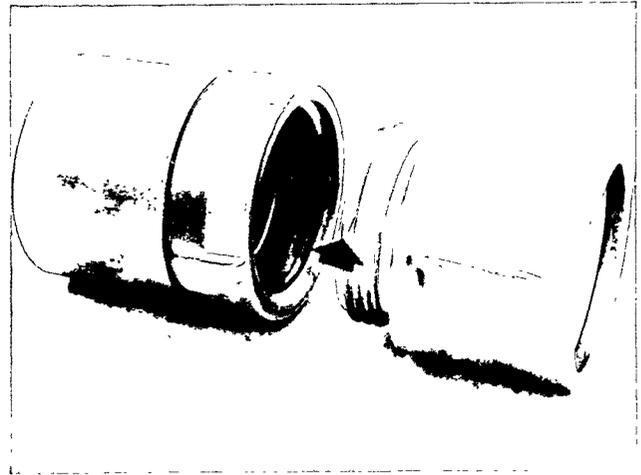
Nominal size (in)	Threads per-in	Maximum male dia. (in)	Nat'l Bureau of Standards symbol
2-1/2	7-1/2	3.06	NH
1-1/2	9	1.99	NH
1	11-1/2	1.30	NPSH
3/4	11-1/2	1.06	NH

In the wildland fire service, the large 2-1/2-in diameter threads are used primarily for suction hose couplings and on loading hose at chemical airtanker bases. The 1-1/2-in size is by far the most common in forestry practice and is used for distribution lines. The 1-in connection is used on most nozzle bases, on 1-in hose, and on 3/4-in hard-rubber hose for reels.

The tips for straight-stream and fog nozzles have 3/4-in NH thread (3/4-in - 11-1/2 NH) in general forestry practice as provided in Forest Service specification 5100-244b. This 3/4-in thread is no longer an NFPA standard (NFPA standard No. 194, 1968). Use of 3/4-in garden hose couplings is *not* recommended for fire service use.

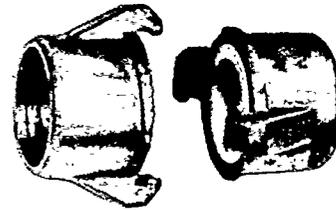
Chemical (booster) hose (3/4-in), and 1-in, is used in fire department practice, and the thread used is

designated as 1-8 NH (1.375-in OD) This thread is also known as chemical or booster hose thread.



Higbee cut: To prevent mutilation and cross threading, and to facilitate rapid coupling, fire hose connections and fittings are manufactured with the first thread cut away or blunted. This is referred to as "blunt start" or the Higbee cut.

c. Quarter-turn (quick) coupler



The quarter-turn hose coupler has become standard within some State agencies. This coupler has the advantage of being quick and "sexless." In addition, no spanner wrench is required, and one coupler size can be used on a range of hose size from 3/4- to 1-1/2-in. This allows for a simple system to reducing hose size, and accessories are available for connecting to pumps, wyes and nozzles.

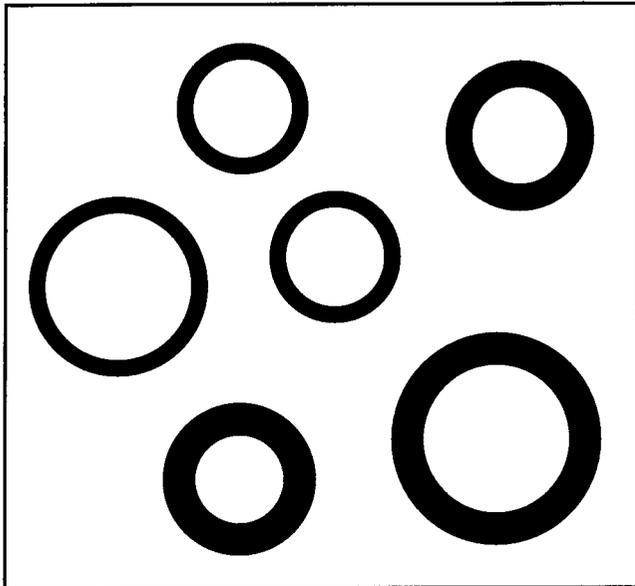
d. Gaskets

Gaskets provide a seal for threaded connections to prevent leakage when fire hoses and fittings are coupled together. They are made of soft rubber, and fit into the female end of the hose fitting against a seat provided in the manufacturing process. Gaskets are commonly

WATER DELIVERY COMPONENTS AND ACCESSORIES

Fittings and Connections

1/16-in larger than the normal ID of the hose on which used. They vary in thickness with the hose diameter (3/16-in for hose of 3/4- to 1-1/2-in ID, to 1/4-in for hose of 2- to 4-1/2-in ID, and 3/8-in for 5-in ID and larger).



The OD of gaskets has never been standardized, and depends entirely on the width of the gasket seat in the hose bowl. On rubber-lined hose, this dimension must be measured and a gasket provided with an OD wide enough to prevent seepage between the rubber liner and the outside emerging, ensuring a water-tight fit. Seepage will cause hose "blistering" to develop and eventually rupture the hose.

Available from GSA (Forest Service specification 5100-190A):

1-in	NSN 5330-00-720-2621
1-1/2-in	NSN 5330-00-239-1873
2-in	NSN 5330-00-239-1875
2-1/2-in	NSN 5330-00-239-1877

3. *Fittings/connections*

These items include the many different types of couplings, connections, adapters, increasers, reducers, wyes, and valves required in wildland fire hose lines. If the item attaches to a fire hose line, it should be found here. Consult the *GSA Fire Supply Catalog* for many of these items

a. Thread adapter



Type: Female to male with lugs.

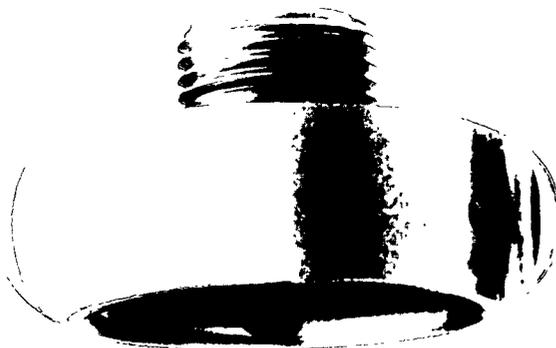
Threads: Different hose threads on opposite ends as specified.

Size: Same on opposite ends.

Available from GSA:

1-1/2-in NH x 1-1/2-in NPSH	NSN4210-01-079-9284
1-1/2-in NPSH x 1-1/2-in NH	NSN4210-01-079-9283

b. Reducer



Type: Female to male with lugs.

Threads: Same or different hose threads on both ends as specified.

Size: Different on opposite ends.

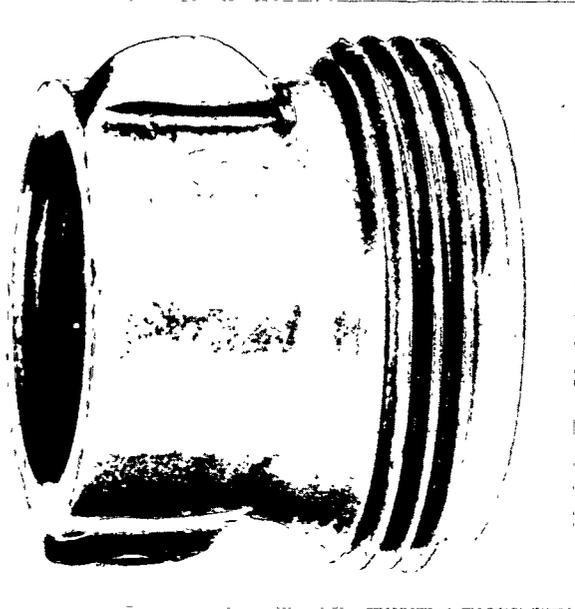
WATER DELIVERY COMPONENTS AND ACCESSORIES

Fittings and Connections

Available from GSA:

1-in NPSH x 3/4-in NH	NSN 4210-01-079-9286
1-1/2-in NH x 1-in NPSH	NSN 4210-00-975-2969
1-1/2-in NPSH x 1-in NPSH	NSN 4210-00-294-2648
2-1/2-in NPSH x 1-1/2-in NH	NSN 4210-01-081-0419

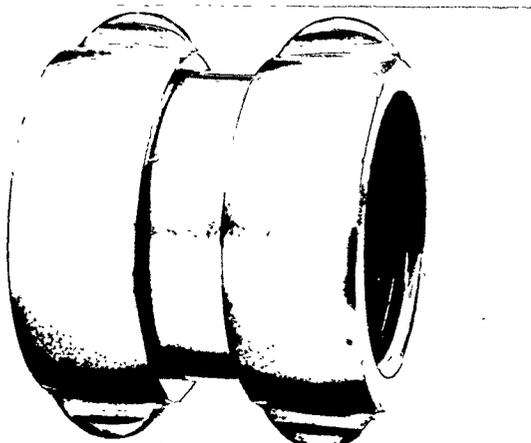
c. Increaser



Type: Female to male with lugs.
Threads: Same or different hose threads on both ends as specified.
Size: Different on opposite ends.
Available from GSA:

3/4-in NH x 1-in NPSH	NSN 4210-01-080-6531
1-in NPSH x 1-1/2-in NH	NSN 4210-01-080-6532

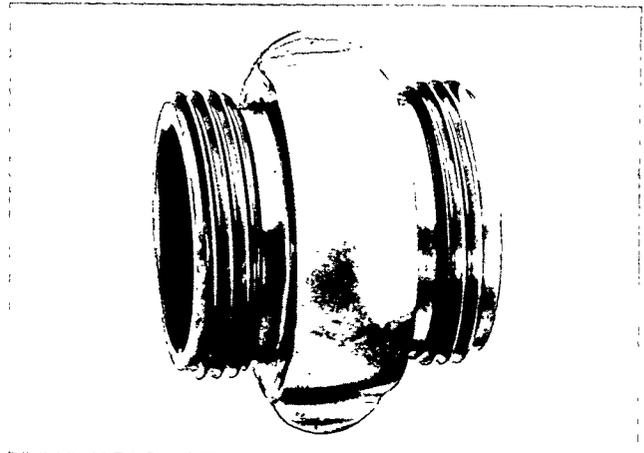
d. Double female coupling



Type: Swivel female ends with lugs.
Threads: Same hose threads on both ends as specified.
Size: Same on both ends as specified.
Available from GSA:

1-in NPSH	NSN 4210-01-080-1457
1-1/2-in NH	NSN 4210-01-081-8749

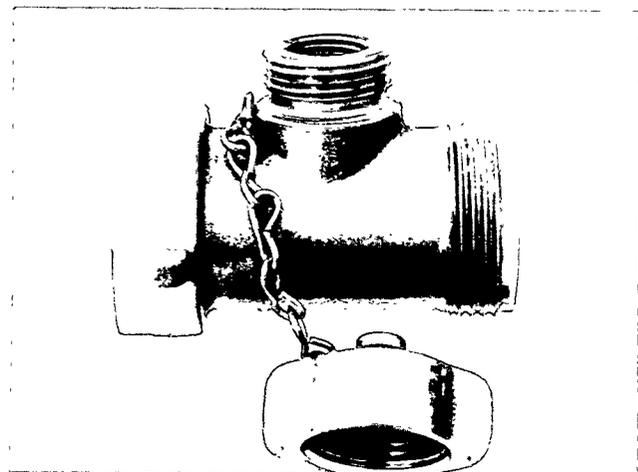
e. Double male coupling



Type: Male ends with lugs.
Threads: Same hose threads on both ends as specified.
Size: Same on both ends as specified.
Available from GSA:

1-in NPSH	NSN 4210-01-080-1458
1-1/2-in NH	NSN 4210-01-079-9285

f. Hose line tee

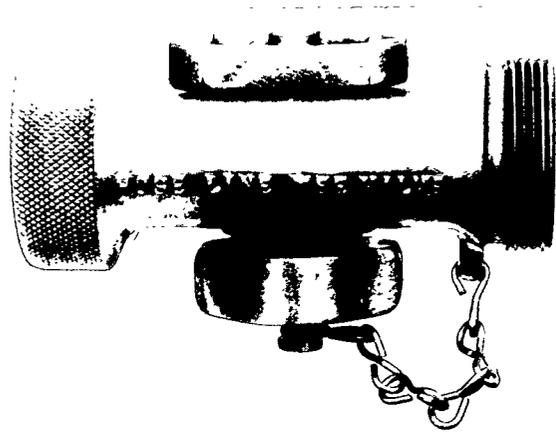


WATER DELIVERY COMPONENTS AND ACCESSORIES
Fittings and Connections

Type: Three-port design. Inlet, branch, and outlet, with chain and cap for branch port.
Threads: Inlet and outlet same hose threads as specified.
Size: Same both ends and branch or as specified.
Available from GSA:

1-in NPSH x 1-in NPSH x 3/4-in NH NSN 4210-01-081-0418
 1-in NPSH x 1-in NPSH x 1-in NPSH NSN 4210-01-080-1459
 1-1/2-in NH x 1-1/2-in NH x 1-in NPSH NSN 4210-01-080-1460

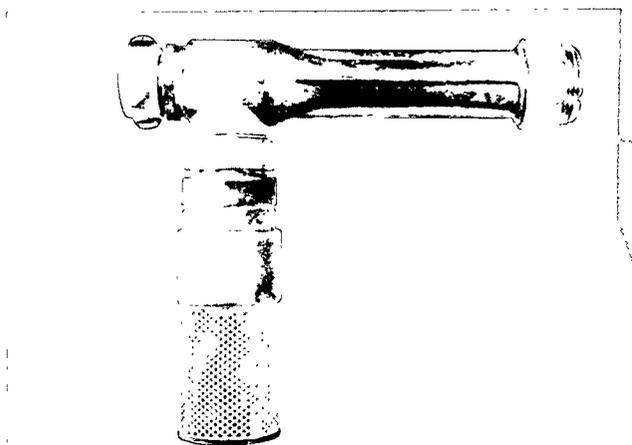
g. Hose line tee valve



Type: With valve branch, female with lug one end, male opposite end and on branch.
Threads: Inlet and outlet same hose threads as specified.
Size: As specified.
Available from GSA:

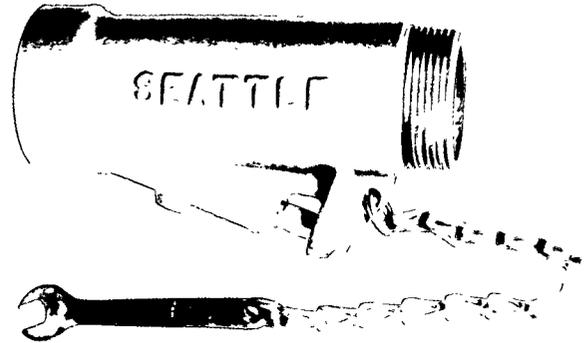
1-1/2-in NH x 1-1/2-in NH x 1-in NPSH NSN 4210-01-081-0417

h. Ejector



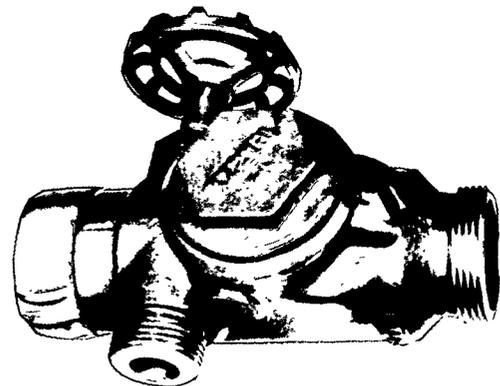
Type: Straight type with foot valve.
Threads: Pipe thread adapted to hose thread as specified.
Size: As specified.

i. Bleeder valve



Type: In-line hose branch with wrench to bleed water for backpack tank.
Threads: Female one end, male other end, hose threads as specified.
Size: 1-1/2-in.

j. Check and bleeder valve



Type: Swing check valve with bleeder valve with branch male, swivel inlet with lugs.
Threads: Female inlet, male outlet, hose threads as specified, 1-in NPSH male branch.
Size: 1-1/2-in inlet and outlet.

WATER DELIVERY COMPONENTS AND ACCESSORIES
Fittings and Connections

k. Ball valve shut-off

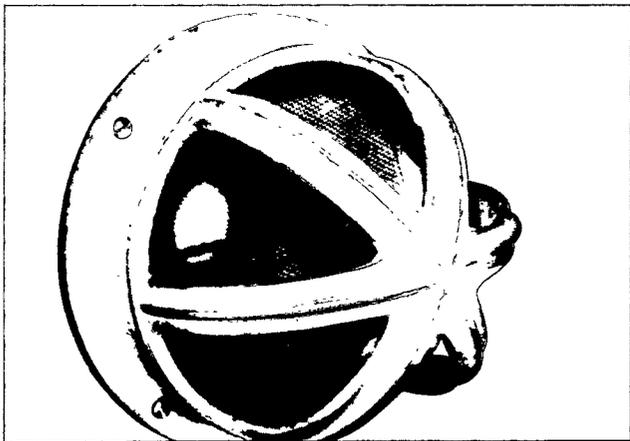


Type: Ball with lever handle, swivel inlets optional.
Threads: Female-inlet, male outlet, hose threads as specified.
Size: 1-in and 1-1/2-in inlets and outlets as specified.
Available from GSA:

1-in NPSH
1-1/2-in NH

NSN 4210-01-165-6599
NSN 4210-01-165-6600

l. Suction strainer

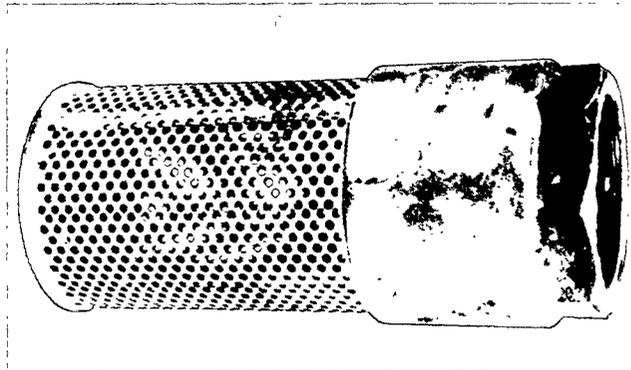


Type: Low-velocity, globe-shaped.
Threads: Female hose threads as specified.
Size: As specified.
Available from GSA:

1-1/2-in NH
2-1/2-in NH

NSN 4210-00-984-3460
NSN 4210-00-203-3228

m. Foot valve

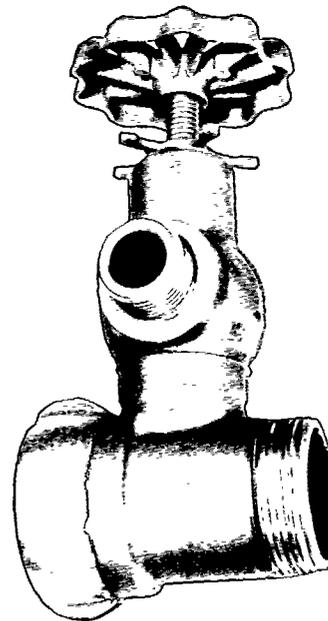


Type: Spring action with strainer female connection.
Threads: Female adapted to hose threads as specified.
Size: As specified.
Available from GSA:

1-1/2-in NH

NSN 4820-00-126-5114

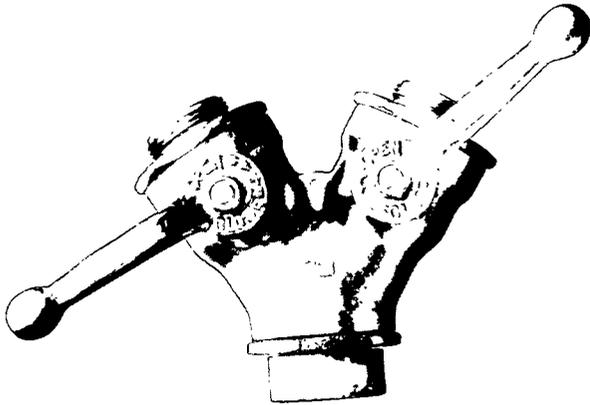
n. Pressure relief valve



Type: In-line hose branch with spring loaded relief valve and adjustment nut, swivel-inlet with lugs.
Threads: Female inlet, male outlet, NH threads, 1-in NPSH threads.
Size: 1-1/2-in inlet and outlet.

WATER DELIVERY COMPONENTS AND ACCESSORIES
Fittings and Connections

o. Wye valve



Type: Swivel inlet, gate valve branch outlets with handles.

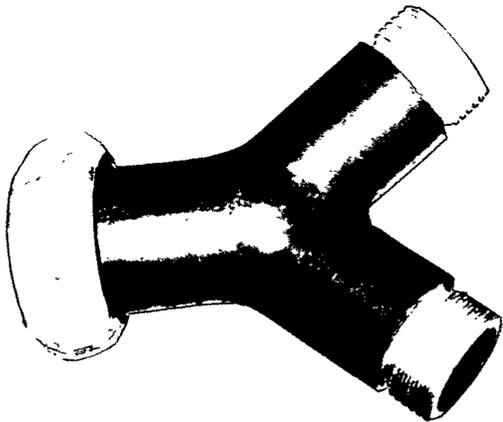
Threads: Female-inlet, male outlets, hose threads as specified.

Available from GSA:

1-in NPSH
1-1/2-in NH

NSN 4210-00-126-5108
NSN 4210-00-984-3475

p. Plain wye

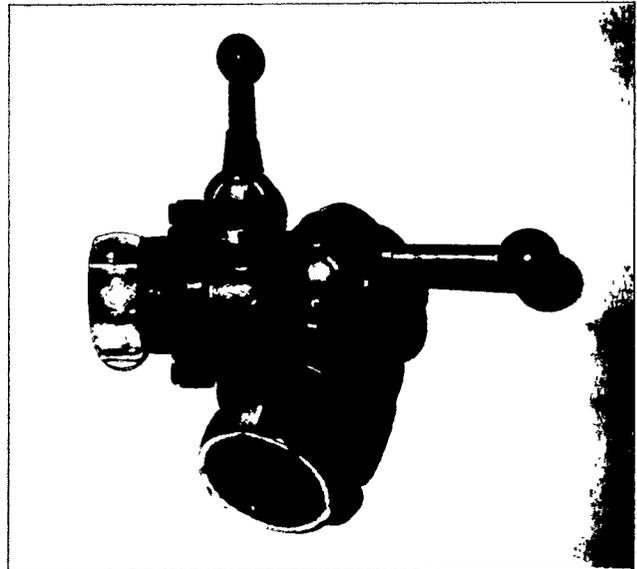


Type: Swivel-inlet, branch outlets.

Threads: Female-inlet, male outlets, hose threads as specified.

Size: 1-in and 1-1/2-in inlet and outlets same size as specified.

q. Siamese wye valve



Type: Two swivel inlets, ball gate valve branch-inlets with handles.

Threads: Two female inlets, male outlet, threads as specified.

Size: 1-1/2-in and 2-1/2-in inlets and outlets same size as specified.

r. Siamese wye



Type: Two swivel-inlets, single outlet.

Threads: Two female-inlets, male outlet, threads as specified.

Size: 1-1/2-in and 2-1/2-in inlets and outlets same size as specified.

s. Gravity sock



Type: Canvas, 3-ft to 4-ft long; 8-in to 15-in inlet, upstream feed.

Threads: Male hose thread outlet as specified.

Size: 1-1/2-in.

F. Nozzles

1. General

There are many varieties of fire hose nozzles available to the firefighter. The municipal type, which apply large volumes of water, are *not* practical in wildland fire situations. The shortage of water precludes any excessive usage. Knockdown capabilities normally applicable to structural fires are not required. Nozzles are designed to do a variety of tasks. Basically, a nozzle is for straight-stream and/or spray applications with variable adjustments. The types of nozzles most appropriate for wildland fires are the adjustable combination barrel, plain, twin, or multiple tips.

2. Design criteria

The following design, or selection, criteria have evolved from many years of forestry practice and numerous detailed studies.

a. Rate of application

Roughly, flow is limited to about 30 gpm for 3/4- and 1-in ID lines and 100 gpm for the 1-1/2-in lines.

b. Right form

Combination nozzles that provide both straight-stream and spray patterns are required. Standard spray tips are available from 3 to 24 gpm. Numerous adjustable

nozzles go to much higher flow rates. Ability to vary the spray is important.

Clean, variable straight streams are required for the full range of working pressures. Straight-stream tips range from 1/8- to 3/8-in. While combination features are desirable, some nozzles show a wide range of discharge flows, increasing with the spray cone angle. This characteristic is *not* desirable.

c. Good pattern

Some nozzles produce solid cone patterns, which are the most desirable. Others have distinct hollow cones, voids, and flat, fan-shaped patterns. Some sprays look like the ribs of an umbrella as water is projected in jet streams. These latter patterns are wasteful, and may result in skips in water-line firefighting.

d. Water droplet size

Fine sprays offer better cooling and give protection to the nozzle person from excessive fire temperatures. Water droplets should be in the 0.14- to 0.39-in size range to be most effective. Nozzles should also produce an acceptably uniform droplet size over a reasonably wide range of pressures. Finely divided sprays, however, may not reach as far as required, and may be severely buffeted and dissipated by winds and updrafts.

e. Nozzle pressure

Range for the nozzles presented in this section have been related to 100-psi nozzle pressure. Flow is reduced to about 0.7 when the nozzle pressure is reduced from 100 to 50 psi. One can use a 3/4-rule when pressure is reduced to 100 to 50 psi. (See appendix 3.)

f. Control valves

Shutdown features and flow pattern variations are controlled by lever-type ball valves, by rotating the body of the nozzle, or by trigger action. Nozzles are marked, indexed, or referenced so that efficient operation is possible—even by an inexperienced firefighter.

g. Tips

If flows and patterns are varied by exchanging tips, the tips will be provided with 3/4-in GH threads and meet the requirements of Forest Service specification 5100-244b.

WATER DELIVERY COMPONENTS AND ACCESSORIES

Nozzles

h. Clogging

Since engines pickup water in open sources at the nearest water chance, foreign matter and silt are often a problem; thus, spray nozzles should be equipped with adequate screens that can be easily removed and serviced.

i. Base-inlet

All booster nozzles are provided with 1-in NPSH (1-11 1/2-in NPSH) threads. There is limited need for 1-1/2-in base nozzles in wildland firefighting. Rocker lugs or a knurled base are required.

j. Weight

Weight is an important factor, so lightweight material is desirable. Some heavy brass nozzles are thus eliminated from practical forestry use. Nozzles should preferably weigh no more than 2 lb. Some lightweight plastic materials may not withstand higher working pressures under some forestry applications.

k. Cost

Simple, trouble-free construction providing the performance listed in items "a" through "j" is necessary. Expensive materials, such as copper-bearing brass, and highly polished or plated hardware and accessories, are neither required nor desired for forestry use.

A representative nozzle in widespread use that meets most of the above requirements is available under Forest Service specification 5100-240 (nozzle, twin-tip, shut-off, 1-in base, straight-stream and fog tip). This nozzle is furnished by the Federal Supply Service as catalog item NSN 4210-00-640-1892.

3. Nozzle types

For simplicity, nozzles can be grouped into several broad classes. If the nozzle can produce either a straight stream or a spray selectivity, it is classed as a combination type. A few nozzles can produce both patterns simultaneously, but their flow requirements are high. The more common types are listed as follows:

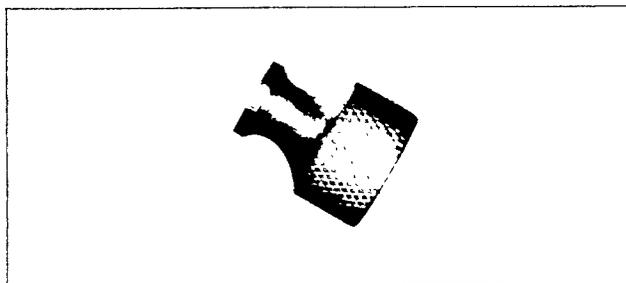
- a. Single Tip (with shut-off)
- b. Screw Tip (without shut-off)
- c. Twin Tip

- d. Adjustable Straight Stream
- e. Combination
- f. Hydro-Fog Combination
- g. Selectable Gallonage.

4. Nozzle tips

Since forestry tips are comparatively small (primarily 1/8- to 3/8-in), 3/4 - 11-in NH has been adopted for the basethread. The Forest Service maintains specification 5100-244 on straight-stream and spray tips. This specification lists five different diameter straight-stream tips and eight different flows (gpm) in spray tips. The bore diameter is on the outlet flange of the straight-stream tips, and the flow (gpm) is stamped on the barrel tip of the spray tips. The tips are made of noncorrosive material and are designed to withstand a pressure of 600 psi. Materials and construction are detailed in Forest Service specification 5100-244.

a. Straight stream



Straight-stream tips are designed and inspected to produce the following minimum performance:

Tip size (in)	Min. stream @ 100 psi (ft)	Flow rate @ 50 psi (gpm)	Flow rate @ 100 psi (gpm)
1/8	29	3.3	4.8
3/16	34	7.4	10.5
1/4	40	13.2	18.7
5/16	41	22.0	30.0
3/8	41	39.7	42.0

*Measured 36-in above the ground, and to the center of the area where the stream strikes the ground.

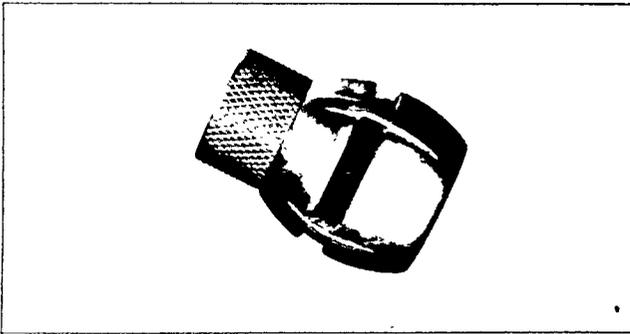
Available from GSA:

3/16-in	NSN 4210-00-203-3855
1/4-in	NSN 4210-00-177-6135
3/8-in	NSN 4210-00-203-3845

WATER DELIVERY COMPONENTS AND ACCESSORIES

Nozzles

b. Spray



The spray requirements specify a uniform solid-cone mist with a minimum horizontal range of 12 ft. The flow rate at a tip pressure of 100 psi must be within the range shown in the following table:

Tip No. (gpm)	Min. discharge angle (deg)	Max. discharge angle (deg)	Min. flow rate (gpm)	Max. flow rate (gpm)
3	18	22	2.0	4.0
6	18	22	5.0	7.0
8	18	22	7.0	9.0
9	26	30	11.0	13.0
15	26	30	13.5	16.5
18	26	30	16.5	19.5
24	26	30	22.5	25.5

Available from GSA:

Size 3	NSN 4210-00-204-3358
Size 6	NSN 4210-00-204-3386

c. Adjustable

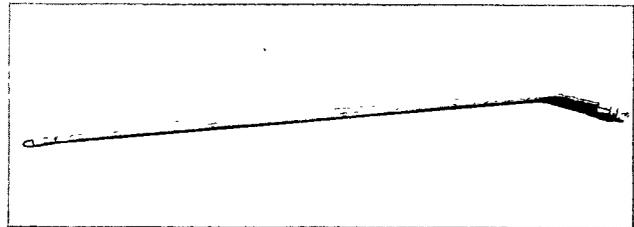
Premium garden hose nozzles are often used as tips on booster line nozzles, especially for mop-up work. Forest Service specification 5100-243 calls out first-class material and construction capable of working pressures of 250 psi with no leakage in any adjusted position. Overall maximum length is 5 in in the shut-off position; weight does not exceed 14 oz.

Position	Min. discharge @ 100 psi (gpm)	Max. discharge @ 100 psi (gpm)
1—High-velocity, low-discharge, wide-angle spray	6.0	7.0
2—Straight-stream spray	4.5	5.5
3—Low-velocity, high-discharge spray	9.5	10.5

Firefighters should observe the low working pressure requirements of this tip.

Available from GSA: NSN 4730-00-595-1103.

5. Applicator pipe



An applicator pipe, or wand, is available for reaching under logs, roots, stumps, and into the base of piled fuels. It can be used in deep duff, peat, and sawdust. The applicator is 48-in long, has a 45° bend near the end, and is equipped with 3/4-in NH male threads to accommodate a special low-flow spray tip (3 gpm with a 60° pattern).

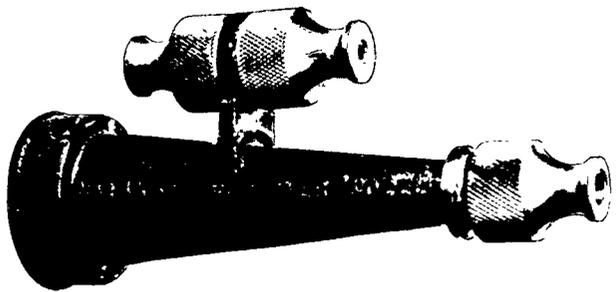
6. Nozzle descriptions

A dozen or so commonly used booster nozzles with 1-in bases have been included for reference purposes, as have several plain nozzles with 1-1/2-in bases. The information is in brief descriptive format. Factual test information is included where available.

WATER DELIVERY COMPONENTS AND ACCESSORIES

Nozzles

a. Plain screw tip



Type: Plain 1/2-in bore, 3/4-in NH outlet, with tip holder bracket.

Action: Nonadjustable, interchangeable tips (straight-stream or spray).

Manufacturer: See appendix 6.

Weight: 2-lb, 6-oz.

Length: 7-3/4-in.

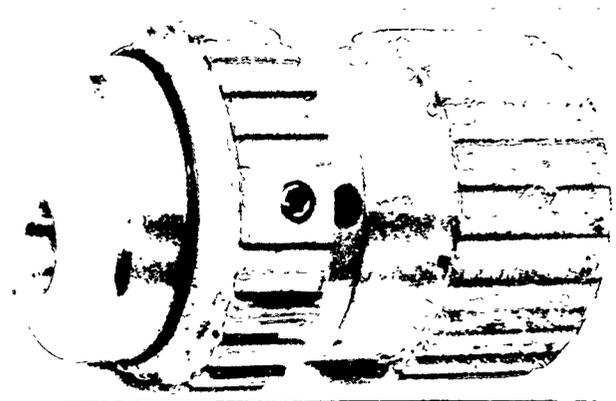
Base (inlet): 1-1/2-in 9 NH.

Material and finish: Smooth sand cast brass.

Performance (flow and pressure):

Tip size (in)	Flow @ 100 psi (gpm)	Horizontal range (ft)
3/16	10.5	34
1/4	18.7	40
3/8	42.1	41

b. All-in-one



Type: Adjustable straight-stream.

Action: Sequence from shut-off to 1/8-, 3/16-, and 1/4-in.

Manufacturer: Hansen Manufacturing (supplied by Wajax Pacific).

Weight: 1-in, 5-1/2-oz; 1-1/2-in, 7-oz.

Length: 1-in, 2-9/16-in; 1-1/2-in, 2 3/4-in.

Base (inlet): 1-in NPSH, 1-1/2-in NH.

Material and finish: Aluminum alloy Delran insert.

Performance (flow and pressure) for 1-1/2-in base only:

Orifice size (in)	Flow @ 100 psi (gpm)
1/8	3
3/16	9
1/4	13
5/16	20

c. Ball shut-off



Type: Single-tip, ball or cylinder lever valve shut-off, 1/2-in bore, 3/4-in NH outlet for interchangeable tips.

Action: Sequence shut-off (lever forward), straight-stream or spray.

Available from GSA: NSN 4210-00-203-3519.

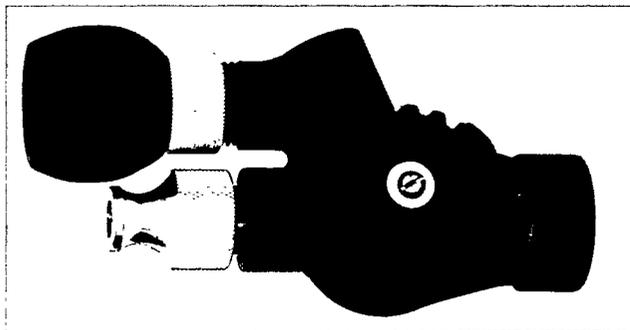
Weight: 1-lb, 15-oz, brass (with tip); 13-oz, aluminum.

Base (inlet): 1-in, 1 1/2-in NPSH.

Material and finish: Smooth sand-cast brass, or forged aluminum.

Performance: See twin-tip nozzle performance table for flow and pressure ranges.

d. Twin-tip combination



Type: Combination spray, straight-stream, 1/2-in bore, two 3/4-in NH outlets.

Action: Sequence shut-off, spray (fog), straight-stream.

Available from GSA: NSN 4210-00-640-1892.

Weight: 1-lb, 10-oz.

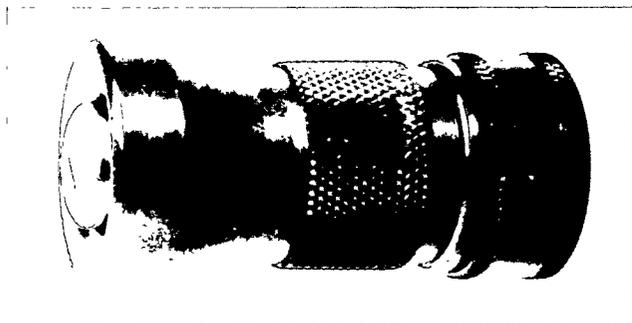
Length: 7-in.

Base (inlet): 1-in, 11-1/2 NPSH.

Material and finish: Brushed cast aluminum alloy, knurled hand grip.

Performance (flow and pressure): Nozzle used with straight-stream and spray tips (see that table).

e. Adjustable combination



Type: Adjustable combination.

Action: Sequence-shut-off, straight-stream, spray.

Available from GSA:

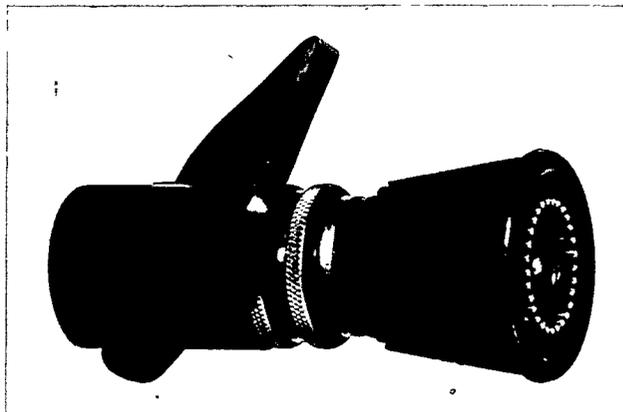
NSN 4210-00-085-2291 1-in NPSH polycarbonate

NSN 4210-00-181-8872 1-1/2-in NPSH polycarbonate

NSN 4210-01-165-6603 1-in NH anodized aluminum

NSN 4210-01-167-1123 1-1/2-in NH anodized aluminum

f. Hydra-fog combination



Type: Adjustable combination barrel.

Action: Fog, straight-stream, shut-off.

Manufacturer: See appendix 6.

Weight: 1-in, 2-1/2 lb; 1-1/2-in, 8-1/4-in.

Length: 1-in, 7-in; 1-1/2-in, 8-1/4-in.

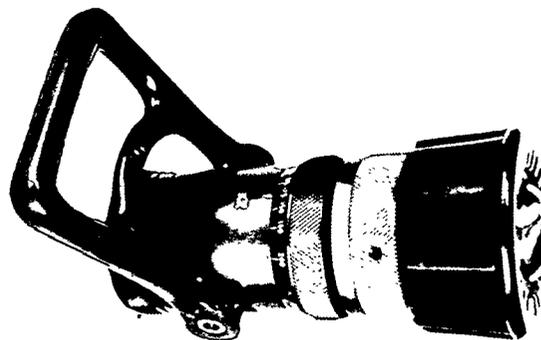
Base (inlet): 1-in NPSH; 1-1/2-in NH.

Material and finish: Brushed anodized aluminum, neoprene rubber bumper, stainless steel fog tip.

Performance (flow and pressure):

Size (in)	Flow (gpm)	Pressure (psi)
1	23	100
1-1/2	95	100

g. Selectable gallonage fog nozzle



Selectable gallonage fog nozzles with gallonage selections of 5 to 200 gpm, with in operation quick flush.

WATER DELIVERY COMPONENTS AND ACCESSORIES

Water Storage Tanks (Folding/Collapsible)

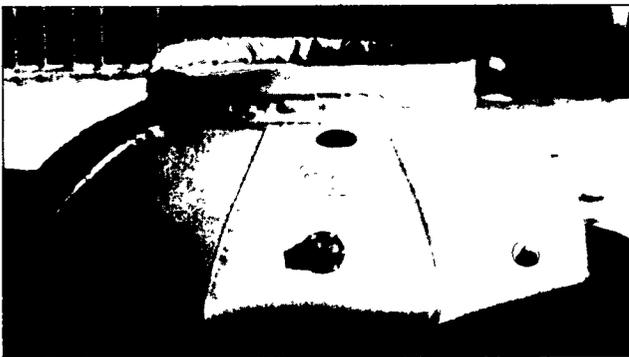
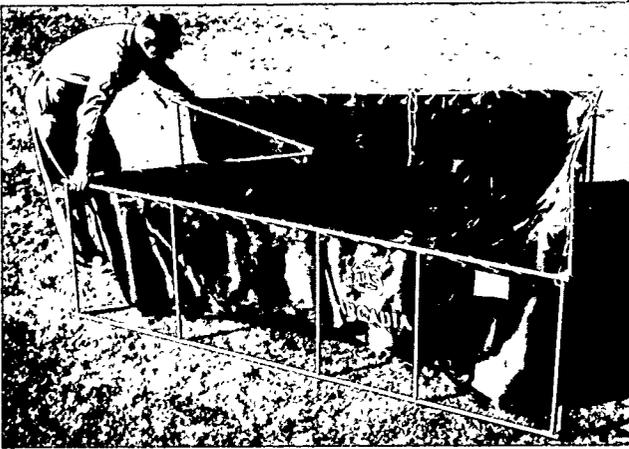
The wide range of gallonage settings, ease of maintenance, size, weight, and durability make these versatile nozzles. They are available as direct-connect nozzles with integral stainless ball shut-off, or as a fog tip with twist shut-off. Models feature a flush without shutting down.

Type: Selectable gallonage.

Action: Constant flow in each setting; quick-change seat.

Material and finish: Hard coat anodized; rubber bumper protection; lightweight construction.

G. Water Storage Tanks (Folding/Collapsible)



Type: Open and closed storage auxiliary tank.

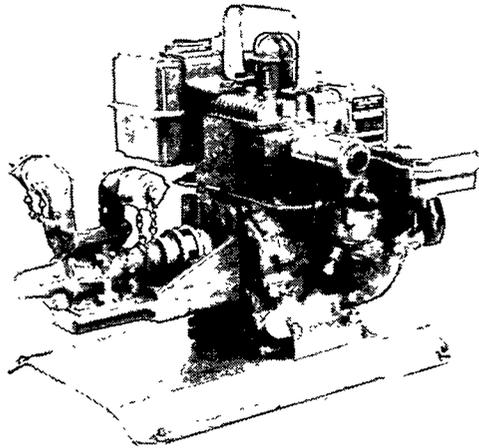
Construction and material: May be self-supporting, pyramidal, or pillow-shaped collapsible canvas tanks; or tubular metal frame with Hypalon liner having grommeted edges for attaching to a frame. Each type is foldable for easy storage and transport.

Sizes: 75 to 300 gal for normal relay type use, large 600-, 1,000-, 1,500-, 2,000-, and 3,000-gal capacities.

Availability: Fire equipment companies (see appendix 6).

APPENDIXES





PUMP

ENGINE

MAKE Edwards Manufacturing Co.
 MODEL EBE
 TYPE Positive displacement⁴
 PRIMING DEVICE None
 INLET SIZE 1-in
 OUTLET SIZE 1-in
 HEIGHT (IN) 15 WIDTH (IN) 16
 LENGTH (IN) 18 DRY WEIGHT (LB) 42

MAKE Briggs & Stratton²
 MODEL 80332
 HORSEPOWER 3 RPM 3,600
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline—no additives
 FUEL PUMP AVAILABLE No

MANUFACTURER

Edwards Manufacturing Co.
 2441 SE Stubbs St., Milwaukie, OR 97222

PUMP PERFORMANCE VALUES^{1/}

PSI	50	100 ²	150
GPM	11	11	10

HEARING SAFETY SOUND LEVEL 92 dBA (Warning label required)^{5/}
 COMMUNICATION SAFETY SOUND LEVEL —

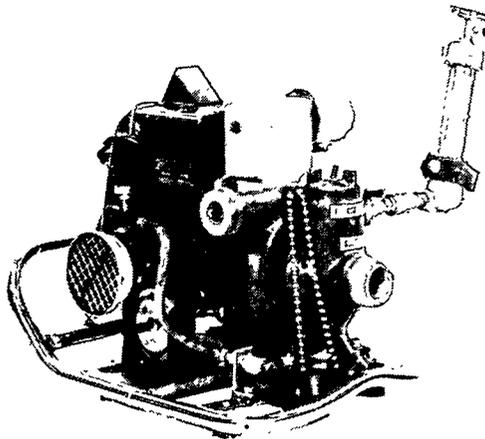
DESCRIPTION

PUMPER DESIGNATION P-045-15/08 INTEGRAL OR REMOVABLE HANDLES Removable
 WATER OR AIR COOLED Air-cooled RELIEF VALVE Yes
 STARTING SYSTEM Rewind BACKPACK & STRAPS N/A
 2- OR 4-STROKE CYCLE 4-stroke SPECIAL ACCESSORIES OR TOOLS None
 PRESSURE GAUGE Optional
 INTEGRAL OR REMOVABLE BASE Removable

REMARKS

* Forest Service—USDA qualified October 31, 1963 * Meets Forest Service—USDA Specification 5100-273
 FOOTNOTES—^{1/} Corrected for sea level conditions ^{2/} 100-hr endurance test rating 3,060 rpm
^{3/} Stellite exhaust valve and seat; exhaust valve rotator ^{4/} Compound 107 impellers
^{5/} See pg. 1, "Special Considerations," for sound level definitions

APPENDIX 1
Pump Data Sheet



PUMP

MAKE Gorman-Rupp
 MODEL 61-1/2 DF (FS)
 TYPE Single-stage, centrifugal
 PRIMING DEVICE Hand-operated
 INLET SIZE 1 1/2-in—9NH
 OUTLET SIZE 1 1/2-in—9NH
 HEIGHT (IN) 13-1/2 WIDTH (IN) 11-1/2
 LENGTH (IN) 18-1/2 DRY WEIGHT (LB) 29-1/2

ENGINE

MAKE West Bend (Chrysler)
 MODEL 82003
 HORSEPOWER 8 RPM 7,000 cont.
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline—oil mixture
 FUEL PUMP AVAILABLE Incorp w/carb

MANUFACTURER

Gorman-Rupp
305 Bowman Street, P.O. Box 1217, Mansfield, OH 44902

PUMP PERFORMANCE VALUES^{1/}

PSI	50	100	150 ^{2/}	175	200
GPM	50	42	27	20	10

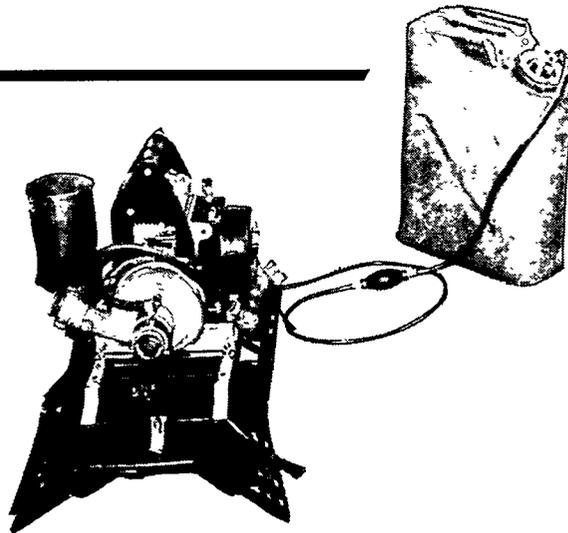
HEARING SAFETY SOUND LEVEL 102 dBA (Warning label required)^{3/}
 COMMUNICATION SAFETY SOUND LEVEL 90 dBA^{3/}

DESCRIPTION

PUMPER DESIGNATION C-30-150/25⁴
 WATER OR AIR COOLED Air-cooled
 STARTING SYSTEM Re-coil—rope
 2- OR 4-STROKE CYCLE 2-stroke
 PRESSURE GAUGE Optional
 INTEGRAL OR REMOVABLE BASE Removable
 INTEGRAL OR REMOVABLE HANDLES N/A
 RELIEF VALVE No
 BACKPACK & STRAPS Optional
 SPECIAL ACCESSORIES OR TOOLS Spare spark plug and spark plug wrench, backpack type fuel tank, combination foot valve and strainer.

REMARKS

* Forest Service—USDA qualified: March 27, 1967
 * Meets Forest Service—USDA Specification 5100-274
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating 5,300 rpm
^{3/} See page 1, "Special Considerations," for sound level considerations ^{4/} Alternate codings 175/15 200/09



PUMP

MAKE Homelite
 MODEL FP 150
 TYPE Centrifugal
 PRIMING DEVICE Hand-operated
 INLET SIZE 1-1/2 in
 OUTLET SIZE 1-1/2 in
 HEIGHT (IN) 15 WIDTH (IN) 19
 LENGTH (IN) 16 DRY WEIGHT (LB) 29

ENGINE

MAKE Homelite
 MODEL FP 150
 HORSEPOWER 6.8 RPM 7,500
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline-oil mixture
 FUEL PUMP AVAILABLE None

MANUFACTURER

Homelite Textron

14401 Carowinds Boulevard, Charlotte, NC 28217

PUMP PERFORMANCE VALUES^{1/}

PSI	50	75	100	125 ^{2/}	150	175	190
GPM	51	46	40.5	34.5	26.5	16	0

HEARING SAFETY SOUND LEVEL 107 dBA (Warning label required)^{3/}
 COMMUNICATION SAFETY SOUND LEVEL 90 dBA^{3/}

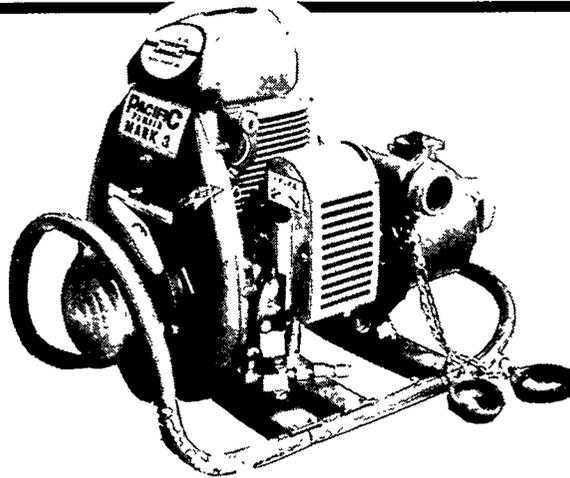
DESCRIPTION

PUMPER DESIGNATION C-30-150/25⁴
 WATER OR AIR COOLED Air-cooled
 STARTING SYSTEM Rope
 2- OR 4-STROKE CYCLE 2-stroke
 PRESSURE GAUGE Optional
 INTEGRAL OR REMOVABLE BASE Integral
 INTEGRAL OR REMOVABLE HANDLES Integral
 RELIEF VALVE None
 BACKPACK & STRAPS Optional
 SPECIAL ACCESSORIES OR TOOLS Foot valve,
 combination spark plug wrench/screw driver

REMARKS

* Forest Service—USDA qualified: July 15, 1980
 * Meets Forest Service—USDA Specifications 5100-274b
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating—6,550 rpm
^{3/}See pg. 1, "Special Considerations," for sound level definitions ^{4/}Alternate codings: 175/15

APPENDIX 1
Pump Data Sheet



PUMP

MAKE Wajax/Pacific Pumps, Inc.
 MODEL Mark 3
 TYPE 4-stage, centrifugal
 PRIMING DEVICE Hand-operated
 INLET SIZE 2 in NPSH^{2/}
 OUTLET SIZE 1-1/2 in NPSH
 HEIGHT (IN) 16-1/2 WIDTH (IN) 12
 LENGTH (IN) 22 DRY WEIGHT (LB) 55

ENGINE

MAKE Bombardier Rotary
 MODEL 185 cc
 HORSEPOWER 8.5 RPM —
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline-oil mixture
 FUEL PUMP AVAILABLE Incorp w/carb

MANUFACTURER

Wajax/Pacific Pumps, Inc.
227 Andover Park East, Seattle, WA 98188

PUMP PERFORMANCE VALUES^{1/}

PSI	50	75	100	125	150 ^{2/}	175	200	225	250	275
GPM	83.5	76.5	69.5	62	54	46	38	30	21	12

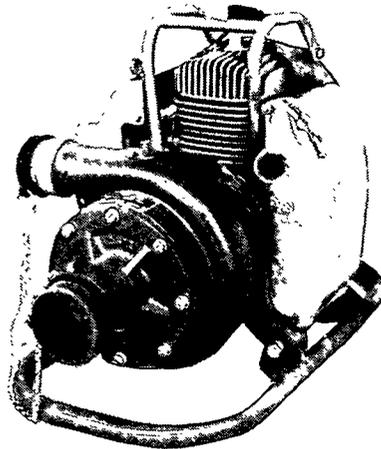
HEARING SAFETY SOUND LEVEL 110 dBA (Warning label required)^{3/}
 COMMUNICATION SAFETY SOUND LEVEL —

DESCRIPTION

PUMPER DESIGNATION C-60-150/50⁴ INTEGRAL OR REMOVABLE HANDLES No
 WATER OR AIR COOLED Air-cooled RELIEF VALVE No
 STARTING SYSTEM Rewind BACKPACK & STRAPS Optional
 2- OR 4-STROKE CYCLE 2-stroke SPECIAL ACCESSORIES OR TOOLS Metric tools and
 PRESSURE GAUGE Optional assorted nuts and bolts
 INTEGRAL OR REMOVABLE BASE No

REMARKS

* Forest Service—USDA qualified: July 22, 1966
 * Meets Forest Service—USDA Specifications 5100-274
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating—5,050 rpm
^{3/}Inlet hose threads adapted to 1-1/2 in dimension (1-1/2 in—9NH) ^{4/}Alternate pumper designation C-60-200/35
^{5/}See pg. 1, "Special Considerations," for sound level definitions



PUMP

MAKE Wajax/Pacific Pumps, Inc.
 MODEL Mark 26
 TYPE 2-stage, centrifugal
 PRIMING DEVICE Hand-operated
 INLET SIZE 2-in
 OUTLET SIZE 1 1/2-in
 HEIGHT (IN) 13 1/2 WIDTH (IN) 12
 LENGTH (IN) 19 1/2 DRY WEIGHT (LB) 39

ENGINE

MAKE Wajax/Pacific Pumps^{2/}
 MODEL Rotax
 HORSEPOWER 5 RPM N/A
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline-oil mixture
 FUEL PUMP AVAILABLE No

MANUFACTURER

Wajax/Pacific Pumps, Inc.

227 Andover Park East, Seattle, WA 98188

PUMP PERFORMANCE VALUES^{1/}

PSI	50	75	100 ^{2/}	125	150	160
GPM	65	54	42	28	10	0

HEARING SAFETY SOUND LEVEL 108.5 dBA (Warning label required)^{4/}

COMMUNICATION SAFETY SOUND LEVEL 90 dBA^{4/}

DESCRIPTION

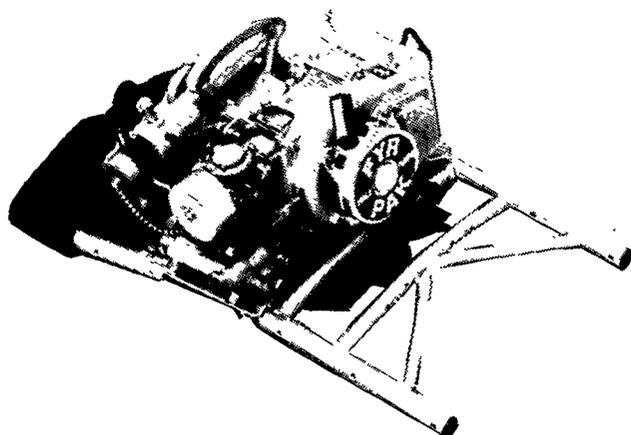
PUMPER DESIGNATION C-40-150/09
 WATER OR AIR COOLED Air-cooled
 STARTING SYSTEM Rope rewind
 2- OR 4-STROKE CYCLE 2-stroke
 PRESSURE GAUGE None
 INTEGRAL OR REMOVABLE BASE Removable

INTEGRAL OR REMOVABLE HANDLES Removable
 RELIEF VALVE None
 BACKPACK & STRAPS Yes
 SPECIAL ACCESSORIES OR TOOLS Primer, grease gun,
 foot valve, and tool kit

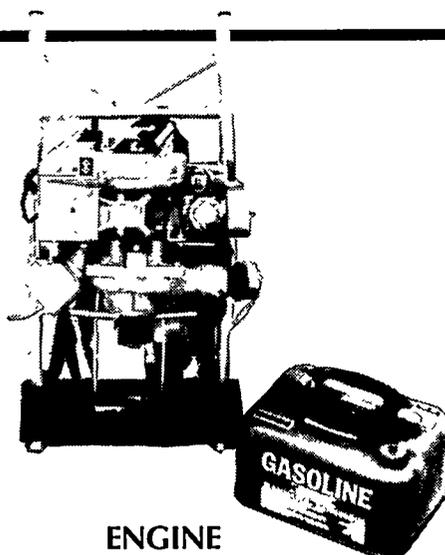
REMARKS

* Forest Service—USDA qualified: May 10, 1976
 * Meets Forest Service—USDA Specifications 5100-274
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/} 100-hr endurance test rating 5,250 rpm
^{3/}Change operator's manual to reflect correct gasoline-oil mix ratio
^{4/}See pg. 1, "Special Considerations," for sound level definitions

APPENDIX 1
Pump Data Sheet



PUMP



ENGINE

MAKE Hale
 MODEL 20FP-C8K Fyr-Pak
 TYPE Centrifugal
 PRIMING DEVICE Hand-operated
 INLET SIZE 2-in adapted to 1 1/2-in9NH
 OUTLET SIZE 1 1/2-in adapted to 1 1/2-in9NH
 HEIGHT (IN) 13 WIDTH (IN) 16 1/2
 LENGTH (IN) 32 DRY WEIGHT (LB) 34

MAKE Chrysler Corporation
 MODEL 82034 2-cycle Power Bee
 HORSEPOWER 8 RPM 7,000
 IGNITION TYPE Electronic CYLINDERS 1
 FUEL USED Gasoline-oil mixture 25:1
 FUEL PUMP AVAILABLE Incorp w/carb

MANUFACTURER

Hale Fire Pump Co., American Godiva, Inc.
750 American Blvd., St. Joseph, TN 38481

PUMP PERFORMANCE VALUES^{1/}

PSI	50	75	100	117 ^{2/}	125	150	175	190
GPM	65	57	47	42	39	29	18	10

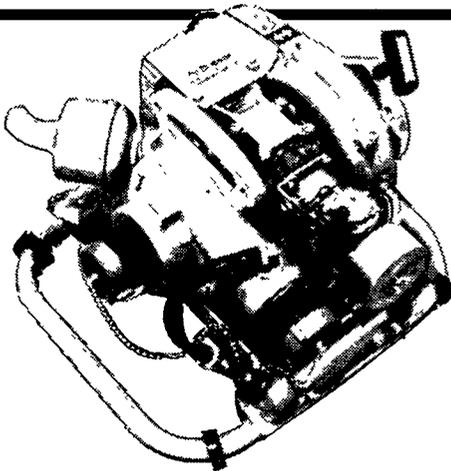
HEARING SAFETY SOUND LEVEL 105 dBA (Warning label required)^{3/}
 COMMUNICATION SAFETY SOUND LEVEL 94 dBA^{4/}

DESCRIPTION

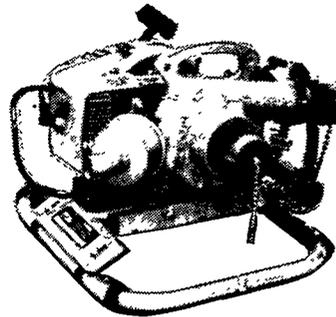
PUMPER DESIGNATION C-40-150/25^{3/} INTEGRAL OR REMOVABLE HANDLES N/A
 WATER OR AIR COOLED Air-cooled RELIEF VALVE No
 STARTING SYSTEM Rewind BACKPACK & STRAPS Yes
 2- OR 4-STROKE CYCLE 2-stroke SPECIAL ACCESSORIES OR TOOLS Tune-up kit—spark
 plug, socket wrench with handle—packaged in pouch
 PRESSURE GAUGE No
 INTEGRAL OR REMOVABLE BASE No

REMARKS

* Forest Service—USDA qualified: Feb. 8,1991
 * Meets Forest Service—USDA Specifications 5100-274b
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/} 100-hr endurance test rating—6,375 rpm
^{3/}Alternate pumper designation (C-40-175/15)
^{4/}See pg. 1, "Special Considerations," for sound level definitions



PUMP



ENGINE



MAKE Hale
 MODEL 20FP-C8SK Fyr-Port
 TYPE Centrifugal
 PRIMING DEVICE Hand-operated
 INLET SIZE 2 in adapted to 1-1/2 in 9NH
 OUTLET SIZE 1-1/2 in adapted to 1-1/2 in 9NH
 HEIGHT (IN) 13 WIDTH (IN) 16 1/2
 LENGTH (IN) 16 DRY WEIGHT (LB) 33

MAKE Chrysler Corporation
 MODEL 82034 2-cycle Power Bee
 HORSEPOWER 8 RPM 7,000
 IGNITION TYPE Electronic CYLINDERS 1
 FUEL USED Gasoline-oil mixture 25:1
 FUEL PUMP AVAILABLE Incorp w/carb

MANUFACTURER

Hale Fire Pump Co., American Godiva, Inc.
750 American Blvd., St. Joseph, TN 38481

PUMP PERFORMANCE VALUES^{1/}

PSI	50	75	100	117 ^{2/}	125	150	175	190
GPM	65	57	47	42	39	29	18	10

HEARING SAFETY SOUND LEVEL 105 dBA (Warning label required)^{1/}
 COMMUNICATION SAFETY SOUND LEVEL 94 dBA^{1/}

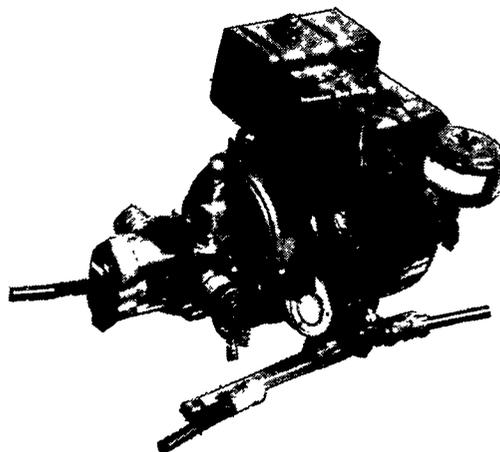
DESCRIPTION

PUMPER DESIGNATION C-40-150/25^{3/}
 WATER OR AIR COOLED Air-cooled
 STARTING SYSTEM Rewind
 2- OR 4-STROKE CYCLE 2-stroke
 PRESSURE GAUGE No
 INTEGRAL OR REMOVABLE BASE No
 INTEGRAL OR REMOVABLE HANDLES N/A
 RELIEF VALVE No
 BACKPACK & STRAPS No
 SPECIAL ACCESSORIES OR TOOLS Tune-up kit—spark plug, socket wrench with handle—packaged in pouch

REMARKS

* Forest Service—USDA qualified: Feb. 8, 1991
 * Meets Forest Service—USDA Specifications 5100-274b
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/} 100-hr endurance test rating—6,375 rpm
^{3/}Alternate pumper designation (C-40-175/15)
^{4/}See pg. 1, "Special Considerations," for sound level definitions

APPENDIX 1
Pump Data Sheet



PUMP

MAKE Edwards Manufacturing Co.
 MODEL TSD25
 TYPE Positive displacement
 PRIMING DEVICE Self-priming
 INLET SIZE 1-1/2 in
 OUTLET SIZE 1-1/2 in
 HEIGHT (IN) 22 WIDTH (IN) 20
 LENGTH (IN) 28 DRY WEIGHT (LB) 180

ENGINE

MAKE Briggs & Stratton^{2/}
 MODEL 243434
 HORSEPOWER 10 RPM 3,600
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline—no additives
 FUEL PUMP AVAILABLE No

MANUFACTURER

Edwards Manufacturing Co.

2441 SE Stubb St., Milwaukie, OR 97222

PUMP PERFORMANCE VALUES^{1/}

PSI	50	75	100	125	150	175	180 ²	200	225
GPM	42	39.5	37	35	33	30	29	25.5	19

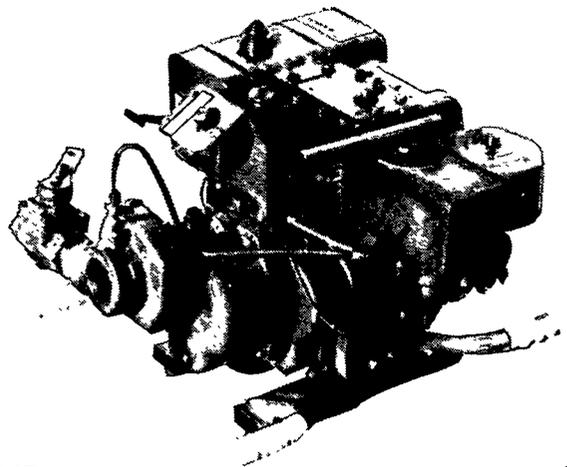
HEARING SAFETY SOUND LEVEL 101 dBA (Warning label required)^{4/}
 COMMUNICATION SAFETY SOUND LEVEL 84 dBA^{4/}

DESCRIPTION

PUMPER DESIGNATION P-200-15/30⁵ INTEGRAL OR REMOVABLE HANDLES Removable
 WATER OR AIR COOLED Air-cooled RELIEF VALVE Yes
 STARTING SYSTEM Electric BACKPACK & STRAPS N/A
 2- OR 4-STROKE CYCLE 4-stroke SPECIAL ACCESSORIES OR TOOLS Packing gland &
 PRESSURE GAUGE Optional wrench, starter rope
 INTEGRAL OR REMOVABLE BASE Removable

REMARKS

* Forest Service—USDA qualified: July 13, 1979
 * Meets Forest Service—USDA Specifications 5100-273b
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating—3,100 rpm
^{3/}Safety guard on spark arrestors ^{4/}See pg. 1, "Special Considerations," for sound level definitions
^{5/}Alternate code P-200-20/25



PUMP

MAKE Hale Fire Pump Co.
 MODEL 20FD-B25
 TYPE Centrifugal
 PRIMING DEVICE Exhaust
 INLET SIZE 2 in adapted to 1-1/2 in or 2-1/2 in^{3/}
 OUTLET SIZE 1-1/2 in
 HEIGHT (IN) 18-1/4 WIDTH (IN) 22
 LENGTH (IN) 24 DRY WEIGHT (LB) 132

ENGINE

MAKE Briggs & Stratton
 MODEL 25217
 HORSEPOWER 11 RPM 3,600
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline—no additives
 FUEL PUMP AVAILABLE No

MANUFACTURER

Hale Fire Pump Co.

700 Spring Mill Avenue, Conshohocken, PA 19428

PUMP PERFORMANCE VALUES^{1/}

1-1/2 in suction	PSI	50	75	100	125	150	166	175	200	225	250	275
	GPM	60.5	60	58	53	47	43	40.5	34	26.5	19.5	10.5
2-1/2 in suction	PSI	50	75	100	125	150	170 ^{2/}	175	200	225	250	
	GPM	77	75	69	61	54	48	46	38	31	22	

HEARING SAFETY SOUND LEVEL 104dBA (Warning label required)^{4/}

COMMUNICATION SAFETY SOUND LEVEL 85.5 dBA^{4/}

DESCRIPTION

PUMPER DESIGNATION C-175-15-50⁵ INTEGRAL OR REMOVABLE HANDLES Removable
 WATER OR AIR COOLED Air-cooled RELIEF VALVE None
 STARTING SYSTEM Electric BACKPACK & STRAPS N/A
 2- OR 4-STROKE CYCLE 4-stroke SPECIAL ACCESSORIES OR TOOLS None
 PRESSURE GAUGE Optional
 INTEGRAL OR REMOVABLE BASE Removable

REMARKS

* Forest Service—USDA qualified: December 7,1979

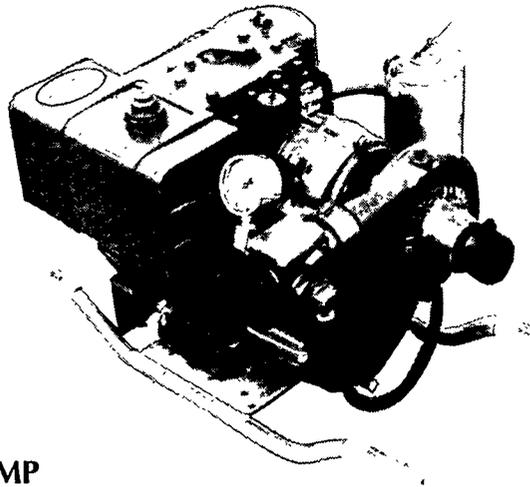
* Meets Forest Service—USDA Specifications 5100-273b

FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating—3,200 rpm

^{3/}Adapt inlet to 1-1/2—9NH or 2-1/2—7-1/2NH ^{4/}See pg. 1, "Special Considerations," for sound level definitions

^{5/}Alternate coding: C-175-20/35, C-175-25/20

APPENDIX 1
Pump Data Sheet



PUMP

ENGINE

MAKE Wajax/Pacific Pumps Inc.
 MODEL B1-11
 TYPE Centrifugal
 PRIMING DEVICE Arrester-Primer
 INLET SIZE 1-1/2 in
 OUTLET SIZE 1-1/2 in
 HEIGHT (IN) 20 WIDTH (IN) 21-1/2
 LENGTH (IN) 28 DRY WEIGHT (LB) 121

MAKE Briggs & Stratton
 MODEL 252417
 HORSEPOWER 11 RPM 3,600
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline—no additives
 FUEL PUMP AVAILABLE None

MANUFACTURER

Wajax/Pacific Pumps Inc.

227 Andover Park East, Seattle, WA 98188

PUMP PERFORMANCE VALUES^{1/}

PSI	51	75	100	125	150 ^{2/}	175	200	225	250
GPM	58	58	55	50	44	36	28	19	5

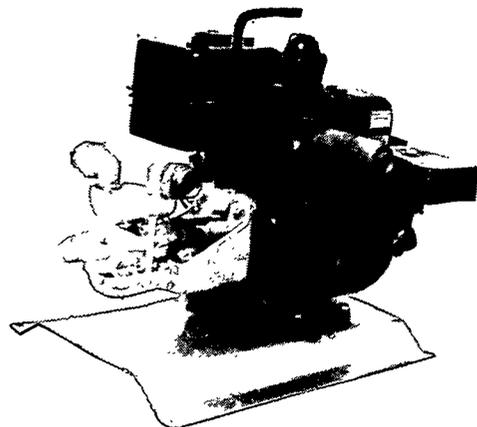
HEARING SAFETY SOUND LEVEL 108 dBA (Warning label required)^{1/}
 COMMUNICATION SAFETY SOUND LEVEL 88 dBA^{1/}

DESCRIPTION

PUMPER DESIGNATION C-130-15/40^{2/} INTEGRAL OR REMOVABLE HANDLES Removable
 WATER OR AIR COOLED Air-cooled RELIEF VALVE N/A
 STARTING SYSTEM Electric and rope BACKPACK & STRAPS N/A
 2- OR 4-STROKE CYCLE 4-stroke SPECIAL ACCESSORIES OR TOOLS None
 PRESSURE GAUGE Optional
 INTEGRAL OR REMOVABLE BASE Removable

REMARKS

* Forest Service—USDA qualified: March 14,1982
 * Meets Forest Service—USDA Specifications 5100-273c
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating—3,200 rpm
^{3/}C-130-20/25 alternate ^{4/}See pg. 1, "Special Considerations," for sound level definitions



PUMP

MAKE Wajax/Pacific Pumpers Inc.
 MODEL BE
 TYPE Positive displacement
 PRIMING DEVICE None
 INLET SIZE 1 in
 OUTLET SIZE 1 in
 HEIGHT (IN) 16 WIDTH (IN) 15.5
 LENGTH (IN) 19 DRY WEIGHT (LB) 41.5

ENGINE

MAKE Briggs & Stratton^{2/}
 MODEL 80332
 HORSEPOWER 3 RPM 3,600
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline—no additives
 FUEL PUMP AVAILABLE No

MANUFACTURER

Wajax/Pacific Pumpers Inc.
227 Andover Park East, Seattle, WA 98188

PUMP PERFORMANCE VALUES^{1/}

PSI	50	100	150 ^{2/}
GPM	11.5	11.2	11

HEARING SAFETY SOUND LEVEL 92 dBA (Warning label required)^{1/}
 COMMUNICATION SAFETY SOUND LEVEL —^{1/}

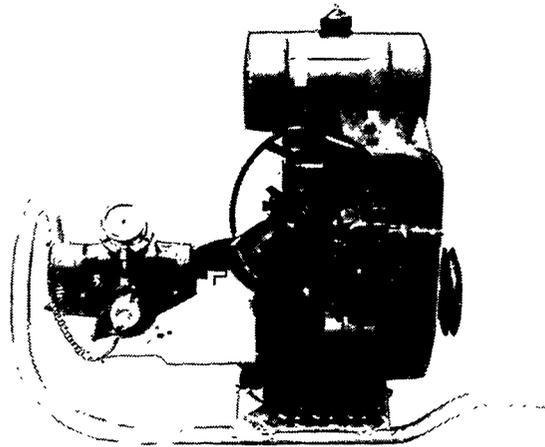
DESCRIPTION

PUMPER DESIGNATION P-045-15/11
 WATER OR AIR COOLED Air-cooled
 STARTING SYSTEM Rope or rewind
 2- OR 4-STROKE CYCLE 4-stroke
 PRESSURE GAUGE Optional
 INTEGRAL OR REMOVABLE BASE Removable
 INTEGRAL OR REMOVABLE HANDLES Removable
 RELIEF VALVE Yes
 BACKPACK & STRAPS N/A
 SPECIAL ACCESSORIES OR TOOLS None

REMARKS

* Forest Service—USDA qualified: May 18, 1960
 * Meets Forest Service—USDA Specifications 5100-273
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/} 100-hr endurance test rating—3,060 rpm
^{3/}Stellite exhaust valve and seat; exhaust valve rotator ^{4/}See pg. 1, "Special Considerations," for sound level definitions

APPENDIX 1
Pump Data Sheet



PUMP

ENGINE

MAKE Wajax/Pacific Pumpers Inc.
 MODEL WA-7
 TYPE Positive displacement
 PRIMING DEVICE None
 INLET SIZE 1 in
 OUTLET SIZE 1 in
 HEIGHT (IN) 20 WIDTH (IN) 18
 LENGTH (IN) 27 DRY WEIGHT (LB) 98

MAKE Wisconsin^{2/}
 MODEL BKND
 HORSEPOWER 6.8 RPM 3,600
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline—no additives
 FUEL PUMP AVAILABLE No

MANUFACTURER

Wajax/Pacific Pumpers Inc.

227 Andover Park East, Seattle, WA 98188

PUMP PERFORMANCE VALUES^{1/}

PSI	50	100	150 ^{2/}	200	250
GPM	26	25	24	21	17

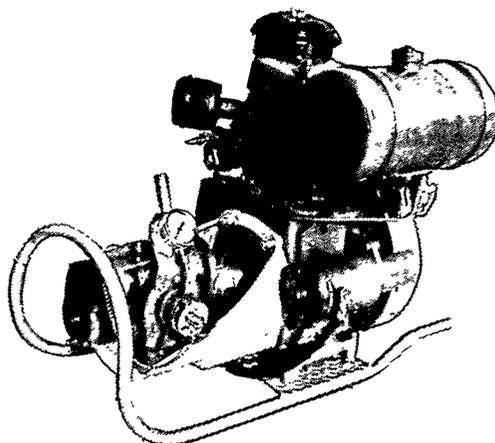
HEARING SAFETY SOUND LEVEL 100 dBA (Warning label required)^{3/}
 COMMUNICATION SAFETY SOUND LEVEL ^{4/}

DESCRIPTION

PUMPER DESIGNATION P-130-15/20⁵ INTEGRAL OR REMOVABLE HANDLES Removable
 WATER OR AIR COOLED Air-cooled RELIEF VALVE Yes
 STARTING SYSTEM Rope or electric BACKPACK & STRAPS N/A
 2- OR 4-STROKE CYCLE 4-stroke SPECIAL ACCESSORIES OR TOOLS Packing gland
 PRESSURE GAUGE Optional & wrench
 INTEGRAL OR REMOVABLE BASE Removable

REMARKS

* Forest Service—USDA qualified: March 18,1960
 * Meets Forest Service—USDA Specifications 5100-273b
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating—3,060 rpm
^{3/}Stellite exhaust valve and seat; exhaust valve rotator ^{4/}See pg. 1, "Special Considerations," for sound level definitions
^{5/}Alternate coding: P-130-20/20 P-130-25/15



PUMP

MAKE Wajax/Pacific Pumpers Inc.
 MODEL WX-10
 TYPE Positive displacement
 PRIMING DEVICE None
 INLET SIZE 1-1/2 in
 OUTLET SIZE 1-1/2 in
 HEIGHT (IN) 23-1/2 WIDTH (IN) 20-1/2
 LENGTH (IN) 29-1/2 DRY WEIGHT (LB) 144

ENGINE

MAKE Wisconsin^{3/}
 MODEL AENLD
 HORSEPOWER 8.3 RPM 3,400
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline—no additives
 FUEL PUMP AVAILABLE No

MANUFACTURER

Wajax/Pacific Pumpers Inc.

227 Andover Park East, Seattle, WA 98188

PUMP PERFORMANCE VALUES^{1/}

PSI	50	100	150 ^{2/}	200
GPM	45	43	32	24

HEARING SAFETY SOUND LEVEL 98.5 dBA (Warning label required)^{1/}

COMMUNICATION SAFETY SOUND LEVEL ^{1/}

DESCRIPTION

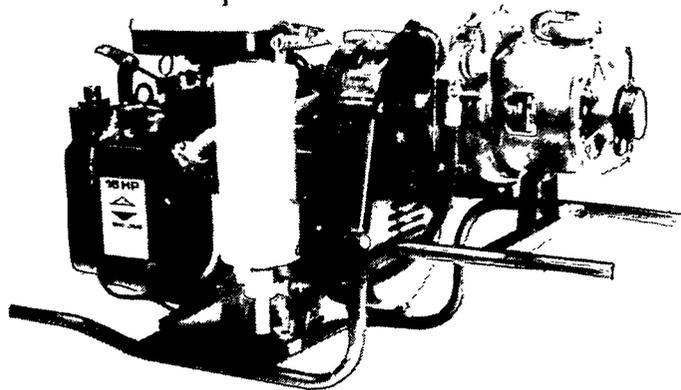
PUMPER DESIGNATION P-175-15/30^{2/}
 WATER OR AIR COOLED Air-cooled
 STARTING SYSTEM Rope or electric
 2- OR 4-STROKE CYCLE 4-stroke
 PRESSURE GAUGE Optional
 INTEGRAL OR REMOVABLE BASE Removable

INTEGRAL OR REMOVABLE HANDLES Removable
 RELIEF VALVE Yes
 BACKPACK & STRAPS N/A
 SPECIAL ACCESSORIES OR TOOLS Packing gland
& wrench

REMARKS

* Forest Service—USDA qualified: March 18,1960
 * Meets Forest Service—USDA Specifications 5100-273b
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating—2,890 rpm
^{3/}Stellite exhaust valve and seat; exhaust valve rotator ^{4/}See pg. 1, "Special Considerations," for sound level definitions
^{5/}Alternate coding: P-175-20/20

APPENDIX 1
Pump Data Sheet



PUMP

MAKE Wajax/Pacific Pumpers Inc.
 MODEL BB-4
 TYPE 4-stage, centrifugal
 PRIMING DEVICE Exhaust primer
 INLET SIZE 2 in adapted to 1-1/2 in or 2-1/2 in^{d/}
 OUTLET SIZE 1-1/2 in
 HEIGHT (IN) 19 WIDTH (IN) 25
 LENGTH (IN) 34 DRY WEIGHT (LB) 167

ENGINE

MAKE Briggs & Stratton
 MODEL I/C Series 402437
 HORSEPOWER 16 RPM 3,600
 IGNITION TYPE Mag. CYLINDERS 2
 FUEL USED Gasoline—regular
 FUEL PUMP AVAILABLE Yes

MANUFACTURER

Wajax/Pacific Pumpers Inc.

227 Andover Park East, Seattle, WA 98188

PUMP PERFORMANCE VALUES^{1/}

1-1/2 in suction	PSI	50	75	100	125	150	175	200	225 ^{2/}	250	275	295
	GPM	79	77	75	69.5	63	56.5	51	46	40.5	29.5	0
2-1/2 in suction	PSI	50	75	100	125	150	175	200	225 ^{2/}	250	275	300
	GPM	85	80	75.5	69.5	64	57	52	47	42	32.5	0

HEARING SAFETY SOUND LEVEL 107 dBA (Warning label required)^{5/}

COMMUNICATION SAFETY SOUND LEVEL 87 dBA^{5/}

DESCRIPTION

PUMPER DESIGNATION C-175-25/40^{3/}
 WATER OR AIR COOLED Air-cooled
 STARTING SYSTEM Rope and electric
 2- OR 4-STROKE CYCLE 4-stroke
 PRESSURE GAUGE Yes
 INTEGRAL OR REMOVABLE BASE Integral

INTEGRAL OR REMOVABLE HANDLES Integral
 RELIEF VALVE None
 BACKPACK & STRAPS None
 SPECIAL ACCESSORIES OR TOOLS Pump seal, grease
 pump dual circuit alternator for battery charging and lights

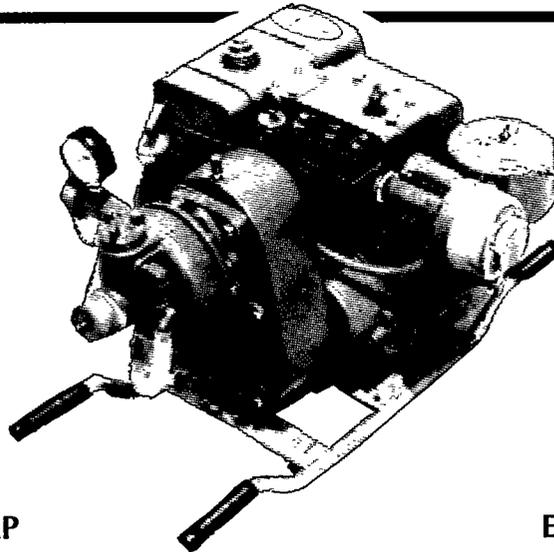
REMARKS

* Forest Service—USDA qualified: December 2, 1981 * Meets Forest Service—USDA Specifications 5100-273b
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating—2,990 rpm

^{3/}Alternate codings: C-175-15/60; C-175-20/50 for both 1-1/2 and 2-1/2 inch suction

^{4/}Adapt inlet to 1-1/2—9NH or 2-1/2—7-1/2NH

^{5/}See pg. 1, "Special Considerations," for sound level definitions



PUMP

ENGINE

MAKE Western Fire Equipment Co.
 MODEL 14270
 TYPE Single-stage, centrifugal
 PRIMING DEVICE Hand-operated
 INLET SIZE 1-1/2 in
 OUTLET SIZE 1-1/2 in
 HEIGHT (IN) 19-1/2 WIDTH (IN) 20-1/2
 LENGTH (IN) 30-1/2 DRY WEIGHT (LB) 126

MAKE Briggs & Stratton
 MODEL 251400
 HORSEPOWER 10 RPM 3,600
 IGNITION TYPE Mag. CYLINDERS 1
 FUEL USED Gasoline—no additives
 FUEL PUMP AVAILABLE No

MANUFACTURER

Western Fire Equipment Company
440 Valley Drive, Brisbane, CA 94005

PUMP PERFORMANCE VALUES^{1/}

PSI	50	100	125	150	160 ^{2/}	175	200	225
GPM	46	44	40	36	34	30.5	24.5	16.5

HEARING SAFETY SOUND LEVEL 97 dBA (Warning label required)^{3/}
 COMMUNICATION SAFETY SOUND LEVEL 82 dBA^{3/}

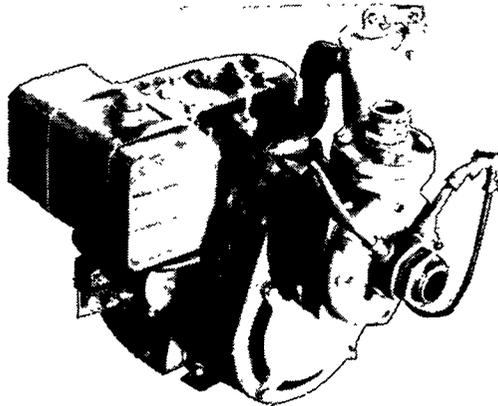
DESCRIPTION

PUMPER DESIGNATION C-130-15/35^{4/}
 WATER OR AIR COOLED Air-cooled
 STARTING SYSTEM Rope or electric
 2- OR 4-STROKE CYCLE 4-stroke
 PRESSURE GAUGE Optional
 INTEGRAL OR REMOVABLE BASE Removable
 INTEGRAL OR REMOVABLE HANDLES Removable
 RELIEF VALVE None
 BACKPACK & STRAPS N/A
 SPECIAL ACCESSORIES OR TOOLS None

REMARKS

* Forest Service—USDA qualified: March 11, 1978
 * Meets Forest Service—USDA Specifications 5100-273b
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating—2,950 rpm
^{3/}See pg. 1, "Special Considerations," for sound level definitions
^{4/}Alternate coding: C-130-20/20

APPENDIX 1
Pump Data Sheet



PUMP

ENGINE

MAKE Berkeley
 MODEL B1 1/2XQBS-11
 TYPE Single-stage, centrifugal
 PRIMING DEVICE Hand-operated exhaust
 INLET SIZE 1-1/2 in
 OUTLET SIZE 1-1/2 in
 HEIGHT (IN) 31 WIDTH (IN) 26
 LENGTH (IN) 25-1/2 DRY WEIGHT (LB) 146

MAKE Briggs & Stratton
 MODEL 252415
 HORSEPOWER 11 RPM 3,600
 IGNITION TYPE Mag.^{3/} CYLINDERS 1
 FUEL USED Gasoline—no additives
 FUEL PUMP AVAILABLE No

MANUFACTURER

Sta-Rite Industries/Berkeley Pump Company
293 South Wright St. , Delavan, WI 53115

PUMP PERFORMANCE VALUES^{1/}

PSI	50	75	100	125	150	160 ^{2/}	175	195
GPM	41	39	38	37	36	35	29	0

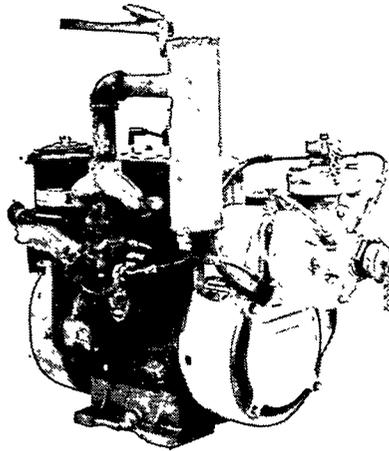
HEARING SAFETY SOUND LEVEL 109 dBA (Warning label required)^{1/}
 COMMUNICATION SAFETY SOUND LEVEL 89dBA^{4/}

DESCRIPTION

PUMPER DESIGNATION C-175-15/35 INTEGRAL OR REMOVABLE HANDLES None
 WATER OR AIR COOLED Air-cooled RELIEF VALVE None
 STARTING SYSTEM Rope or electric BACKPACK & STRAPS N/A
 2- OR 4-STROKE CYCLE 4-stroke SPECIAL ACCESSORIES OR TOOLS Starter rope
 PRESSURE GAUGE Optional
 INTEGRAL OR REMOVABLE BASE Integral

REMARKS

* Forest Service—USDA qualified: October 24, 1991
 * Meets Forest Service—USDA Specifications 5100-273b
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/} 100-hr endurance test rating—3,150 rpm
^{3/}Spark plug protective boot ^{4/}See pg. 1, "Special Considerations," for sound level definitions



PUMP

ENGINE

MAKE Berkeley
 MODEL B1-1/2XQBS-18
 TYPE Centrifugal
 PRIMING DEVICE Exhaust ejector^{2/}
 INLET SIZE 2-1/2 in—7-1/2 in NH
 OUTLET SIZE 1-1/2—9NH
 HEIGHT (IN) 31 WIDTH (IN) 25
 LENGTH (IN) 33 DRY WEIGHT (LB) 356 w/starter; 330 w/o starter

MAKE Wisconsin^{3/4/}
 MODEL THD and TJD
 HORSEPOWER 18 RPM 3,200
 IGNITION TYPE Mag. CYLINDERS 2
 FUEL USED Gasoline—no additives
 FUEL PUMP AVAILABLE Yes

MANUFACTURER

Sta-Rite Industries/Berkeley Pump Company
293 South Wright St., Delavan, WI 53115

PUMP PERFORMANCE VALUES^{1/}

PSI	50	100	150	175 ^{2/}	200	250	275	300
GPM	110	106	95	85	72	47	32	17

HEARING SAFETY SOUND LEVEL 100 dBA (Warning label required)^{2/}
 COMMUNICATION SAFETY SOUND LEVEL —

DESCRIPTION

PUMPER DESIGNATION C-400-15/90^{5/} INTEGRAL OR REMOVABLE HANDLES None
 WATER OR AIR COOLED Air-cooled RELIEF VALVE None
 STARTING SYSTEM Electric or crank BACKPACK & STRAPS N/A
 2- OR 4-STROKE CYCLE 4-stroke SPECIAL ACCESSORIES OR TOOLS One starter crank
 PRESSURE GAUGE Optional
 INTEGRAL OR REMOVABLE BASE Integral

REMARKS

* Forest Service—USDA qualified: October 24, 1991 * Meets Forest Service—USDA Specifications-5100-273b
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/} 100-hr endurance test rating—2,510 rpm
^{3/}A 3-way cock to permit attachment of an auxiliary fuel supply ^{4/}An exhaust control on the carburetor to adjust the fuel to air ratio for difference in density altitude ^{5/}Berkeley Model BM-6090 exhaust primer spark arrester built in accordance with USFS drawing No. F70-02 ^{6/}Alternate coding: C-400-20/70 & C400-25/40 ^{7/}See pg. 1, "Special Considerations," for sound level definitions.

APPENDIX 1
Pump Data Sheet



PUMP

MAKE Western Fire Equipment Co.
 MODEL 14280
 TYPE Single-stage, centrifugal
 PRIMING DEVICE Hand-operated
 INLET SIZE Adapted to 1-1/2 in or 2-1/2 in^{1/}
 OUTLET SIZE 1-1/2 in
 HEIGHT (IN) 21 WIDTH (IN) 18
 LENGTH (IN) 26 DRY WEIGHT (LB) 230

ENGINE

MAKE Onan
 MODEL CCKB
 HORSEPOWER 20 RPM 3,900
 IGNITION TYPE Mag. CYLINDERS 2
 FUEL USED Gasoline—no additives
 FUEL PUMP AVAILABLE No

MANUFACTURER

Western Fire Equipment Company
440 Valley Drive, Brisbane, CA 94005

PUMP PERFORMANCE VALUES^{1/}

PSI	50	75	100	125	150 ^{2/}	175	200	225	250	275	294
GPM	94.5	94	93.5	89.5	77	67	56	45	34	22.5	0
PSI		75	100	125	150	175	200	225	250		
GPM		118.5	117	98	86.5	74.5	62	50	47.5		

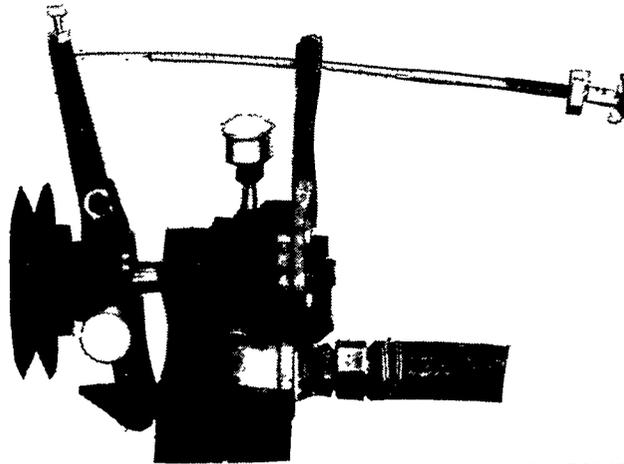
HEARING SAFETY SOUND LEVEL 97 dBA (Warning label required)^{3/}
 COMMUNICATION SAFETY SOUND LEVEL 81 dBA

DESCRIPTION

PUMPER DESIGNATION C-300-15/70^{3/} INTEGRAL OR REMOVABLE HANDLES None
 WATER OR AIR COOLED Air-cooled RELIEF VALVE None
 STARTING SYSTEM Rope or electric BACKPACK & STRAPS N/A
 2- OR 4-STROKE CYCLE 4-stroke SPECIAL ACCESSORIES OR TOOLS Starter rope
 PRESSURE GAUGE Optional
 INTEGRAL OR REMOVABLE BASE Integral

REMARKS

* Forest Service—USDA qualified: January 18, 1979
 * Meets Forest Service—USDA Specifications 5100-273b
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating—2,950 rpm
^{3/}Alternate coding: 1-1/2 inch suction—C-300-20/50, C-300-25/30; 2-1/2 inch suction—C-300-15/80, C-300-20/60; C-300-25/40
^{4/}Adapt inlet to 1-1/2—9NH or 2-1/2—7-1/2NH threads. ^{5/}See page 1, "Special Considerations," for sound level definitions.



PUMP

ENGINE

MAKE Panama
 MODEL 3/4 in BB
 TYPE Positive displacement
 PRIMING DEVICE —
 INLET SIZE 3/4 in IPT (adapted to 1-1/4 in IPT)
 OUTLET SIZE 3/4 in IPT
 HEIGHT (IN) 10-1/2 WIDTH (IN) 5
 LENGTH (IN) 7-1/4 DRY WEIGHT (LB) 31

MAKE Pickup truck ^{2/}
 MODEL —
 HORSEPOWER — RPM —
 IGNITION TYPE — CYLINDERS —
 FUEL USED —
 FUEL PUMP AVAILABLE —

MANUFACTURER

Panama Pump Co.

P.O. Box 15626 Meadow Lane, Hattiesburg, MS 39404

PUMP PERFORMANCE VALUES ^{1/}

PSI	25	50	75	100	125	150 ^{2/}	175	200
GPM	12.2	12	11.6	11.4	11	10.9	10.6	10.5
PSI	25	50	75	100	125	150 ^{2/}	175	200
GPM	24	24	23.8	23.8	23.7	23.6	23.5	23.5

HEARING SAFETY SOUND LEVEL N/A
 COMMUNICATION SAFETY SOUND LEVEL N/A

DESCRIPTION

PUMPER DESIGNATION —
 WATER OR AIR COOLED —
 STARTING SYSTEM —
 2- OR 4-STROKE CYCLE —
 PRESSURE GAUGE —
 INTEGRAL OR REMOVABLE BASE —
 INTEGRAL OR REMOVABLE HANDLES —
 RELIEF VALVE Bypass
 BACKPACK & STRAPS —
 SPECIAL ACCESSORIES OR TOOLS —

REMARKS

* Forest Service—USDA qualified: August 5, 1978
 * Meets Forest Service—USDA Specifications 5100-344
 FOOTNOTES—^{1/}Corrected for sea level conditions ^{2/}100-hr endurance test rating—1,200 rpm
^{3/}Pump, clutch with pulley, v-belt, drive pulley, clutch controls to truck dashboard, suction and discharge hoses with fittings, and a bypass relief valve.



APPENDIX 2
Nozzle Flow Rates

Flow discharge of nozzles in gal per min (gpm)

Head (psi)	Head (ft)	Velocity of discharge (ft/sec)	Nozzle flow (gpm) @ ea. tip orifice size					
			1/8 inch	3/16 inch	1/4 inch	3/8 inch	1/2 inch	1 inch
10	23.1	38.6	1.48	3.32	5.91	13.3	23.6	94.5
15	34.6	47.25	1.81	4.06	7.24	16.3	28.9	116.
20	46.2	54.55	2.09	4.69	8.35	18.8	33.4	134.
25	57.7	61.0	2.34	5.25	9.34	21.0	37.3	149.
30	69.3	66.85	2.56	5.75	10.2	23.0	40.9	164.
35	80.3	72.2	2.77	6.21	11.1	24.8	44.2	177.
40	92.4	77.2	2.96	6.64	11.8	26.6	47.3	189.
45	103.9	81.8	3.13	7.03	12.5	28.2	40.1	200.
50	115.5	86.25	3.30	7.41	13.2	29.7	52.8	211.
55	127.0	90.4	3.46	7.77	13.8	31.1	55.3	221.
60	138.6	94.5	3.62	8.12	14.5	32.5	57.8	231.
65	150.1	98.3	3.77	8.45	15.1	33.8	60.2	241.
70	161.7	102.1	3.91	8.78	15.7	35.2	62.5	250.
75	173.2	105.7	4.05	9.08	16.2	36.4	64.7	259.
80	184.8	109.1	4.18	9.39	16.7	37.6	66.8	267.
85	196.3	112.5	4.31	9.67	17.3	38.8	68.9	276.
90	207.9	115.8	4.43	9.95	17.7	39.9	70.8	284.
95	219.4	119.0	4.56	10.2	18.2	41.0	72.8	292.
100	230.9	122.0	4.67	10.5	18.7	42.1	74.7	299.
105	242.4	125.0	4.79	10.8	19.2	43.1	76.5	306.
110	254.0	128.0	4.90	11.0	19.6	44.1	78.4	314.
115	265.5	130.9	5.01	11.2	20.0	45.1	80.1	320.
120	277.1	133.7	5.12	11.5	20.5	46.0	81.8	327.
125	288.6	136.4	5.22	11.7	20.9	47.0	83.5	334.
130	300.2	139.1	5.33	12.0	21.3	48.0	85.2	341.
135	311.7	141.8	5.43	12.2	21.7	48.9	86.7	347.
140	323.3	144.3	5.53	12.4	22.1	49.8	88.4	354.
145	334.8	146.9	5.62	12.6	22.5	50.6	89.9	360.
150	346.4	149.5	5.72	12.9	22.9	51.5	91.5	366.
175	404.1	161.4	6.18	13.9	24.7	55.6	98.8	395.
200	461.9	172.6	6.61	14.8	26.4	59.5	106.	423.
250	577.4	193.0	7.39	16.6	29.6	66.5	118.	473.
300	692.8	211.2	8.08	18.2	32.4	72.8	129.	517.

The pressure and flow tables presented in the following pages are frequently used when pumping water through a nozzle onto a fire. These tables are simple to use. Examples are as follows:

Problem 1: What should the pump pressure be if 50 psi is needed at the nozzle?

Solution: Estimate hose length from pump to nozzle and difference in elevation between pump and nozzle. Check orifice size in the nozzle tip. Find pump pressure.

Case 1: Known information - 200 ft hose, nozzle 100 ft above pump, 1/8-in orifice size.

Solution: 94 psi pump output pressure.

Problem 2: How much water is being discharged at the nozzle?

Solution: Read pressure at pump gauge, estimate elevation between pump and nozzle. Check orifice size in the nozzle tip. Find flow at nozzle.

Case 2: Known information - 35 psi pump pressure gauge + 15 psi nozzle elevation (0.5 x 30 ft-pump to nozzle height) = 50 psi. 1/8-in orifice size.

Solution: 3.30 gpm flow at nozzle.

Fractional differences can be calculated by proportional estimates. Some values may vary due to different friction losses of the hose linings. These figures should be used for estimating. More precise tables are available from fire equipment companies.

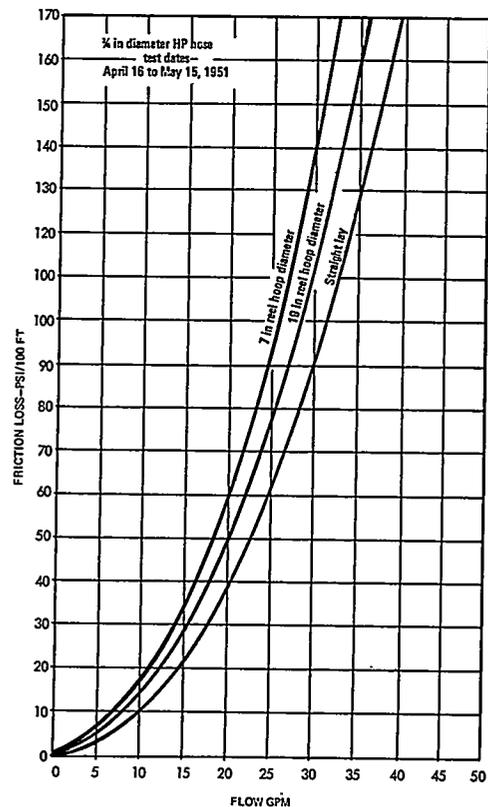
FRICION LOSS

Friction loss is the resulting resistance as water (fluids) moves along the inside wall of either fire hose or pipe.

Points to remember—

- Friction loss increases as flow (gpm) increases.
- Total friction loss varies with the length.
- Friction loss is nearly independent of pressure.
- Friction losses on reeled hose average about 21 percent more than for straight hoselays (see chart— "Hose friction loss vs. flow curve").
- Friction loss varies with the type, quality, and age of the hose.

In the following table the friction loss for 100 ft of hose is shown for varying flows and different types. *These data were extracted from Forest Service tests and vary from NFPA tables because of differences in hose ID's, elasticity, and liner. These friction losses are consistently lower than those reported by several manufacturers.*



APPENDIX 3
Pressure and Flow Tables

Friction loss (lb/100 ft) in hose*

Flow (gpm)	Hose size (ID) and type						
	1/2-in GH	5/8-in GH	3/4-in HP	1-in CJRL	1-1/2-in CJRL	1-1/2-in Linen	2-1/2 (Lined)
5	22	9	3.5				
10	75	30	13	3.0		1.0	
15	155	60	25	6.0	1.0	2.2	
20		100	42	10	1.5	3.6	
25		150	62	15	2.5	5.5	
30		200	86	20	3.5	8.0	
40		335	140	34	5.5	13	
50			215	50	8.0	20	
60				70	11	28	
70				90	15	37	
80				115	19	47	
90				140	23	59	
100				170	30	72	2.5
150							5.8
200							10.1

See table 4, pg. 10, "Capacities of and Pressures Losses Through Reeled and Unreeled Small-Diameter Hoses," Forest Service-USDA, E.D. Report No. 28, October 1954. Also see the pocket-sized, inexpensive "Nozzle Discharge and Friction Loss Calculator."

The 1/2- and 5/8-in hose represents friction loss in garden hose (GH). The 3/4-, 1-, 1-1/2-in CJRL and 1-1/2-in linen are Forest Service specification hose in straight lays. The 2-1/2-in data are from table 17-7h of the *NFPA Fire Protection Handbook*, 16th edition.

Friction reducing agents are available. They are formulated to reduce friction losses in a given hose diameter, and thereby have the effect of reducing hose size, weight, and cost—while still retaining the same performance. Ref: *NFPA Fire Protection Handbook* (sect. 17-98), 16th edition.

APPENDIX 3
Pressure and Flow Tables

Comparative Diameters and Weights (100- ft) Lengths
(Uncoupled)

Type of hose	FS SPEC	Jacket	ID (in)	Proof Pressure (psi)	Max Dry Weight (lb)	Water (gal)	Weight Water (lb)	Max total weight (lb)
Garden (Commercial gr.)	None	—	5/8	125	28	1.6	13	41
High pressure (reel)	185	—	3/4	425	50	2.3	19	69
High pressure (reel)	None	—	1	—	53	4.1	34	87
Cotton-jacket, rubber-lined	None	Single	1	300	28	4.1	34	62
Cotton-synthetic rubber-lined	5100-186	Single	1	450	22	4.1	34	56
Synthetic jacket, rubber-lined	5100-187	Single	1	450	9	4.1	34	43
Unlined (linen)	5100	Single	1	300	10	4.1	34	44
Cotton-jacket, rubber lined	None	Single	1-1/2	300	33	9.2	77	110
Cotton-synthetic jacket, rubber-lined	5100-186	Single	1-1/2	450	26	9.2	77	103
Synthetic jacket, rubber-lined	5100-187	Single	1-1/2	450	15	9.2	77	92
Unlined linen	5100-183	Single	1-1/2	300	15-	9.2	77	92
Cotton-synthetic jacket, rubber lined (light tube)	None	Double	2-1/2	—	58 to 160	25.5	213	271 to 373

The actual weight of the small diameter jacketed fire hose is usually 1 to 3 lb less than the maximum dry weight given. Coupling sets (1-1/2-in) vary in weight from 0.9 to 1.6 lb.

APPENDIX 3
Pressure and Flow Tables

Pump Pressures for 100 psi Nozzle Pressure
3/4-in Hose (high pressure)

Length hose (ft)	Nozzle above pump (ft)	Tip orifice size (in)/Pump psi (gpm)				
		1/8	3/16	1/4	5/16	3/8
100	0	103	113	138	183	253
	100	146	156	181	226	296
150	0	105	120	157	224	327
	100	148	163	200	247	362
200	0	106	126	176	266	406
	100	149	169	219	309	449
250	0	108	132	195	307	482
	100	151	173	238	350	325
300	0	110	139	214	349	559
	100	153	182	257	392	602
	200	197	226	301	436	646
400	0	113	152	252	432	712
	100	156	195	295	475	755
	200	200	239	339	519	799
	300	243	282	382	562	842
500	0	116	165	290	515	
	100	159	208	333	558	
	200	203	252	377	602	
	300	246	295	420	645	

Discharge (gpm)	4.7	10.5	18.7	28.7	42.1	74.7
Psi loss/100 ft		3.3	13.0	38.0	83.0	153

Lower right side of broken line are hose pressures near the engine which exceed the normal working pressure of High Pressure Hose (Forest Service specification 5100-185). If a significant amount of hose is left on the reel, the friction loss will be increased.

Pump Pressures for 100 psi Nozzle Pressure
1-in Hose

Length hose (ft)	Nozzle above pump (ft)	Tip orifice size (in)/Pump psi (gpm)					
		1/8	3/16	1/4	5/16	3/8	1/2
100	0	101	103	109	118	135	200
100	144	146	152	161		178	243
200	0	101	106	118	136	170	300
	100	144	149	161	179	213	343
300	0	102	109	127	154	205	400
	100	145	152	170	197	248	443
	200	189	196	214	241	292	487
400	0	103	112	136	172	240	500
	100	146	155	179	215	283	542
	200	190	199	223	259	327	587
	300	233	242	266	302	370	630
500	0	103	115	145	190	275	600
	100	146	158	188	233	318	643
	200	190	202	232	277	362	687
	300	233	245	275	320	405	730
1,000	0	107	131	190	280	450	
	100	150	174	233	323	493	
	200	150	174	233	323	493	
	300	237	261	320	410	580	
	400	281	305	364	454	624	
	500	324	348	407	497	667	
	600	368	392	451	541	711	

Discharge (gpm)	4.7	10.5	18.7	28.7	42.1	74.7
psi loss/100 ft	0.7	3.1	9.0	18.0	35	100

Lower right side of broken line are hose pressures near the engine which exceed the normal working pressure of Single Jacket, Cotton-Synthetic Lined Hose (Forest Service specification 5100-186).

APPENDIX 3
Pressure and Flow Tables

Pump Pressures for 100 psi Nozzle Pressure
1-1/2-in Hose (high pressure)

Length hose (ft)	Nozzle above pump (ft)	Tip orifice size (in)/Pump psi (gpm)					
		1/8	3/16	1/4	5/16	3/8	1/2
100	0	101	101	102	103	106	117
	100	144	144	145	146	149	160
200	0	101	102	103	107	112	134
	100	144	145	146	150	155	177
300	0	101	101	105	110	118	151
	100	144	144	148	153	161	194
400	200	188	190	192	197	205	238
	0	101	102	106	113	124	168
	100	144	145	149	156	167	211
500	200	188	189	193	200	211	255
	300	231	232	236	243	254	298
	0	101	103	108	117	130	185
	100	144	146	151	160	173	228
1,000	200	188	190	195	204	217	272
	300	231	233	238	247	260	315
	0	101	105	115	133	160	270
	100	144	148	158	176	203	313
	200	188	192	202	220	247	357
2,000	300	231	235	245	263	290	400
	400	275	275	289	307	334	444
	500	318	322	332	350	317	487
	600	362	366	376	394	421	531
	0	102	110	130	166	220	410
	100	145	153	173	209	263	433
	200	189	197	217	253	307	527
	300	232	240	260	296	350	570
	400	276	284	304	340	394	614
	500	319	327	347	383	437	657
3,000	600	363	371	391	427	481	701
	700	406	414	434	470	524	744
	800	450	458	478	514	568	788
	0	103	115	145	199	280	610
	100	143	158	188	242	323	653
	200	190	202	232	286	367	697
	300	233	245	275	329	410	740
	400	277	289	319	373	454	784
	500	320	332	362	416	497	827
	600	364	376	406	460	541	871
800	700	407	419	449	503	584	
	800	451	463	493	547	628	

Discharge (gpm) 4.7 10.5 18.7 28.7 42.1 74.7
psi loss/100 ft 0.1 0.5 1.5 3.3 6.0 17

Lower right side of broken line are hose pressures near the engine which exceed the normal working pressure of Single Jacket, Cotton-Synthetic Hose (Forest Service specification 5100-186).

APPENDIX 4 Service Test for Fire Hose

Service Tests. All fire hose shall be service tested at intervals specified in NFPA Standard 1962, "Care, Use and Maintenance of Fire Hose." To remain in service the hose shall pass the service test for that type of hose.

The procedure shall be followed carefully, using the applicable service test pressure listed in table 1, below. Testing hose is dangerous and shall be conducted by trained personnel, following the procedure specified below.

Service Tests For Fire Hose. All fire hose shall be service tested as specified in NFPA Standard 1962; i.e., annual test; after being used, frozen, or attachment of new or used couplings.

Before subjecting hose to the service test, it shall be physically inspected for jacket defects, coupling damage, and worn or defective gaskets. All lengths with any of these defects shall be removed from the test area and repaired (if serviceable), and then retested before being put back in service. Couplings and gaskets shall be inspected as specified in Chapter 7 of NFPA Standard 1962.

Service Test Pressures. The service test pressures shall be as specified in table 1.

EXCEPTION: In cases where hose may need to be used at pressures greater than service test pressure, a service test pressure at least 10 percent above that greater pressure shall be used in lieu of the service test pressure in table 1, but this test pressure is NOT to exceed 70 percent of the new hose rated acceptance pressure. Some hose manufactured after January 1987 may have the marking "Service test to..... psi." If not, table 1 and 10 percent rule shall apply.

Service Test Methods. In making the service pressure test, care shall be taken to remove all air from the hose before the nozzle or test cap valve is closed and the pressure allowed to rise. It shall be recognized that development of test pressures introduces a serious accident potential—even when the specified procedures are followed.

Test Procedures. The following test procedures shall be followed:

Hydrostatic Test Equipment. A hose testing machine, a stationary pump, or a fire department pumper

equipped with a hose test gate valve shall be used. The gauges used to read the test pressure shall be certified at least annually.

Table 1.

Trade size (in)	Jackets	New hose rated acceptance test pressure (psi)	Service test pressure (psi)
Lined, Industrial Standpipe, and Fire Dept.			
1-1/2 thru 2-1/2	Single	300	150
1-1/2 thru 4-1/2	Single	400	250
1-1/2 thru 2-1/2	Single	500	250
1-1/2 thru 4	Multiple	400	250
1-1/2 thru 4	Multiple	250	
Unlined Standpipe			
1-1/2 thru 2-1/2	Single		150
Lined Forestry			
1 and 1-1/2	Single	450	250
Unlined Forestry			
1 and 1-1/2	Single	450	250
Relay Supply			
3-1/2 thru 4-1/2	Single	400	200
5 and 6	Single	300	150
Pumper Supply (so ft suction)			
4 thru 6	Multiple	400	200

The hose test gate valve shall be a fire department gate with a 1/4-in opening drilled through a gate that permits the pressure to be raised to the test pressure after the hose has been filled, the air completely removed, and the hose test gate valve closed, but shall not permit a pressure surge if the hose bursts during testing.

Location. A location shall be selected that allows connection of the hydrostatic equipment to an adequate water source.

Hose Lines. The total length of each hose line to be tested shall not exceed 300 ft. The hose liners shall be straight and without kinks or twists.

Hook Up. The hose lines to be tested shall be connected to the hose test gate valve of the pump. The hose test gate valve shall be used to prevent an excessive pressure surge to the equipment should a hose burst during the test. The hose test gate valve

APPENDIX 4

Service Test for Fire Hose

end of the hose line shall be secured with a belt tie-in or rope hose tool at a point 10 to 15 in from the coupling. Shut-off nozzles or test caps shall be attached to the far end of the line. The shut-off device, or the hose directly in back of the device, shall be secured to avoid possible whipping or other uncontrollable reaction.

Removing the Air. With the hose test gate valve open and the nozzle or test cap valve open, the pressure shall be gradually raised to approximately 50 psi. After the line is charged and all air has been exhausted from the hose, the nozzle or test cap valve shall be slowly closed and the hose test gate valve shall be closed, which will allow just enough water to pass to keep pressure on the hose line.

Marking for Coupling Slippage. After filling hose, each coupling shall be marked at each end at the back of the coupling to determine whether the coupling slips during the test. All couplings shall be checked for leakage and tightened with spanner where necessary.

Pressure Test. The pressure shall be raised slowly at a rate not greater than 1,000 psi per minute to the specified service test pressure in table 1 and held for 5 minutes. During the test, walk down the line and inspect for leaks. *Neyer* stand in front of the free end nor straddle a hose line under pressure. Inspection personnel shall always keep at least 15 ft to the left side of the hose line under test. The left side of the hose line shall be defined as that side which is to the left when facing the free end from the pressure source.

Draining. After 5 minutes the pressure shall be reduced slowly, the pump discharge gates closed, and each nozzle or test cap valve opened to drain the hose.

Recording Data. If the length is defective, a tag explaining what the defect is and, if applicable, a distinguishing mark noting the location of the defect shall be placed on the hose.

Inspection. Observe marks placed on hose at back of the coupling. If the coupling has moved during the test, the coupling shall be cut from the hose, the length tagged, and sent for recoupling. All couplings shall be examined when the hoses are uncoupled, and any leaking gaskets or defective couplings shall be replaced. Any burst or leaking lengths shall be tagged, taken out of service, and sent for repair.

Completion. After testing or retesting, all hose shall be thoroughly cleaned, drained, and dried before being placed back in service or stored.

Unlined Hose. All service testing of unlined hose shall be performed in accordance with procedures specified for lined hose, except that unlined linen hose shall have a 10-minute wet soak at 50 psi prior to applying full pressure to condition the linen yam prior to running the service rate of 20 gpm, the hose shall be removed from service. Linen hose shall be thoroughly dried immediately after testing to avoid mildew.

Nonwoven Rubber Hose. Braided hose shall be service tested annually to 150 percent of its rated working pressure when tested in accordance with ASTM D380, "Standard Method of Testing Rubber Hose."

Hard Suction Hose. Hard suction hose shall be service tested annually to 150 percent of rated working pressure when tested in accordance with ASTM D380. Hard suction hose shall also be dry vacuum tested annually as follows:

- The hose shall be attached to a suction source; i.e., pumper suction inlet.
- The free end shall be sealed with a transparent disk and connected to an accurate vacuum measuring instrument.
- A 22-in mercury vacuum shall be developed. While holding the vacuum, the lining of the hose shall be inspected through the transparent disk. There shall be no collapsing of the lining into the waterway.

USDA FOREST SERVICE SPECIFICATIONS/STANDARDS

5100-101b	Wrench, spanner, fire hose
5100-102c	Couplings, fire and suction hose
5100-105c	Strainer, suction hose
5100-108d	Couplings, lightweight, fire and suction hose
5100-183g	Hose, linen, 1-in and 1-1/2-in
5100-184b	Hose suction
5100-185d	Hose, rubber, high-pressure 3/4-in
5100-186b	Hose, cotton-synthetic jacketed, lined, 1-in and 1-1/2-in
5100-00187	Hose, fire, lightweight, lined, synthetic woven jacket, 1-in and 1-1/2-in
5100-238a	Shut-off, valve, ball
5100-239a	Nozzle with shut-off, combination barrel
5100-240b	Nozzle, twin tip, shut-off, 1-in base
5100-241b	Nozzle, shut-off
5100-242c	Nozzle, screw-tip, 1-1/2-in
5100-243b	Nozzle, garden hose
5100-244b	Nozzle tips, straight-stream and spray
5100-245b	Clamp, fire hose, shut-off
5100-256a	Pump, fire, backpack, hand-operated
5100-257b	Tank, fire, backpack
5100-273c	Pumper, engine-driven
5100-274b	Pumper, lightweight, portable
5100-275a	Pumper, portable, floating
5100-304a	Long-term retardant, forest fire aircraft or ground application
5100-305b	Wetting agent
5100-00306	Short-term retardant, forest fire aircraft application
5100-316d	Sheaths, plastic, hand tool
5100-340a	Reel, hose, booster
5100-341a	Tanker, slip-on, metal, end-mounted, 125-, 200-gal, Model 21
5100-343b	Tanker, slip-on, fiberglass-reinforced resin, capacity 75-, 125-, 200-gal, Model 30
5100-344a	Pumper, belt-driven, vehicle engine
5100-346b	Tanker, slip-on, 50-gal, Model 10
5100-347c	Tanker, slip-on, metal, end mounted, 75-, 125-, 200-gal, Model 20
5100-349b	Tanker, slip-on, 300-gal, Model 51
5100-380c	Valve, wye
5100-382b	Valve, check and bleeder
5100-383a	Valve, foot, with strainer
5100-1a	Spark arresters for internal combustion engines
5100-107a	Fire hose connections and fittings
5100-190a	Threads, gaskets, and rocker lugs, connections & fittings, fire hose
5100-500d	Accessories, external-loading, helicopter

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA), INC. STANDARDS

NFPA 1961	Fire hose
NFPA 1962	Care, use, and maintenance of fire hose including connections and nozzles
NFPA 1963	Screw threads and gaskets for fire hose connections

APPENDIX 5 Specifications and Standards

CROSS REFERENCE OF FEDERAL NUMBERS

[NOTE: NFES = National Fire Equipment System of the National Wildfire Coordinating Group (NWCG)]

National Stock Number (NSN)	NFES No.	Forest Service Number	Item
4210-00-126-5108	0259	5100-380c	Valve, wye, 1-in
4210-00-165-4864	0944	5100-184b	Hose, suction, 1-in, 8-ft length
4210-00-177-6135	0737	5100-244b	Nozzle tips, straight-stream and spray
4210-00-203-3228	0680	5100-105c	Strainer, suction hose
4210-00-203-3519	2227	5100-241b	Nozzle, shut-off
4210-00-203-3845	0638	5100-244b	Nozzle tip, 3/8-in
4210-00-203-3855	0637	5100-244b	Nozzle tip, 3/16-in
4210-00-204-3358	0635	5100-244b	Nozzle tip, No. 3.
4210-00-204-3386	0636	5100-244b	Nozzle tip, No. 6.
4210-00-294-2648	0418	5100-107a	Reducer coupling, 1-1/2- to 1-in
4210-00-595-1838	1220	5100-185d	Hose, rubber, high-pressure, 3/4-in
4210-00-595-1839	2427	5100-184b	Hose, suction, 1-1/2-in; 8-ft length
4210-00-640-1892	0024	5100-240b	Nozzle, twin tip, shut-off, 1-in
4210-00-767-7123	0046	5100-245b	Clamp, fire hose, shut-off
4210-00-777-1591	0966	5100-186b	Hose, rubber-lined, cotn-synthtc 1-in;100-ft
4210-00-889-1774	1808	5100-184b	Hose assembly, suction, 1-1/2-in; 8-ft length
4210-00-889-1775	0115	5100-184b	Hose assembly, suction, 1-1/2-in; 10-ft length
4210-00-975-2969	0010	5100-107a	Reducer coupling, 1-1/2- to 1-in
4210-00-984-3460	0217	5100-105c	Strainer, suction hose, 1-1/2-in
4210-00-984-3475	0231	5100-380c	Valve, wye, 1-1/2-in
4210-01-037-7031	0964	5100-186b	Hose, 1-1/2-in; 50-ft length
4210-01-039-4855	0965	5100-186b	Hose, 1-in; 50-ft length
4210-01-079-9283	0007	5100-107a	Thread adapter, 1-1/2-in NH x 1-1/2-in NPSH
4210-01-079-9284	0006	5100-107a	Thread adapter, 1-1/2-in NPSH x 1-1/2-in NH
4210-01-079-9285	0856	5100-107a	Double male coupling, 1-1/2 in
4210-01-079-9286	0733	5100-107a	Reducer 1- to 3/4-in
4210-01-080-1457	0710	5100-107a	Double female coupling, 1-in NPSH
4210-01-080-1458	0916	5100-107a	Double male coupling, 1-in NPSH
4210-01-080-1459	2240	5100-107a	Hose line tee, cap & chain, 1-in
4210-01-080-1460	0731	5100-107a	Hose line tee, cap & chain, 1-1/2-in
4210-01-080-6531	2235	5100-107a	Increaser, 3/4- to 1-in
4210-01-080-6532	0416	5100-107a	Increaser, 1- to 1-1/2-in
4210-01-081-0417	0230	5100-107a	Hose line tee, valve, 1-1/2-in
4210-01-081-0418	1809	5100-107a	Hose line tee, 1- to 3/4-in
4210-01-081-0419	2229	5100-107a	Reducer, 2-1/2- to 1-1/2-in
4210-01-081-8749	0857	5100-107a	Double female coupling, 1-1/2-in
4210-01-081-8751	2210	5100-107a	Cap with chain, 1-1/2-in
4210-01-082-0575	0732	5100-107a	Cap with chain, 1-in
4210-01-108-2934	0639	5100-240b	Nozzle body w/out tips
4210-01-165-6597	1239	5100-00187	Hose, synthetic, lined, 1-1/2-in, 100-ft length
4210-01-165-6599	1201	5100-238a	Shut off, valve, ball, 1-in
4210-01-165-6600	1207	5100-238a	Shut-off, valve, ball, 1-1/2-in
4210-01-165-6603	1081	5100-239a	Nozzle, shut-off, comb. barrel, 1-in
4210-01-166-8122	1238	5100-00187	Hose, synthetic, lined, 1-in, 100-ft length
4210-01-167-1123	1082	5100-239a	Nozzle, shut-off, comb. barrel, 1-1/2-in

APPENDIX 5
Specifications and Standards

National Stock Number (NSN)	NFES No.	Forest Service Number	Item
4210-01-777-1592	0967	5100-186b	Hose, rubber-lined, 1-1/2-in, 100-ft length
4320-00-289-8912	1149	5100-256a	Pump and fabric tank
4320-00-595-0762	0151	5100-256a	Pump, fire, backpack
4320-00-890-5879	0148	5100-274b	Pumper, lightweight, portable
4320-01-035-0047	0253	5100-274b	Pumper, lightweight, portable, backpack
4730-00-595-1103f	0136	5100-243b	Nozzle, garden hose
4820-00-126-5114	0212	5100-383a	Valve, foot, with strainer
5120-00-596-1426	0234	5100-101b	Wrench, spanner, 1- and 1-1/2-in
5120-00-596-1427	0235	5100-101b	Wrench spanner, 1-, 1-1/2-, and 2-1/2-in
5330-00-239-1875	0742	5100-190a	Gasket, fire hose, 2-in
5330-00-239-1877	2326	5100-190a	Gasket, fire hose, 2-1/2-in
5330-00-720-2621	0723	5100-190a	Gasket, fire hose, 1-in
6850-01-111-2200	1329	5100-305b	Wetting agent
8465-00-765-9764	2577	5100-257b	Tank, fire, backpack
9210-00-973-9559		5100-183g	Hose, linen, 1- and 1-1/2-in



FIRE HOSE COUPLINGS

Red Head Brass, Inc.
643 Legion Drive
P.O. Box 566
Shreve, OH 44676

Action Coupling and Equipment Inc.
8248 County Road 245
P.O. Box 99
Holmesville, OH 44633

TEEMS, Inc.
2008 Yale, Unit D
Santa Ana, CA 92704

United Fire Safety Co., Ltd.
3732 Bowen Road
Lancaster, NY 9408

Cordova Fire Equipment Co.
12355 Quicksilver Drive
Rancho Cordova, CA 95742

FIRE HOSE MANUFACTURERS

Angus Fire Armour Corp.
P. O. Box Drawer 879
Angier, NC 27501

Imperial Fire Hose Co.
11325 Nations Ford
Pineville, NC 28134

Niedner Limited
190 Cuitting Street
Coaticook, Quebec
Canada J1A-2S8

National Fire Hose Co.
516 East Oaks Street
P.O. Box 4969
Compton, CA 90224

KK Products
1004 Silhavy Road
Valparaiso, IN 46383

PUMPS

Sta-Rite Industries, Inc.
Water Systems Grp, Berkeley Pump Co.
293 Wright Street
Delavan, WI 53115

D.B. Smith
414 Main Street
Utica, NY 13501

Edwards Manufacturing Co.
2441 S.E. Stubbs Street
Milwaukie, OR 97222

Gorman-Rupp
305 Bowman Street
Mansfield, OH 44902

H.D. Hudson Mfg. Co.
(Backpack pump & tank)
500 North Michigan Ave.
Chicago, IL 60611

Homelite Textron
14401 Carowinds Blvd.
Charlotte, NC 28217

Hale Fire Pump Co.
700-T Spring Mill Ave.
Conshohocken, PA 19428

NOZZLES

Akron Brass Co.
P.O. Box 86
Wooster, OH 44691

Fire Products Manufacturing Inc.
760 N. Main Street
Unit J-T
Orange, CA 92668

KCR Manufacturing, Inc.
2710 North Interstate Ave.
Portland, OR 97227-1608

Santa Rosa Manufacturing Co.
880 Monterey Road
San Jose, CA 95111

Waterous Company
300-T John E. Carroll Ave., East
South St. Paul, MN 55075

APPENDIX 6

Suppliers

HOSE REELS

Aero-Motive Manufacturing Co.
P.O. Box 2678
Kalamazoo, MI 49003

American Reeling Devices, Inc.
9850 Rush Street
S. El Monte, CA 91733

Metal Masters
3862 Depot Road
Hayward, CA 94545

Coxwells, Inc.
720 E. 59th Street
Los Angeles, CA 90001

Clifford Hannay & Sons, Inc.
600 East Main Street
Westerlo, NY 12193

GENERAL SUPPLIERS

Cascade Fire Equipment Co.
P.O. Box 4248
Medford, OR 97501

Circul-Air Corp.
29230-T Ryan Road
Warren, MI 48092

LN Curtis
4133 Broadway
Oakland, CA 94611

Cast Machined Products
3900 Magnolia Street, Unit A
Denver, CO 80207

Fireflex Manufacturing, Ltd.
Distributor: Simplex M
13340 N.E. Whitaker Way
Portland, OR 97230

Halprin Supply Company
3804 S. Broadway Place
Los Angeles, CA 90037-1484

Fire Products Manufacturing Inc.
760 N. Main St., Unit J-T
Orange, CA 92668

Action Coupling & Equipment, Inc.
8248 County Road
P.O. Box 99
Holmesville, OH 44633

S & H Products, Inc.
5160 A Parfet Street, Unit 1
Wheat Ridge, CO 80033

Vico & Sons Mfg. & Supply
P.O. Box 1977, Dept. T
Tustin, CA 92681

Mulligan & Associates
P.O. Box 524
Gresham, OR 97030

Rice Hydro Equipment Mfg.
(Hose tester)
1934 John Towers Ave., Suite A
El Cajon, CA 92020

Wajax/Pacific Fire Equipment
P.O. Box 88540
Seattle, WA 98188

Mallory Company
1814 Baker Way
Kelso, WA 98626

Elkhart Brass Mfg. Co. Inc.
1302 West Beardsley Ave.
P.O. Box 1127
Elkhart, IN 46515

Hawthorne Screw Company
12355 Quicksilver Drive
Rancho Cordova, CA 95742

FOL-DA-TANK Co.
P.O. Box 361
Rock Island, IL 61201

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APPENDIX 7 Acronyms

Acronyms used in this Guide are listed here, along with their meaning, to provide a ready reference for users of the Guide.

ANSI	American National Standards Institute	NIST	National Institute of Standards and Technology
ASTM	American Society for Testing and Materials	NPS	National Park Service, USDI
BIA	Bureau of Indian Affairs, USDI	NPSH	American National Hose coupling threads (straight-pipe threads for hose couplings and nipples)
BLM	Bureau of Land Management, USDI	NPT	American Standard taper pipe threads
°C	Degrees Centigrade	NWCG	National Wildlife Coordinating Group
CA	Cab to axle of motor-driven vehicle	OD	Outside diameter
CAFS	Compressed air foam system	PMS	Publication Management System (of NIIMS)
CJRL	Cotton-jacketed, rubber-lined (hose)	psi	Pounds per square inch
CSRL	Cotton-Synthetic jacketed, rubber-lined (hose)	psig	Pounds per square inch gauge
CDF	California Department of Forestry and Fire Protection	pto	Power take-off
CW	Curb weight of motor-driven vehicle	QPL	Qualified Products List
DJRL	Double-jacketed rubber-lined (hose)	R-1, etc.	Region 1 through Region 10, Forest Service, USDA
DOI	Department of Interior	rpm	Revolutions per minute
°F	Degrees Fahrenheit	SIPT	Straight iron pipe thread
Fed	Federal	S-S	Straight-stream
FEMA	Federal Emergency Management Agency	SDTDC	San Dimas Technology and Development Center
FEWT	Fire Equipment Working Team	spec	Specification
FS	Forest Service, USDA	TPI	Threads per inch
ft	Feet (foot)	UL	Underwriter's Laboratories
FWS	Fish and Wildlife Service, USDI	USDA	U.S. Department of Agriculture
gal	Gallon(s)	USDI	U.S. Department of the Interior
GH	Garden hose	WHEG	Water Handling Equipment Guide
GHT	Garden hose thread		
gpm	Gallons per minute		
GSA	General Services Administration		
GVW	Gross vehicle weight of motor-driven vehicle		
Hg	Mercury		
HP	High pressure (hose)		
hp	Horsepower		
ICS	Incident Command System		
ID	Inside diameter		
in	Inch(es)		
IPT	Iron pipe thread		
lb	Pound(s)		
Lpg	Liquified petroleum gas		
mph	Miles per hour		
NBFU	National Board of Fire Underwriters		
NBS	(National Bureau of Standards— <u>now</u> NIST)		
NFES	National Fire Equipment System		
NFPA	National Fire Protection Association		
NH	American National Fire Hose coupling threads		
NIFC	National Interagency Fire Center, Boise, Idaho		
NIIMS	National Interagency Incident Management Systems		



These definitions are applicable to wildland firefighting activities. There may be other words, phrases, or terminology that are encountered, but those below are the less familiar or prone to be misunderstood.

Abrasion—Grinding or wearing away of a surface by abrasive materials.

Adhesion—Bonding or adherence between rubber lining and the jacket.

Alkali extract—A laboratory test procedure where alkali is extracted by boiling a sample hose jacket in a mixture of sodium carbonate and sodium hydroxide, and then determining the difference in weight of the sample.

Backing—A layer or rubber material used to provide adhesion between the inner tube and the outer jacket.

Baffle—Partitions in a tank that reduce shifting of water load.

Burst—To break open a sample hose with internal hydrostatic pressure (psi). It determines the ultimate breaking strength of the hose.

Cavitation—Caused by reduced pressure and conversely increased vacuum on the water inside the suction of a pump, as a result of the following:

1. Excessive lift.
2. Small or long suction hose.
3. Blocked or small strainer.
4. Warm water.
5. High altitude.
6. Combination of any.

Construction—The type of fiber used, tensile strength of the fiber, number of ends and number of picks per inch in a fire hose jacket.

Continuous performance (85%—pump test)—Eighty-five percent point established from a maximum. Performance test of a pump and corrected to sea level.

Cotton—Spun cotton fiber yarn woven into a hose.

Cotton-Synthetic—Cotton yarn combined with polyester yarn filler for abrasion resistance.

Crimp—The waviness of the yarn in a woven jacket. The difference in distance between two points on a yarn as it lies in a fabric, and their same two points when the yarn has been removed and straightened.

Curb weight (vehicle)—Weight of a vehicle including full fuel tank, cooling system, crankcase, spare wheel, and other standard equipment.

Cure—The act of vulcanization. In fire hose, the vulcanization of the tube to the jacket.

Cycles (engine)—Complete power cycle of an engine—including intake, compression, power, and exhaust strokes.

Dacron—A synthetic polyester fiber. The first manmade fiber ever used in fire hoses. High-strength, low-stretch material ideally suited for fire hoses.

Denier—A unit of weight; used to express the yarn number of polyester and other continuous filament fibers.

Density altitude—Pressure altitude corrected for temperature.

Elongation—The increase in length caused by applied force. It may be measured at any specified load and is expressed as a percentage of the original length.

End—One thread of the warp, either before weaving or in the jacket.

Engine—Gasoline, or other fuel, powered machine that drives a pump, transmission, etc.

Erosion—Act of eroding or wearing away of a surface by the impingement of abrasive materials.

Extrusion—The formation of a desired shape by ejecting through a shaped opening.

Flexibility—The amount of force required to compress a sample hose, or the amount of force to turn a sample hose around a roller drum.

Filament—A single continuous strand of indefinite length, such as a manmade polyester. Compared to staple fibers such as cotton, a filament possesses extreme length and often may be measured in thousands of yards without a break.

APPENDIX 8

Definitions

Filler—The yarn which interlaces with the warp yarn to produce a woven jacket.

Foam—A fire extinguishing chemical that forms bubbles when mixed with water and reduces combustion by cooling, moistening, and excluding oxygen.

Friction loss—Resistance on the surface of a wall (usually the inside surface of a pipe or hose).

Fully backed—The process by which the tube is bonded 360 degrees around within the jacket.

Gear ratio—Number of teeth on the driver gear in proportion to the number of teeth on the driving gear.

Hammer (water)—Instantaneous shock force exerted by water in piping or hose systems by the closing of a valve (i.e., 500 ft of 3-in line being filled with water at 200 psi results in 1,500 lb of water moving at 16 mph (1,500 lb of water moving at 16 mph is equivalent at 15 lb moving at 1,600 mph).

Head—Pressure due to elevation of water. Equals 0.433 psi per foot of elevation. Back pressure. (Approximately 1/2 psi is required to lift water 1 foot in elevation.)

Higbee cut—Removal of the end of the first thread to simplify and facilitate rapid coupling connections (also known as “blunt start”).

Hose lay—Arrangement of connected lengths of fire hose and accessories on the ground from the pump to the nozzle.

Horsepower—Engine work capacity. One horsepower (hp) equals 33,000 ft/lb work per minute. (Gross hp is directly off the engine drive shaft; net hp includes power remaining after power to accessories is subtracted.)

Hypalon—A synthetic rubber with excellent ozone, weathering, and acid resistance. Widely used in fire hose to retard abrasion.

Impeller—Rotating part, or blades, of a pump that transfers energy to movement of water.

Impinge—Projection of a substance into another; i.e., projection of a stream of fluid or chemical product at high velocity.

Impregnate—To infuse a substance with particles of another substance. In fiber hose, a process in which a dye or chemical is forced into the yarns to mildew treat or coat the jacket for various reasons.

Jacket—A seamless, tubular, woven fabric used as the outer covering of a hose.

Kill switch—Automatic energy or engine shut-off feature resulting from pressure or vacuum loss.

Kink—The bursting of a sample hose when kinked (bent over itself) and tied, then hydrostatic pressure applied.

Leakage rate—The amount of water seeping through a sample hose (unlined) in a special trough in a given time period.

Lined hose—A hose that is lined with a tube of petroleum-based thermoplastic or polyester elastomer.

Liner—The innermost continuous petroleum base, thermoplastic, polyester elastomer element of fire hose.

Live hose reel—Reel capable of supporting and operating a length of hose while under working pressure.

Loose-at-fold—The process by which a tube is not bonded 360 degrees around in the jacket.

Maximum hydraulic units—Unit of measure in hydrostatic test of a pump. The highest value obtained when multiplying pressure by flow of a performance curve of a pump.

Maximum performance—The maximum flow at various pressures of a pump with peak revolutions per minute of the engine or motor.

Mildew—Growth of organic matter produced by fungi. It will discolor and cause deterioration of the woven fabric.

Mildew resistant—Designed to withstand the growth of mildew and mold without any deteriorating effect on the fabric.

Mildew treatment—The chemical treatment on a hose jacket to resist organic growth that would deteriorate the hose jacket fibers.

Neoprene—A synthetic rubber. Excellent resistance to many chemicals, weathering, ozone, heat, cold, and abrasion. Ideally suited for fire hose liners where prolonged storage is a factor.

Nylon—A synthetic fiber named by E.I. Dupont Co. used in wearing apparel and other commercial and industrial applications where elongation is not a factor.

One-hundred-hour endurance—Same value as the maximum hydraulic units, but at 85% of the maximum performance corrected to sea level (Forest Service-USDA specification).

Oven aging—The deterioration of a hose lining observed under a 7-power microscope after heating in an oven at a given temperature and time.

Ozone aging—The deterioration of a hose lining or jacket observed under a 7-power microscope after exposure to a given amount of ozone and time.

Pick—Circular yarn woven between longitudinal warp ends that forms a pick on one turn of the finished jacket.

Polyester—A synthetic material either spun or filament. Can be used in both the warp and filler yarn in fire hose.

Power take-off—An output shaft on an engine, transmission, or transfer case of a motorized vehicle that delivers engine power to auxiliary equipment.

Pump performance value—Same value as the maximum hydraulic units at 85%. (Also same as qualified rating. Forest Service-USDA specification.)

Qualified rating—Same value as pump performance value (Forest Service-USDA standard).

Retardant (fire)—A substance that reduces or inhibits flammability of combustible material by chemical or physical action.

Rise—The height of a hose will rise from its original flat position after hydrostatic pressure is applied.

Spun yarn—A textile yarn spun and twisted from staple-length fiber, either natural or synthetic.

Sulfur content—The percent by weight of sulfur contained in a rubber hose lining as determined chemically in a laboratory test.

Suppressant—Agent that extinguishes the flaming and glowing phases of combustion by direct application to the burning fuel. (Water is a suppressant agent.)

Surge—Rapid increase in flow resulting in rise in pressure.

Tandem—One behind another. (In firefighting operation, a relay operation with short lines between pumps.)

Twist—The twisting of a hose when hydrostatic pressure is applied. The twisting is either left or right as observed in the direction of flow.

Uniform leakage—The wetting and close up period of a dry unlined hose.

Unlined hose—A woven hose which does not incorporate a tube. Designed to seep, and manufactured of linen yarn: Normally used as emergency hose, but used in brush fires due to its resistance to hot spots that would burn through other types of hose.

Warp—The amount of deviation from a straight line when the hose is hydrostatically tested; usually expressed in inches.

Water extraction—The pH content of a hose jacket determined after boiling in distilled water in a laboratory test.

Wetting agent—Detergent type chemical that when added to water reduces surface tension and increases penetration into fuels.

Wet water—Water treated with wetting agent.

Wheel base—Distance from centerlines of front axle to rear axle of a motor-driven vehicle.

Yarn number (cotton)—A conventional relative measure of fineness as applied to yarns. Coarse yarns have low numbers and fine yarns have high numbers.

APPENDIX 9

Metric System Equivalents/Conversion Factors

The purpose for including the following metric system equivalents and approximate conversion factors is to meet the requirements of Public Law 100-418. This law requires each Federal agency to use the metric system of measurement by Fiscal Year 1992, in procurements, grants, and other business related activities.

Linear Measure

1 centimeter=	10 millimeters=	0.39 inch
1 decimeter=	10 centimeters=	3.94 inches
1 meter=	10 decimeters=	39.37 inches
1 dekameter=	meters=	32.8 feet
1 hectometer=	10 dekameters=	328.08 feet
1 kilometer=	10 hectometers=	3,280.8 feet

Liquid Measure

1 centiliter=	10 milliliters=	0.34 fl ounce
1 deciliter=	10 centiliters=	3.38 fl ounces
1 liter=	10 deciliters=	38.82 fl ounces
1 dekaliter=	10 liters=	2.64 gallons
1 hectoliter=	10 dekaliters=	26.42 gallons
1 kiloliter=	10 hectoliters=	264.18 gallons

Weights

1 centigram=	10 milligrams=	0.15 grain
1 decigram=	10 centigrams=	1.54 grains
1 gram=	10 decigrams=	0.035 ounce
1 dekagram=	10 grams=	0.35 ounces
1 hectogram=	10 dekagrams=	3.52 ounces
1 kilogram=	10 hectograms=	2.2 pounds
1 quintal=	100 kilograms=	220.46 pounds
1 metric ton=	10 quintals=	1.1 short tons

Square Measure

1 sq centimeter=	100 sq millimeters=	0.155 sq in
1 sq decimeter=	100 sq centimeters=	15.5 sq in
1 sq meter (centare)=	100 sq decimeters=	10.76 sq ft
1 sq dekameter (are)=	100 sq meters=	1,076.4 sq ft
1 sq hectometer (hectare)=	100 sq dekameters=	2.47 acres
1 sq kilometer=	100 sq hectometers=	0.386 sq mi

Cubic Measure

1 cu centimeter=	1000 cu millimeters=	0.06 cu inch
1 cu meter=	1000 cu decimeters=	35.31 cu feet
1 cu decimeter=	1000 cu centimeters=	61.02 cu inches

APPENDIX 9
Water Handling Units

	<u>U.S. Measure</u>	<u>Metric Equivalent</u>
	Volume (Capacity)	
One hose length		
1-1/2-in ID x 100	= 9 gal (approx)	= 34.07 liters
1-in ID x 100	= 4 gal (approx)	= 15.14 liters
Tank size (gal)		
Rectangle	= Length x width x height (inches) x 0.0043	
Cylinder	= 3.14 x diameter squared x height (or length) (inches) divided by 4 x 0.0043	
	Weight	
1 ft of water head (column of water)	= 0.434 psi (1/2 psi)	= 2.99 kPa
	Pressure	
1 psi	= 2 ft of water head (2.304 ft)	= 6.89 kPa
Atmospheric pressure	= 14.696 psi @ sea level (or 29.92 in of Hg @ 32o F)	= 101 kPa @ sea level
1,000 ft increase in elevation	= 1/2 lb decrease in atmospheric pressure	
	Draft	
1 in of mercury	= 1 ft lift (1.134 ft)	= 0.3048 m lift
Drafting guidelines:		
Theoretical lift (max)	= 33.9 ft lift	= 10.33 m lift
Attainable	= 29.4 ft lift	= 8.96 m lift
Excellent pump	= 28 ft lift	= 8.53 m lift
Good pump	= 26 ft lift	= 7.93 m lift

APPENDIX 9
Approximate Conversion Factors

To Change To Multiply By

inches	centimeters	2.54
feet	meters	0.305
yards	meters	0.914
miles	kilometers	1.609
square inches	square centimeters	6.451
square feet	square meters	0.093
square yards	square meters	0.836
square miles	square kilometers	2.590
acres	square hectometers	0.405
cubic feet	cubic meters	0.028
cubic yards	cubic meters	0.765
fluid ounces	milliliters	29,573
pints	liters	0.473
quarts	liters	0.946
gallons	liters	3.785
ounces	grams	28.349
pounds	kilograms	0.454
short tons	metric tons	0.907
pound-feet	newton-meters	1.365
pound-inches	newton-meters	0.11375

To Change To Multiply By

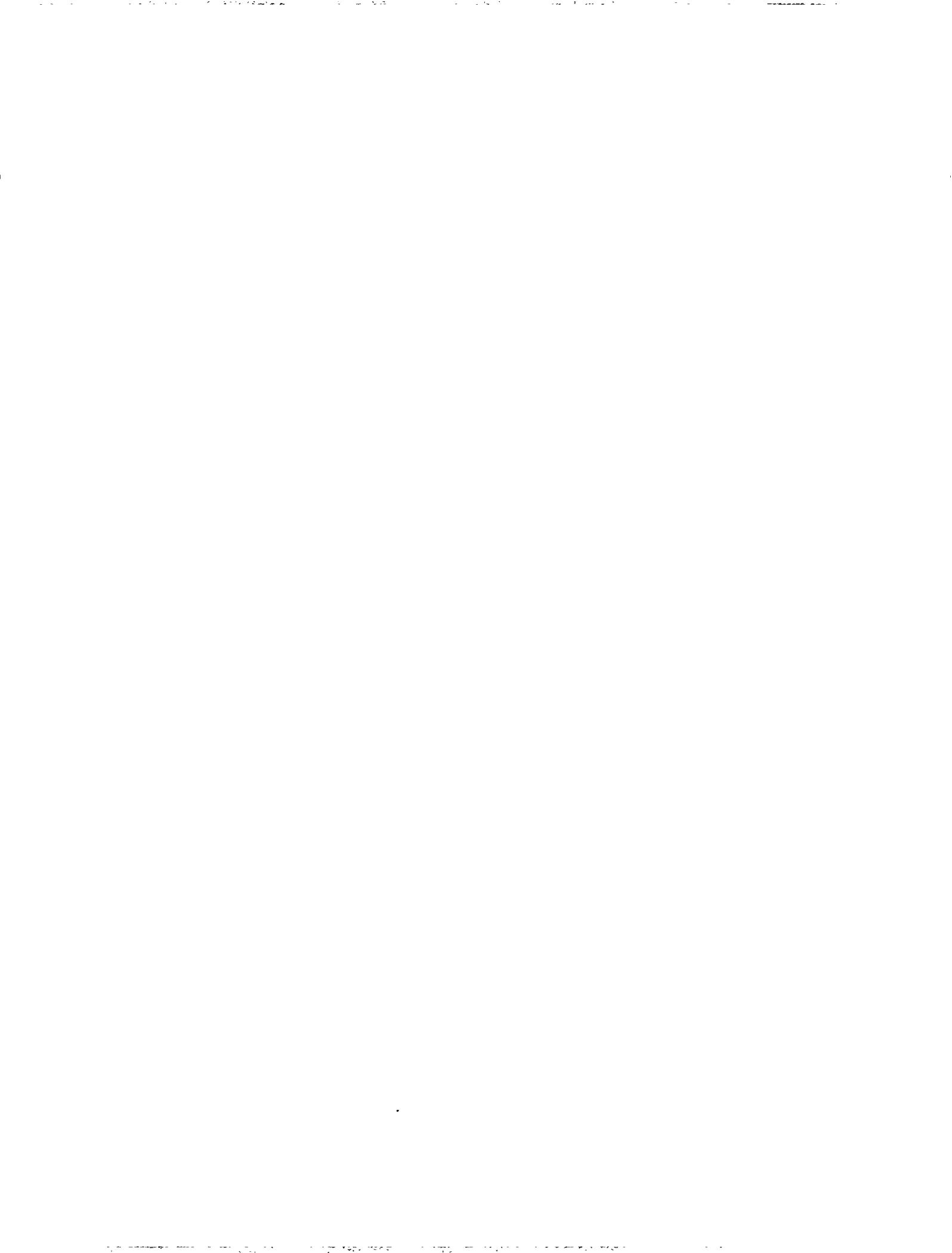
ounce-inches	newton-meters	0.007062
centimeters	inches	0.394
meters	feet	3.280
meters	yards	1.094
kilometers	miles	0.621
square centimeters	square inches	0.155
square meters	square feet	10.764
square meters	square yards	1.196
square kilometers	square miles	0.386
square hectometer	acres	2.471
cubic meters	cubic feet	35.315
cubic meters	cubic yards	1.308
milliliters	fluid ounces	0.034
liters	pints	0.2113
liters	quarts	1.057
liters	gallons	0.264
grams	ounces	0.035
kilograms	pounds	2.205
metric tons	short tons	1.102

Temperature (Exact)

°F=Fahrenheit °C=Celsius

°F=(°Cx9/5)+32 °C=5/9x(°F-32)





**New equipment inputs for the
Water Handling Equipment Guide
should be directed to:**

National Wildfire Coordinating Group
Chairperson, Fire Equipment Working Team
c/o Director, Fire and Aviation Management
USDA Forest Service
P.O. Box 96090
Washington, DC 20013-6090

