1. SCOPE.

1.1. **Scope.** The lightweight portable pump unit and pump kit described in this specification are designed for use in wildland firefighting operations. They are usually backpacked into high altitude remote areas. The lightweight portable pump unit consists of a gasoline driven engine, a positive displacement or centrifugal type pump, backpack frame, spark arrester, and a priming device. The thread series designation for the inlet and outlet connections are 1 inch 11-1/2 NPSH and 1-1/2 inch 9 NH.

1.2. **Classification.**

Type I – Pump kit, which includes the pump unit plus the following:
- Fuel system (3.2.1.4)
- Hand-priming device
- Hose caps for pump connections (3.2.2.1)
- Carrying straps for frame (3.2.3)
- Tool bag, tools, and accessories (3.2.4)

Type II – Pump unit only

2. APPLICABLE DOCUMENTS.

2.1. **Government Documents.** The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issue of these documents are those in effect on the date of the invitation for bids or request for proposals (see 6.2).

**USDA Forest Service Standard**

- 5100-01 - Spark Arresters for Internal Combustion Engines
- 5100-190 - Threads, Gaskets, Rocker Lugs, Connections and Fittings, Fire Hose

Beneficial comments, recommendations, additions, deletions, and any pertinent data that may be used in improving this document should be addressed to: Forest Service, San Dimas Technology and Development Center, 444 East Bonita Avenue, San Dimas, CA 91773-3198 by using the Specification Comment Sheet at the end of this document or by letter.
USDA Forest Service Specification

5100-105 - Strainer, Suction Hose
5100-107 - Fire Hose Connections and Fittings

Federal Standards

FED-STD-595 - Colors

Federal Acquisition Regulation (FAR) – Paragraph 23.403, Recoverable Materials

Military Standard

MIL-W-530 - Webbing, Textile, Cotton, General Purpose, Natural or in Colors

U. S. Department of Labor

Federal Register Volume 37, Number 202, Part II - Occupational Safety and Health Administration, Safety and Health Regulations for Construction.


Copies of Forest Service Specifications and Standards are available from Forest Service, San Dimas Technology and Development Center, 444 East Bonita Avenue, San Dimas, CA 91773-3198.

2.2. Nongovernment Publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those in effect on the date of the invitation for bids or request for proposals.

Society of Automotive Engineers (SAE)

J 512 - Automotive Tube Fittings

J 1349 - Engine Power Test Code, Spark Ignition and Compression Ignition - Net Power Rating

Address requests for copies to the SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001 USA.

American National Standards Institute (ANSI)

S 1.4 - Specification for Sound Level Meters

Address requests for copies to the American National Standards Institute Inc., 25 West 43rd Street, 4th floor, New York, NY 10036

American Society for Quality (ASQ)

ANSI/ASQ Z1.4 – Sampling Procedures and Tables for Inspection by Attributes

Address requests for copies to the American Society for Quality, P.O. Box 3005, Milwaukee, WI 53201-3005
2.3. **Order of Precedence.** In the event of conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. **REQUIREMENTS.**

3.1. **Qualified Products List Number.** The bidder shall possess a currently valid notice of qualification with associated Qualified Products List (QPL) number obtained in accordance with 4.1. The date of issue on the QPL number shall precede the date on the invitation for bids.

3.2. **Construction.** The term pump or pump unit, when used hereafter, shall refer to a pump, engine, and backpack frame combination.

3.2.1. **Engine.** The engine shall be gasoline powered, air cooled, with a magneto type or electronic-ignition system. Spark plugs shall be provided with protective caps. A 2-cycle engine shall be capable of burning a mixture of any commercially available unleaded or regular grade gasoline with oil that is normally used in 2-cycle engines. A 4-cycle engine shall be capable of burning any commercially available gasoline, and of operating with standard lubricating oils as recommended by the engine manufacturer. The pump unit shall be designed to prevent leakage of oil and fuel during transportation by the backpack. The fuel system includes all components beginning at the fuel tank to the threaded connection at the pump. The fuel system shall not leak when a full fuel can is positioned above the pump at a vertical height equal to the length of the fuel line.

3.2.1.1. **Engine Controls.** Suitable controls for engine throttle, choke, ignition, and starting shall be provided. The engine shall be fitted with a positive speed-control governor, such that if the load on the engine should decrease suddenly, the engine shall be prevented from overspeeding.

3.2.1.2. **Spark Arrester Exhaust System.** A spark arrester exhaust system shall be furnished. The spark arrester shall be qualified in accordance with Forest Service Standard 5100-01.

3.2.1.3. **Engine Fuel Connection.** The fuel-line connection on the engine shall be a male 1/4 inch inside diameter SAE J512 automotive flare type threaded connection.

3.2.1.4. **Fuel System.**

3.2.1.4.1. **Fuel Line.** The fuel line shall be a flexible gasoline-, oil-, and ozone-resistant line, with a minimum 5-foot length. A hand operated, inline, bulb-type priming device shall be provided. The end of the hose that connects to the pump shall be a female 7/16 inch SAE J512 automotive flare type threaded connection. The end of the hose that connects to the fuel can shall be equipped with a quick-connect male fitting meeting the dimensional requirements of paragraph 3.2.1.4.3.2.

3.2.1.4.2. **Fuel Can.** The fuel can shall be metal and have a capacity of at least 5 gallons. The color of the fuel can shall be red per paragraph 3.3.1. The fuel can shall be provided with an air vent, cap and chain, integral carrying handle, and a female quick-connect fitting. The air vent shall be installed on the top of the fuel can and designed to be open for pump operation and closed for transportation of the fuel, without leakage of fuel. The fuel cap shall be located in an easily accessible area on the fuel can and shall be adequately secured with minimum No. 12 single-jacket brass chain or other type of chain of equal strength and flexibility to prevent loss of the fuel cap.

3.2.1.4.3. **Quick-Connect Couplings**
3.2.1.4.3.1. **Female Quick-Connect Fitting.** The female quick-connect fitting shall be installed as a bulkhead fitting on the lower portion of the fuel can, shall be self-sealing and shall accept the male quick-connect fitting described in paragraph 3.2.1.4.3.2. When the fuel hose is disconnected and the fuel can is full of gas, the quick-connect fitting shall not leak. The plug opening shall have a polyethylene plug installed, tapered plug shall measure 0.440 tall with 0.608 diameter and 0.532 diameter, equivalent to McMaster-Carr Part Number 4491K43.

3.2.1.4.3.2. **Male Quick-Connect Fitting.** The male coupling shall measure 0.935 inches long by 0.552 inches in diameter. The male connection shall have an axial through hole. The outer diameter of the matting quick connect shall have a minimum of two o-rings.

3.2.1.5. **Carburetor.** The carburetor shall be equipped with an external control for adjusting the fuel-to-air ratio and shall include a dry- or wet-type air filter.

3.2.1.6. **Ember Separator.** The inlet to the air filter shall be equipped with a means of separating water and burning embers from the air intake system, such that burning particulate matter larger than 0.039 inches in diameter cannot reach the air-filter element.

3.2.1.7. **Starter System.** A mechanical rewind starter or a manual rope starter shall be furnished. If a mechanical rewind starter is provided, it shall be designed to be removed and a rope starter used, when applicable. A suitable guard shall be provided around any exposed drive belts or chains. The electrical system shall be moistureproof and weatherproof.

3.2.1.8. **Lubrication For Crankcase Engines.** Engine lubrication shall be adequate for a minimum of 12 hours of continuous pump operation without servicing. The engine oil-fill pipe shall be readily accessible and easily serviced.

3.2.2. **Pump.** The pump shall be a centrifugal or positive displacement type with components indicated as follows.

3.2.2.1. **Pump Connections and Fittings.** The pump inlet and outlet thread series designation shall be 1 inch 11-1/2 NPSH or 1-1/2 inch 9 NH. Protective hose caps shall be provided with the Type I Pump Kit and shall be installed on the pump inlet and outlet connections. The hose caps shall be adequately secured to the pump to prevent loss of the caps. Threads shall be in accordance with Forest Service Standard 5100-190. Drain plugs shall be provided on centrifugal pumps that have an inlet and outlet above the centerline of the pump.

3.2.2.2. **Seal or Packing Gland.** A mechanical shaft seal or pump packing gland and packing shall be provided in order to prevent leakage. It shall be able to endure a minimum 100 hours of operation with no leakage.

3.2.2.3. **Pump Lubrication.** Pump lubrication shall be adequate for a minimum 12 hours of continuous operation.

3.2.2.4. **Pressure Relief For Positive-Displacement Pumps.** If the pump is a positive-displacement pump, a method shall be provided for controlling pressure through an automatic relief valve. The device shall be capable of operating over a range of 90 to 300 pounds per square inch, gravity (psig) discharge pressure. See 3.10.3.1.

3.2.3. **Backpack Frame and Carrying Straps.** A backpack frame shall be provided with the pump unit. The backpack frame shall be separate or be the base or framework of the pump unit. Carrying straps shall be provided with the Type I Pump Kit and shall be made of cotton, nylon, or polypropylene. If made of cotton, they shall conform to the requirements of Military Specification MIL W 530, Type III, Class 4.
3.2.4. **Accessories.** Accessories shall be provided to include as a minimum, a spare spark plug, a spark-plug wrench, and a starter rope or crank. A tool compartment or bag shall be supplied with the Type I Pump Kit for storing accessories. The compartment or bag shall be suitable for attachment to the backpack frame. A metric toolkit shall be supplied with the Type I Pump Kit, if metric fasteners are used.

3.2.5. **Service Manual.** The contractor shall supply, at the time of delivery, at least one copy of a complete operation and service manual covering the portable pump as delivered and accepted, including but not limited to the engine, pump, wiring diagrams if applicable, and lubrication charts.

3.3. **Material.** Where more than one type of material is used in various components, there shall be no incompatibility between materials, which may cause corrosion. All pump materials including fittings and adapters shall be of a material appropriate for an air-water atmosphere.

3.3.1. **Paint.** Exposed surfaces of the pump unit to be painted, shall be thoroughly cleaned of grease and other foreign material with a high quality surface-preparation reducer. Plastic, glass, rubber, chrome, and brass surfaces shall not be painted. Bare metal parts shall be coated with at least two coats of a high quality primer. Exposed galvanized surfaces shall be thoroughly washed with a surface-etching solution then primed with a suitable galvanizing primer. The finish coating shall consist of two coats of top quality commercial gloss enamel red (color 11105), which shall match the corresponding color chip of Federal Standard 595. Painting shall be accomplished by spraying or powder coating wherever practical. There shall be no runs, inadequate coverage, peeling, flaking, bubbling, or other defects causing inferior coatings.

3.3.2. **Recoverable Materials.** The contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR), provided all performance requirements of this specification are met.

3.4. **Dimensions and Weights.**

3.4.1. **Pump Unit.** Prior to performance testing, the dry weight shall be measured and the weight class number shall be determined. See 3.10.3.8. The pump unit shall be weighed as assembled with all component parts including oil and engine-cooling water except for fuel and water. Lightweight portable pumps may not exceed 60 pounds.

3.4.2. **Backpack Frame Carrying Straps.** Straps including hardware shall be at least 40 inches in length, end to end, when assembled. They shall be adjustable to a minimum length of 26 inches and shall be at least 1.5 inches wide.

3.4.3. **Dimensional Tolerance.** Unless otherwise noted, the following tolerances apply: one place (x.x) ± 0.1 inch, two places (x.xx) ± 0.03 inch, and three places (x.xxx) ± 0.010 inch.

3.5. **Workmanship.** Pump units shall conform to the quality of product established by this document. The occurrence of nonconformities shall not exceed the applicable acceptable quality levels. There shall be no nonconformities that affect use, appearance, or serviceability.

3.5.2. **Extruded Components.** Extruded sections shall be free from laps, sharp die marks, cracks, and other nonconformities.

3.5.3. **Cast Components.** Cast parts shall be fine-grained, free from blowholes, pinholes, pits, porosity, hard spots, shrinkage, cracks, or other nonconformities.

3.5.4. **Welding.** All welds to include welds on the pump frame shall be thoroughly fused together with strength equal to or stronger than the adjacent material. All excess welds and splatters shall be cleaned.
3.5.5. **Holes.** Punched holes shall be used in lieu of drilled holes only when the punched holes are dimensionally equivalent to drilled holes. In addition, the material shall not become distorted from the punching process.

3.6. **Threads, Waterways, Gaskets, Gasket Recesses, and Rocker Lugs.** All threads, waterways, gaskets, gasket recesses, and rocker lugs shall be in accordance with Forest Service Standard 5100-190.

3.7. **Surface Treatment.** Aluminum-alloy threaded surfaces shall be hardcoated in accordance with Forest Service Standard 5100-190.

3.8. **Marking.** Markings shall be in accordance with Forest Service Standard 5100-190. In addition, a durable decal or corrosion-resistant metal nameplate shall be permanently attached to the pump. The decal or nameplate markings shall include the model, the name of the contractor, the month and year of manufacture in numeric form (example, 10/05 for October 2005), and the pump performance in gallons per minute (gpm) at 150 psig.

3.9. **Surface Finish.** The finish for all coupling surfaces, to include threaded surfaces, shall be in accordance with Forest Service Standard 5100-190.

3.10. **Performance.**

3.10.1. **Calibration of Equipment.** Before performance testing begins, all test equipment shall be calibrated.

3.10.2. **Engine.**

3.10.2.1. **Overspeed Control.** When tested in accordance with 4.7.3.1, the engine shall not overspeed.

3.10.2.2. **Governor Speed Range.** When tested in accordance with 4.7.3.2, the governor speed range shall be the difference between full and minimum throttle and shall be at least 2/3 of the maximum revolutions per minute (rpm).

3.10.3. **Pump Tests.**

3.10.3.1. **Pressure Relief.** When tested in accordance with 4.7.4.2, the discharge pressure shall not increase more than 30 psig from its pressure-relief setting.

3.10.3.2. **Priming.** When tested in accordance with 4.7.2.1, the pump shall be capable of the following:

3.10.3.2.1. The pump-priming system shall develop a minimum vacuum of 17 inches Hg when tested in accordance with 4.7.2.1.1.

3.10.3.2.2. The pump-priming system shall have a maximum loss of 10 inches Hg in 5 minutes when tested in accordance with 4.7.2.1.2.

3.10.3.2.3. If a non-hand-operated primer is used, the pump unit shall be capable of establishing prime and pumping water within 30 seconds at a 10-foot lift when tested in accordance with 4.7.2.1.3.

3.10.3.3. **Drafting.** When tested in accordance with 4.7.2.2, the pump unit shall be able to draft at a 17-foot lift at a 2,000 feet density altitude, after establishing initial prime.
3.10.3.4. **Preendurance Maximum Performance.** When tested in accordance with 4.7.4.3, the preendurance maximum performance curve shall be plotted. Each of the points on this curve shall be corrected to standard sea level. Using these corrected points, a second curve shall be plotted. From this corrected curve, the maximum pump power, $p_1 f_1$, shall be established.

3.10.3.5. **100-Hour Endurance Performance.** When tested in accordance with 4.7.4.4, the pump-performance rating, $p_2 f_2$, shall be determined by establishing a curve at 85 percent of the corrected curve. The pump-performance rating, $p_2 f_2$, shall be the pressure and flow rate at which the 100 hour endurance test is run.

3.10.3.6. **Postendurance Performance.** When tested in accordance with 4.7.4.5, the postendurance performance curve obtained after subjecting the pump to the 100-hour endurance test, shall not be below the preendurance maximum performance curve by more than 2 percent. Limited carburetor jet adjustments shall be allowed to compensate for barometric pressure, different fuel lots, or in-service filters being restrictive.

3.10.3.7. **Pump-Performance Rating.** The pump-performance rating shall be established at that condition at which the 100 hour endurance test is run ($p_2 f_2$).

3.10.3.8. **Pump-Designation Code.** After weighing the pump according to 3.4 and completing the inspection and tests according to 4.5, and establishing the pump-performance rating according to 4.7, the pump unit shall be assigned a designation code indicating pump type, weight class, and performance rating.

   a. Design Type. Assign a letter “P” or “C” to indicate the design or type of pump: P for a positive displacement pump or C for a centrifugal pump.

   b. Weight-Class Number. From the weight determined from 3.4, a weight-class number shall be assigned using table 1.

<table>
<thead>
<tr>
<th>Dry Weight (lbs)</th>
<th>Weight Class Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 30</td>
<td>30</td>
</tr>
<tr>
<td>31 to 40</td>
<td>40</td>
</tr>
<tr>
<td>41 to 50</td>
<td>50</td>
</tr>
<tr>
<td>51 to 60</td>
<td>60</td>
</tr>
</tbody>
</table>

   c. Performance Rating Code Number. From the performance rating determined from 4.7 ($p_2 f_2$), a pressure-group number shall be assigned using table 2 (pressure, $p_2$); and a capacity-group number shall be assigned using table 3 (flow, $f_2$).
Table 2. Pressure-performance rating code number

<table>
<thead>
<tr>
<th>Pressure Range (psig)</th>
<th>Pressure Group Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 to 174</td>
<td>150</td>
</tr>
<tr>
<td>175 to 199</td>
<td>175</td>
</tr>
<tr>
<td>200 or more</td>
<td>200</td>
</tr>
</tbody>
</table>

Table 3. Pumping capacity performance rating code number

<table>
<thead>
<tr>
<th>Pumping Capacity (gpm)</th>
<th>Capacity Group Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.0 to 14.9</td>
<td>09</td>
</tr>
<tr>
<td>15.0 to 24.9</td>
<td>15</td>
</tr>
<tr>
<td>25.0 to 34.9</td>
<td>25</td>
</tr>
<tr>
<td>35.0 to 39.9</td>
<td>35</td>
</tr>
<tr>
<td>40.0 to 49.9</td>
<td>40</td>
</tr>
<tr>
<td>50.0 to 59.9</td>
<td>50</td>
</tr>
<tr>
<td>60.0 to 69.9</td>
<td>60</td>
</tr>
</tbody>
</table>

d. Example. A positive-displacement pump weighing 27 pounds and capable of operating continuously (at 85 percent curve) with a flow of 16 gpm at 180 psig discharge pressure, would be designated as "P 30 175/15."

3.10.4. Backpack Frame Carrying Straps. When tested in accordance with 4.7.6, the straps shall be able to withstand a tensile load of 250 pounds force.

3.10.5. Sound Level.

3.10.5.1. Hearing Safety Label. A warning label shall be permanently attached to the equipment and clearly visible to the operator. The label shall indicate that hearing protection is required when within 13 feet of the equipment.

3.10.5.2. Maximum Sound Level. When tested in accordance with 4.7.5, the average of four sound level measurements shall not exceed 90 dBA at 13 feet.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES.

4.1. Qualification Testing.
4.1.1. **Contractor Submission for Qualification Tests.** The prospective contractor shall provide, without cost to the Government:

a. Two complete sets of assembly drawings and specifications.

b. One sample pump unit with performance data and operating and maintenance instructions.

c. Certificates of conformance. (See 4.6).

d. The estimated test fee.

e. A signed collection agreement.

f. All of the above items shall be delivered to the attention of the Specifications and Standards Project Leader at the Forest Service, San Dimas Technology and Development Center (SDTDC), 444 East Bonita Avenue, San Dimas, CA 91773. The Government shall not be responsible for the submitted test samples.

4.1.2. **Qualification Test.** Qualification inspection and tests shall be conducted by the Government and at the expense of the contractor at a fee to be determined by the Government. If requested by the contractor, the Government will inform the contractor of date and place of inspection and tests. The contractor may send a representative (who has been designated in writing) to be present and observe the inspection and tests, but they will not be permitted to be a participant. Upon completion of tests, the test sample may be retained by the Government. Qualification testing shall stop upon a single failure and the test sample rejected. The Government shall not be obligated to continue testing a nonconforming item once it is known to be nonconforming or when it is considered to be in the best interest of the Government. The contractor will be informed as to the nature of the failure.

4.1.2.1. **Component Part Failure.** If a component part fails during the test, it may be replaced by the contractor, but the sample must be run until the replacement part has completed 100 hours of operation. Replaced components failing twice will constitute disqualification of the pump.

4.1.3. **Notice of Qualification.** Notice of Qualification shall be issued to the contractor upon the successful completion of qualification tests. Copies of qualification notices shall be provided to the General Services Administration. A copy shall be retained in the SDTDC file.

4.1.4. **Notice of Failure to Qualify.** The contractor shall be notified by letter of a failure to qualify if the submitted pump unit does not meet the requirements of this specification.

4.1.5. **Requalification.** After qualification, the contractor shall notify SDTDC immediately in writing when a component or the component supplier changes in any way, when a major manufacturing process changes in any way, or when a manufacturing location changes. The need for requalification shall be determined by the Government when there are changes to the product or this specification.

4.2. **General Inspection and Tests.** Unless otherwise specified in the contract or purchase order, the contractor is responsible for performance of all inspection requirements prior to submission for Government acceptance inspection and tests. The contractor may utilize their own facilities or any commercial laboratory acceptable to the Government. Inspection records of the examination and tests shall be kept complete and available to the Government.
4.2.1. **Inspection and Test Sites.** The Government shall conduct lot acceptance inspection and tests to determine compliance with the specification. If lot acceptance and tests are conducted at locations other than the manufacturing facilities, the contracting officer will specify location and arrangements. In the case of on-site inspections at the contractor’s facility, the contractor shall furnish the inspector all reasonable facilities for their work. During any inspection, the inspector may take from the lot one or more samples and submit them to an independent test laboratory approved by the Government or to a Government test facility for inspection and tests.

4.2.2. **Testing With Referenced Documents.** The contractor is responsible for insuring that components and materials used were manufactured, examined, and tested in accordance with referenced specifications and standards. The Government reserves the right to perform any of the inspections or tests set forth in this section where such action is deemed necessary to assure supplies and services conform to prescribed requirements. The Government shall not be obligated to continue testing a nonconforming item once it is known to be nonconforming or when it is considered to be in the best interest of the Government. The contractor will be informed as to the nature of the failure.

4.3. **Responsibility for Compliance.** All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor’s overall inspection system or quality program. The absence of any inspection requirements in this specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known nonconforming material, either indicated or actual, nor does it commit the Government to accept nonconforming material.

4.4. **Sampling for Inspection.** When inspection is performed, sampling shall be in accordance with ANSI/ASQ Z 1.4.

4.4.1. **Lot.** All pump units of the same type, presented together in one delivery shall be considered a lot for the purpose of inspection. A sample unit shall be one pump unit.

4.4.2. **Sampling for Visual and Dimensional Examination.** Sampling for visual and dimensional examination shall be S-2, with an Acceptable Quality Level (AQL) of 1.0 percent nonconforming per ANSI/ASQ Z-1.4.

4.4.3. **Sampling for Lot Acceptance Tests.** Sampling for lot acceptance testing shall be S-2 with an AQL of 1.0 percent nonconforming per ANSI/ASQ Z-1.4.

4.5. **Inspection and Tests.**

4.5.1. **Visual and Dimensional Examination.** When selected in accordance with 4.4.2, each sample pump unit shall be visually and dimensionally examined to determine conformance with this specification. Visual or dimensional nonconformities shall be classified as major or minor. A nonconformity not listed in table 4 shall be classified as a minor nonconformity. If the number of nonconformities in any sample exceeds the indicated AQL, the lot shall be rejected.
Table 4. Major and minor nonconformities

<table>
<thead>
<tr>
<th>Nonconformity</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Engine and components not as required.</td>
<td>Major X</td>
</tr>
<tr>
<td>2. Pump and components not as required.</td>
<td>Major X</td>
</tr>
<tr>
<td>3. Frame and carrying handle not as required.</td>
<td>Minor X</td>
</tr>
<tr>
<td>4. Accessories not as required.</td>
<td>Minor X</td>
</tr>
<tr>
<td>5. Welding not as required.</td>
<td>X</td>
</tr>
<tr>
<td>6. Threads, waterways, gaskets, and markings</td>
<td>Minor X</td>
</tr>
<tr>
<td>not as required.</td>
<td></td>
</tr>
<tr>
<td>7. Materials not as required.</td>
<td>Minor X</td>
</tr>
<tr>
<td>8. Painting and color not as required.</td>
<td>X</td>
</tr>
</tbody>
</table>

4.5.2. **Lot Acceptance Tests.** Each of the samples selected in accordance with 4.4.3, shall be tested in accordance with 4.7, to determine conformance with requirements of this specification.

4.5.3. **Quality Conformance Inspection.** Unless otherwise specified, sampling for inspection shall be performed in accordance with ANSI/ASQ Z 1.4. The inspection level and AQL shall be as specified in 4.4.3.

4.6. **Certificate of Conformance.** A certificate of conformance shall meet the requirements of Forest Service Standard 5100-190. Where certificates of conformance are required, the Government reserves the right to verify test any such items to determine the validity of certification. These certificates shall be based on the testing of component materials and may be performed by the component material supplier. The contractor shall provide certificates of conformance for 3.3, 3.7, and 3.10.5.

4.6.1. **Certificates of Conformance in Lieu of Testing.** Unless otherwise specified, certificates of conformance may be acceptable in lieu of testing end items.

4.7. **Performance Testing.** Samples shall be subjected to the following tests to determine if the samples meet the requirements of the specification.

4.7.1. **Fluid Medium.** All testing requiring the use of a fluid medium shall be performed using municipally supplied potable water; this shall include, but is not limited to pump-performance testing. If the contractor does not have access to a municipal water supply, the testing shall be performed using any clear fresh water normally available for firefighting. Testing performed by the Government will be conducted using municipally supplied potable water.

4.7.2. **Pump Setup.** The pump unit shall be installed on a pump test stand with necessary controls to conduct pump performance tests below. If the pump unit has not been previously broken-in by the contractor, it shall be subjected to a break-in period of at least 4 hours of varying speeds and loads.

4.7.2.1. **Priming Test.** As required by 3.10.3.2, the priming capabilities of the pump shall be determined.

4.7.2.1.1. The pump inlet and outlet shall be capped. As required by 3.10.3.2.1, the pump priming system shall develop a minimum vacuum of 17 inches Hg.
4.7.2.1.2. With the pump inlet and outlet capped, a minimum vacuum of 17 inches Hg shall be established. As required by 3.10.3.2.2, the pump priming system shall have a maximum vacuum loss of 10 inches Hg in 5 minutes.

4.7.2.1.3. The pump inlet shall be connected to a 24-foot length of suction hose. The suction-hose diameter shall correspond to the nominal diameter of the pump-inlet coupling. The centerline of the pump impeller shall be 10 feet above the water level. As required by 3.10.3.2.3 for pumps with non-hand-operated primers, the pump unit shall establish prime and pump water within 30 seconds.

4.7.2.2. **Drafting Test.** The pump inlet shall be connected to a minimum 24-foot length of suction hose. The suction hose diameter shall correspond to the nominal diameter of the pump inlet coupling. The centerline of the pump impeller shall be 17 feet above the water level. As required by 3.10.3.3, after prime has been established, drafting shall be performed while observing pump flow and pressure.

4.7.3. **Engine Testing.**

4.7.3.1. **Overspeed Control Test.** As required by 3.10.2.1, the pump’s overspeed control capability shall be tested. With the pump unit running at the contractor’s recommended speed, priming shall be interrupted by breaking the pump-inlet vacuum, thereby inducing engine speed increase. The engine speed shall be observed for overspeed and shutoff.

4.7.3.2. **Governor Test.** As required by 3.10.2.2, the governor speed range shall be determined as follows.

4.7.3.2.1. **Centrifugal Type Pump.** The pump shall be run at full throttle at the contractor’s recommended maximum engine speed producing the pump unit’s maximum rated pressure. A small flow shall be established and maintained during the test. The throttle shall be reduced while maintaining the established flow until the pump engine speed is reduced to a minimum. The difference in engine speed between full and minimum throttle position shall be the governor speed range.

4.7.3.2.2. **Positive-Displacement Type Pump.** The pump shall be run at full throttle at the contractor’s recommended maximum engine speed flowing water with the discharge fully open. The throttle shall be reduced while maintaining the water flow until the pump engine speed is reduced to a minimum. The difference in engine speed between full and minimum throttle position shall be the governor speed range.

4.7.4. **Pump Testing.**

4.7.4.1. **Suction-Lift Test Condition.** All pump testing shall be conducted at a 5-foot ± 3-inch suction lift. The pump inlet shall be connected to a 24-foot length of suction hose. The suction-hose diameter shall correspond to the nominal diameter of the pump inlet coupling. A suction-hose strainer meeting the requirements of Forest Service Specification 5100-105 shall be used.

4.7.4.2. **Pressure Relief Test.** As required by 3.10.3.1, the pressure relief valve or regulator on positive-displacement pump units shall be tested. With the pressure relief control set in accordance with the contractor’s recommendations, and the pump unit running at rated performance, the pump discharge shall be closed gradually until the bypass through the relief valve reaches full flow. The pump discharge pressure shall be observed.

4.7.4.3. **Preendurance Maximum Performance Test.** As required by 3.10.3.4, the pump unit shall be tested for preendurance maximum performance. The pump shall be run at the maximum speed recommended by the contractor. The pump discharge shall be reduced in 25 psig increments until complete shutoff. Pressure, flow, and speed shall be recorded at each 25 psig increment. From this information, the maximum performance curve shall be plotted on a graph. The maximum performance
curve shall be corrected to standard sea level conditions at 29.92 inches Hg vacuum and 60 °F in accordance with SAE J 1349. See figure 1. The maximum pump power shall be the highest value obtainable by multiplying pressure \( p_1 \) and flow rate \( f_1 \) on the corrected curve.

4.7.4.4. **100 Hour Endurance Performance Test.** As required by 3.10.3.5, the pump shall be tested for 100 hours endurance performance. The endurance testing does not need to be continuous, but each segment of the total 100 hours shall be a minimum of 7 hours of continuous operation. After plotting the corrected curve and determining the maximum pump power, \( p_1 f_1 \), the endurance performance curve shall be plotted by using 85 percent of the corrected curve. For example, multiply the square root of 0.85 with each value of the corrected curve \( p_2 = [ p_1 \times \text{square root of 0.85}] \); \( f_2 = [ f_1 \times \text{square root of 0.85}] \). After plotting the endurance performance curve, draw a straight line between \( t_1 f_1 \) and the zero point on the graph. See figure 1. The intersection of the straight line with the endurance performance curve shall be indicated as the pump-performance rating, \( p_2 f_2 \), on the graph which shall be the pressure and flow rate values used in conducting the 100 hour endurance test.

![Figure 1. Pump-performance curve.](image)

4.7.4.5. **Postendurance Performance Test.** As required by 3.10.3.6, the pump unit shall be tested for postendurance performance. The pump unit shall be run at maximum speed and the pump discharge reduced by 25 psig increments until complete shutoff. The pressure and flow values shall be corrected to standard sea level conditions and plotted on the graph then compared with the preendurance curve.

4.7.4.6 **Tolerances.** Unless otherwise specified, the following tolerances apply: vacuum in inches Hg = +/- 0.10 inch Hg, dimensions in feet = +/- 0.25 feet, density altitude elevation in feet = +/- 1,000 feet.

4.7.5. **Sound Level Test.** As required by 3.10.5, the pump unit shall be tested for sound level.

4.7.5.1 **Test Site.** The test site shall consist of a flat, smooth, outdoor area. The surface shall be covered with grass or turf not higher than 3.0 inches, pavement, bare earth, gravel, or a similar substance. In addition, the surface shall be free of snow, loose dry grass or weeds, ashes, or other substances which might interfere with the accuracy of the test. There shall be no obstructions larger than 5 square feet within 50.0 feet and no obstructions at all within 13.0 feet of the pump unit under test.

4.7.5.2 **Test Instruments.** A sound-level meter meeting the requirements of ANSI Standard S 1.4-1983, Type 1 or 2 shall be used. The A-weighted scale shall be used during the measurements with the sound-level meter set to slow response.
4.7.5.3. **Test Method.** The pump unit shall be operated at $p_2$, $f_2$. Measurements shall be taken at four equally dispersed points around the pump unit with the sound-level meter microphone located at a horizontal distance of 13.0 feet from the pump unit and 5 feet above the ground. The sound-level meter manufacturer’s instructions shall be followed for proper orientation of the microphone. Note: A free-field response microphone is generally pointed towards the sound source, and a pressure-response microphone is generally oriented perpendicular to a line between the sound source and the microphone.

4.7.5.4. **Limit and Report.** The average of the four sound-level measurements shall be reported to the nearest whole decibel.

4.7.6. **Backpack Frame Carrying Straps.** As required by 3.10.4, the straps shall be able to withstand a tensile load of 250 pounds force.

5. **PACKAGING, PACKING, AND MARKING.**

5.1. **Packaging, Packing, and Marking.** The packaging, packing, and marking shall be as specified in the contract or order.

6. **NOTES.**

6.1. **Intended Use.** The lightweight portable pumps described in this specification are designed for use in wildland firefighting operations. They are usually backpacked into high-altitude remote areas. The lightweight portable pumping units consist of a gasoline driven engine, a positive displacement or centrifugal type pump, backpack frame and carrying straps, spark arrester, and a separate 5-gallon fuel tank with fuel line.

6.2. **Acquisition Requirements.** Acquisition documents, such as Invitation For Bids and Request For Proposals should specify the following:

   a. Title, number, and date of this specification.
   b. Designation code of pump required (see 3.10.3.8).
   c. If certificates of conformance are acceptable in lieu of lot by lot testing (see 4.6).
   d. Packaging, packing, and marking (see 5.1).
   e. Date of the invitation for bids or request for proposals (see 2.1).

6.3. **Qualification.** The contracting officer should verify that the bidder possesses a currently valid notice of qualification with associated Qualified Products List (QPL) number obtained in accordance with 4.1. This QPL shall have already been obtained with a date of issue prior to the date of invitation for bids.

6.4. **Notice.** When Government drawings, documents, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs neither responsibility nor any obligation whatsoever.

6.5. **Preparing Activity.** Forest Service, San Dimas Technology and Development Center, 444 East Bonita Avenue, San Dimas, CA 91773-3198.
### Forest Service  
**Standardization Document Improvement Proposal**

**Instructions:** This form is provided to solicit beneficial comments which may improve this document and enhance its use. Contractors, government activities, vendors, or other prospective users of this document are invited to submit comments to the Forest Service, San Dimas Technology and Development Center, 444 East Bonita Avenue, San Dimas, California 91773-3198. Attach any pertinent data which may be of use in improving this document. If there is additional documentation, attach it to the form and place both in an envelope addressed to the preparing activity. A response will be provided when a name and address are included.

**Note:** This form shall not be used to submit request for waivers, deviation, or for clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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**Submitted by:** (Print or type name and address - Optional)  
**Telephone number:** (Optional)  
**Date:**
Forest Service
San Dimas Technology & Development Center
Attn: Water Handling Project Leader
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