

PHILIPPINE NATIONAL STANDARD

PNS/PAES 153:2010
(PAES published 2010)
ICS 65.060.01

Agricultural machinery – Hand Pump – Specifications



BUREAU OF PRODUCT STANDARDS

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National Foreword

This Philippine Agricultural Engineering Standards PAES 153:2010, Agricultural machinery – Hand Pump – Specifications was approved for adoption as Philippine National Standard by the Bureau of Product Standards upon the recommendation of the Agricultural Machinery Testing and Evaluation Center (AMTEC) and the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development of the Department of Science and Technology (PCARRD-DOST).

Foreword

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled “Development of Standards for Agricultural Production and Postharvest Machinery” funded by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development - Department of Science and Technology (PCARRD - DOST).

This standard has been technically prepared in accordance with BPS Directives Part 3:2003 – Rules for the Structure and Drafting of International Standards.

The word “shall” is used to indicate mandatory requirements to conform to the standard.

The word “should” is used to indicate that among several possibilities one is recommended as particularly suitable without mentioning or excluding others.

In the preparation of this standard, the following documents/publications were considered:

Gray, W.B. and C.B. Ball. 1916. A working manual of American plumbing practice. American Technical Society.

Keene, E.S. 1918. Mechanics of the household. McGraw-Hill Book Company, Inc.

Nasir, A., S.O. Ubokwe and A. Isah. 2004. Development of a manually operated hand pump for rural water supply. AU J.T. 7(4):187-192.

Regional Network for Agricultural Machinery. 1983. Test codes and procedures for farm machinery. Economic and Social Commission for Asia and the Pacific.

United States Patent 6694862B1

http://www.ajayindustrial.com/handp_force&lift.htm

<http://www.waterencyclopedia.com/Po-Re/Pumps-Traditional.html>

<http://www.cee.vt.edu/ewr/environmental/teach/wtprimer/pumps/pumps.html>

<http://www.steelforge.com/alloysteels.htm>

<http://www.survivalunlimited.com/waterpumps/ohandpumps.htm>

<http://www.cee.vt.edu/ewr/environmental/teach/wtprimer/pumps/pumps.html>

Agricultural Machinery – Hand Pump – Specifications

1 Scope

This standard specifies the manufacturing and performance requirements for a hand pump.

2 References

The following normative documents contain provisions, which, through the reference in this text, constitute provisions of this National Standard:

PAES 102: 2000 Agricultural Machinery – Operator’s Manual – Content and Presentation

PAES 154:2010 Agricultural Machinery – Hand Pump – Methods of Test

3 Definitions

For the purpose of this standard, the following definitions shall apply:

3.1**check valve**

valve inside the cylinder that holds the column of water in the draw pipe while the plunger is being pushed down after each up-stroke

3.2**discharge valve**

valve attached to the discharge side (for lift type hand pump) or to the body of the cylinder (for force type hand pump) to allow one direction of flow of water only

3.3**hand pump**

water pump powered by the movement of human arms

3.4**handle**

lever that connects the pump rod to the pump head which often includes some mechanism to add counterweight to balance the weight of the water being lifted up the draw pipe

3.5

outlet

spout assembly of pump where water comes out

3.6

plunger

piston

part of the cylinder that is connected to the pump rod and which forces water up the draw pipe

3.7

pump head

pump assembly attached to the stand which contains the handle outlet assembly

3.8

pump rod

plunger rod

steel rod that connects the pump handle to the plunger assembly within the cylinder

3.9

pump stand

pedestal

base that attaches the hand pump to the ground and connects to the draw pipe

3.10

stroke

maximum distance that the plunger moves when the handle is moved

3.11

suction inlet

inlet to which the suction pipe is connected

3.12

suction pipe

pipe connecting the pump cylinder to the pump body where water moves up and out to the pump spout during pumping

4 Classification

The hand pump shall be classified according to the following:

4.1.1 Lift type

Type of hand pump intended for use in lifting water from low-head cisterns and wells, the depth of which is not beyond the head furnished by atmospheric pressure (Fig. 1).

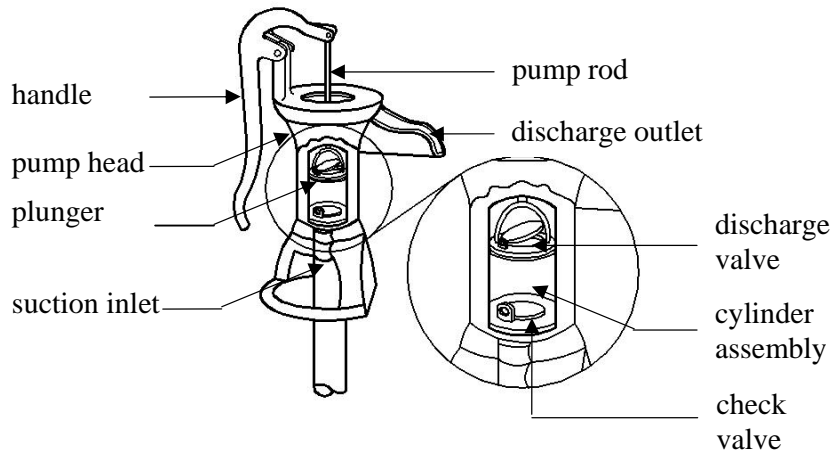


Figure 1. Lift type hand pump

4.1.2 Force type

Type of hand pump that performs the work of a lift pump and in addition forces the water from the outlet at a pressure to suit any domestic application (Fig. 2).

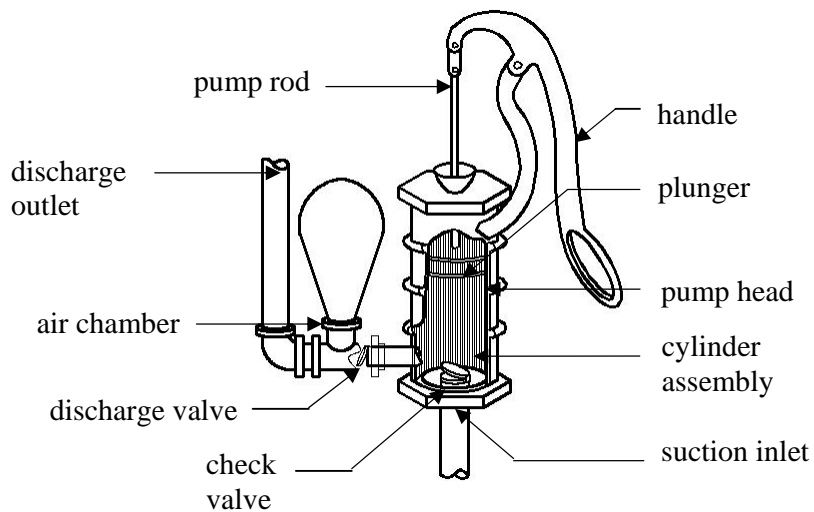


Figure 2. Force type hand pump

4.1.2.1 Single acting

Type of force type hand pump that discharges water only on the forward stroke of the piston or plunger and draw in water into the cylinder during the back stroke.

4.1.2.2 Double acting

Type of force type hand pump that discharges water on both forward and back strokes.

5 Principle of Operation

5.1 Lift type

- 5.1.1** Water shall be lifted by the action of the plunger.
- 5.1.2** By pressing the handle downwards, the valve shall be raised inside the cylinder.
- 5.1.3** The pressure inside the cylinder shall be reduced as the plunger assembly is raised. This shall allow water in the suction pipe to rise correspondingly.
- 5.1.4** After repeated strokes, water shall then reach the cylinder entering the check valve connected to the suction inlet.
- 5.1.5** The check valve shall open during downward stroke, and shall close during upward stroke.
- 5.1.6** The space between the check valve and the plunger shall be filled with water.
- 5.1.7** Succeeding strokes of the cylinder shall then push the water between the plunger and the check valve into the discharge valve connected to the plunger. During the next upward stroke, water shall be lifted to the spout.

5.2 Force type

- 5.2.1** Almost the same principle shall apply as that of the lift type.
- 5.2.2** As the cylinder is filled with water, the downward stroke of the plunger shall push the water through the discharge valve connected to the cylinder's body.
- 5.2.3** Water shall pass through the discharge outlet. Some of the water shall enter an air chamber which is also connected to the discharge outlet.
- 5.2.4** The water shall compress the air inside the chamber and shall create a pressure to force the water out.

6 Manufacturing Requirements

The hand pump shall consist of a pump head, handle, plunger, cylinder assembly, suction inlet and outlet.

- 6.1** The pump head and handle shall be made of cast iron or better material.

- 6.2 The cylinder assembly shall be made of cast iron or better material and shall have an inside diameter of at least 76 mm.
- 6.3 The check valve shall be made of cast iron or better material with a diameter of at least 32 mm. It shall have sieves to filter possible contaminants.
- 6.4 The plunger shall be made of cast iron or better material. It shall be surrounded with a gasket to keep it tight.
- 6.5 Gaskets shall be made of non-corrosive material (e.g. rubber).
- 6.6 Pump rods shall be made of cast iron or better material.
- 6.7 There shall be a provision for securing the handle to the pump head (e.g. cotter pin or lock nut).

6.8 Lift type

- 6.8.1 The discharge valve in the plunger assembly shall be made of cast iron or better material. It shall have a diameter of at least 32 mm.
- 6.8.2 The discharge outlet shall be made of cast iron or better material.

6.9 Force type

- 6.9.1 The discharge valve connected to the cylinder shall be made of cast iron or better material. It shall have a diameter of at least 32 mm.
- 6.9.2 Air chamber shall be made of cast iron or better material with at least 6 mm thickness. It shall be air-tight and water-tight.

7 Performance Requirements

- 7.1 Check valves shall be water-tight.
- 7.2 Lift type hand pump shall lift the water from cistern or well to at least 6 m.
- 7.3 Force type hand pump shall lift the water up to a height of 15 m from ground level.

8 Safety, Workmanship and Finish

- 8.1 The hand pump shall have a rust-free finish.
- 8.2 The hand pump shall be free from sharp edges.

9 Warranty of Construction

- 9.1** The hand pump's construction shall be rigid and durable without breakdown of its major components within one (1) year from the date of original purchase.
- 9.2** Warranty shall be provided for parts and services within one (1) year after installation and acceptance by the consumer.

10 Maintenance and Operation

An operator's manual which conforms to PAES 102 shall be provided.

11 Testing

Testing of the hand pump shall be conducted on-site. It shall be tested for performance in accordance with PAES 154.

12 Marking and Labeling

- 12.1** The hand pump shall be marked in English with the following information using a plate, stencil or by directly punching it at the most conspicuous place:
 - 12.1.1** Brand name or Registered trademark of the manufacturer
 - 12.1.2** Model and/or Serial number
 - 12.1.3** Country of manufacture (if imported)/"Made in the Philippines" (if manufactured in the Philippines)

Philippine Agricultural Engineering Standards

AMTEC-UPLB – PCARRD Project: “Development of Standards for Agricultural Production and Postharvest Machinery”

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