PHILIPPINE NATIONAL STANDARD

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ICS 65.060.01

Agricultural machinery – Granule Applicator – Specifications

BUREAU OF PRODUCT STANDARDS

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National Foreword

This Philippine Agricultural Engineering Standards PAES 165:2011, Agricultural machinery – Granule Applicator – 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:

ASAE S207.10 Operating requirement for tractors and power take-off driven implements

ASAE EP371 Preparing granular applicator calibration procedures

PAES 145:2005 Agricultural Machinery – Granular Fertilizer Applicator – Specifications

PAES 146:2005 Agricultural Machinery – Granular Fertilizer Applicator – Methods of Test

United States Patent US6810822. Agricultural and Gardening Fertilizer Applicator.

United States Patent US5860604. Motorized Fertilizer Spreader.

United States Patent US6610147. Shingle Granule Valve And Method Of Depositing Granules Onto A Moving Substrate.

1 Scope

This standard specifies the manufacturing and performance requirements for a granule applicator.

2 References

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

AWS D1.1:2000 Structural Welding Code - Steel

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

PAES 118: 2001 Agricultural Machinery – Four-Wheel Tractor – Specifications

PAES 311:2001 Engineering Materials – Bolts and Nuts for Agricultural Machines – Specifications and Applications

PAES 166: 2011 Agricultural Machinery – Granule Applicator – Methods of Test

3 Definitions

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

3.1
agitator
part of the granule applicator that puts the granule in motion through continuous stirring or rotation (Fig.1)

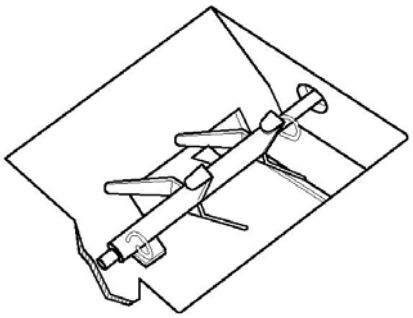

Figure 1. Agitator

3.2
granule
generic term used for a small particle having a diameter ranging from 2 to 4 mm

3.3
granule applicator
agricultural tool used to apply granular fertilizers or pesticides to the field

3.4
hopper
part of granule applicator where granules are loaded

3.5
orifice
opening in the hopper or tank through which the granules pass through

3.6
power take-off shaft
external shaft on the rear of a tractor that provides rotational power to implements

3.7
spinner plate
part of the granule applicator that spreads the granules (Fig.2)

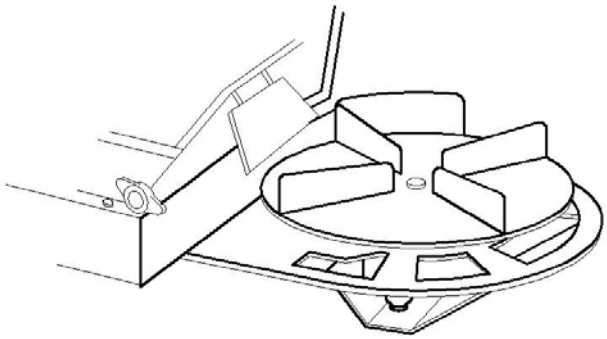

Figure 2. Spinner plate

4 Classification

4.1 Handheld granule applicator

Type of granule applicator designed for handheld operation. It makes use of screw or spinner plate operated manually to facilitate metering of granules (Fig.3).

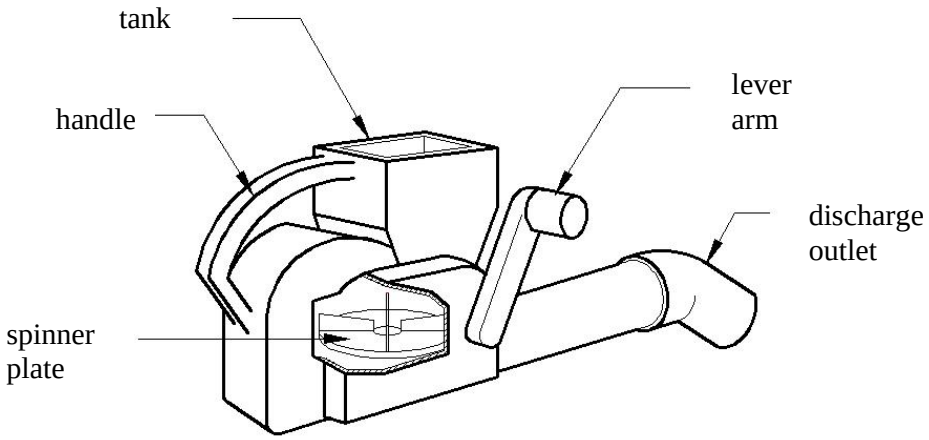

Figure 3. Handheld granule applicator

4.2 Knapsack granule applicator

Type of granule applicator designed to be carried on back during application

4.2.1 Gravity knapsack

Type of knapsack granule applicator that makes use of gravitational force to apply granules (Fig.4).

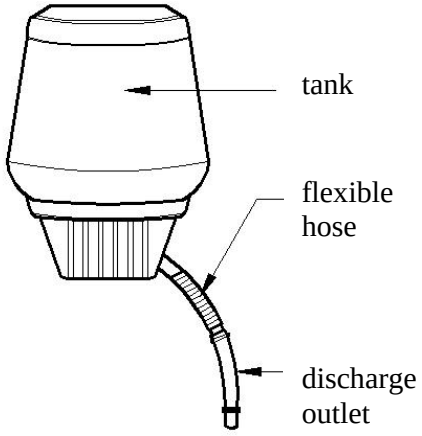

Figure 4. Gravity knapsack

4.2.2 Powered knapsack

Type of knapsack granule applicator which makes use of an engine or an electric motor attached to a fan blower to facilitate its operation (Fig.5).

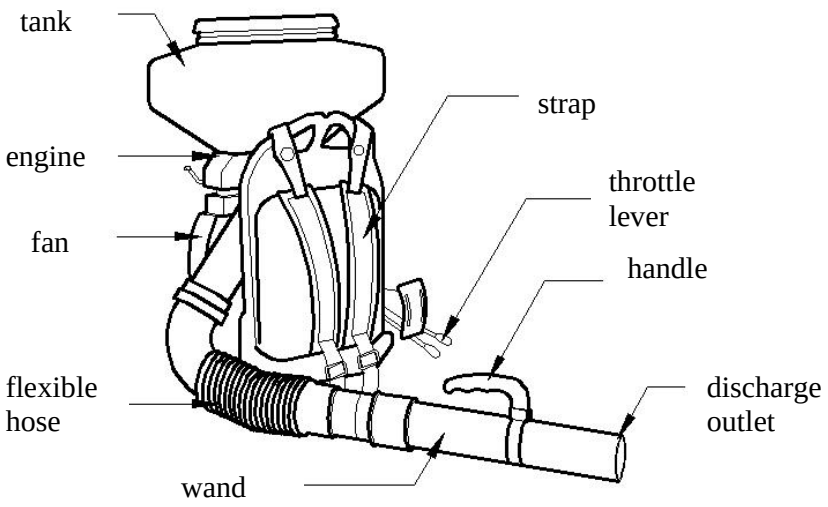

Figure 5. Powered knapsack

4.3 Walk-behind granule applicator

Type of granule applicator that makes use of the ground wheels to facilitate movement of the unit during operation.

4.3.1 Mechanical walk-behind type

Type of walk-behind granule applicator that makes use of ground wheels to actuate the screw or spinner plate for application of granules (Fig.6).

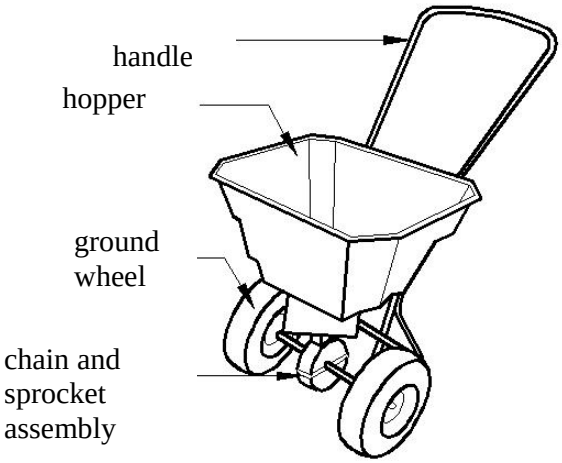

Figure 6. Mechanical walk-behind type granule applicator

4.3.2 Powered walk-behind type

Type of walk-behind granule applicator that uses engine to actuate the agitator and screw or spinner plate for application of granules (Fig.7).

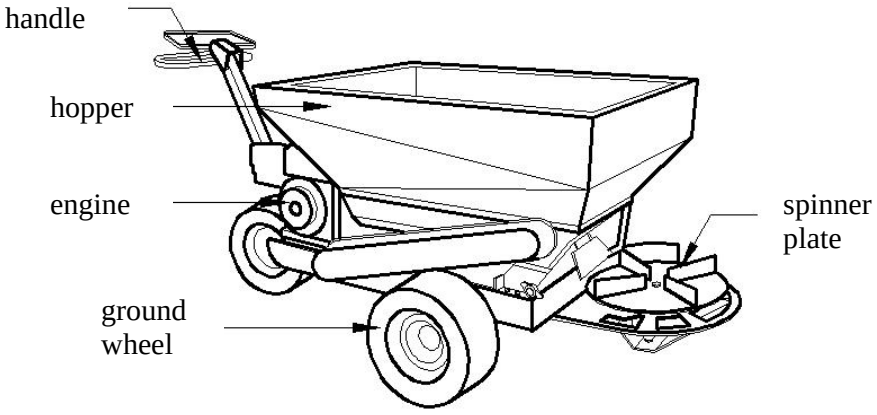

Figure 7. Powered walk-behind type

4.4 Mounted granule applicator

Type of granule applicator mounted on a tractor or vehicle

4.4.1 Three-point hitch type granule applicator

Type of granule applicator that uses a spinner plate or a screw attached to the power take-off shaft to actuate metering of granules (Fig.8)

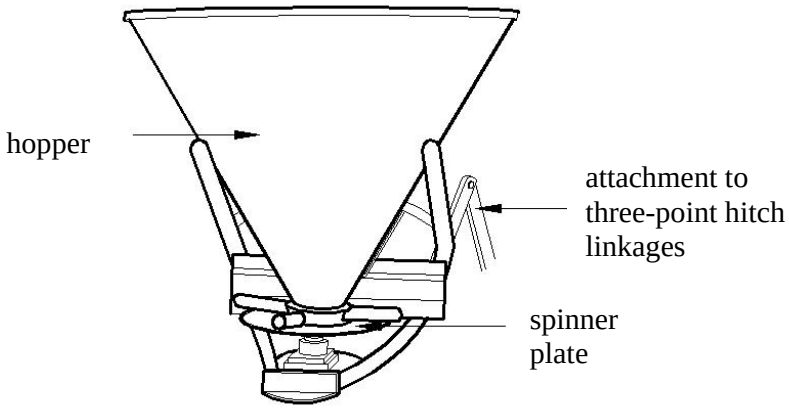

Figure 8. Three point hitch type granule applicator

4.4.2 Trailing granule applicator

Type of granule applicator that uses wheel rotational motion to actuate application of granules. The granules are metered by a spinner plate or a screw attached to the ground wheel (Fig.9).

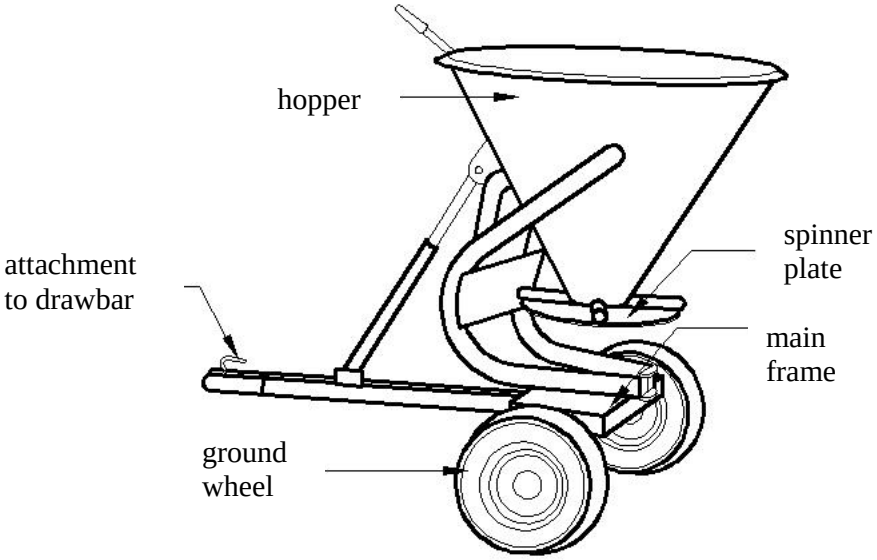

Figure 9. Trailing granule applicator

5 Principle of Operation

5.1 Handheld granule applicator

The tank shall be initially filled with granule material. The lever arm shall be rotated to agitate the granules in the tank and to actuate the spinner plate. With the operator walking backwards, the discharge outlet shall be swayed from side to side to apply the granules.

5.2 Knapsack granule applicator

The tank shall be initially filled with granule material with the equipment in its naturally upright position. The desired application rate shall be set prior to the operation by adjusting the orifice. With the operator walking backwards, the discharge outlet shall be swayed from side to side to apply the granules.

5.2.1 Gravity knapsack

The granules shall be allowed to flow through the flexible hose attached to the base of the tank by gravity. The orifice shall be adjusted to vary application rate of the equipment. The discharge outlet shall be lowered to near vertical position to direct the flow of the granules. At the end of each row, the hose and the discharge outlet shall be raised to stop the flow of the granules.

5.2.2 Powered knapsack

The granules shall be allowed to flow through the hose of the equipment where air is blown. The application rate shall be calibrated through the adjustment knob at the wand of the applicator.

5.3 Walk-behind granule applicator

5.3.1 Mechanical walk-behind type

The granule applicator shall be initially filled with the granules. When the applicator is moved forward, the agitator in the hopper shall be rotated. Consequently, the granules shall sink to the opening of the hopper. The granules shall be spread by the screw or spinner plate which is actuated by the rotation of the ground wheels.

5.3.2 Powered walk-behind type

The same principle applies as that of the mechanical walk-behind type, but the rotation of the agitator and the spinner plate or screw shall be actuated by an engine instead of the ground wheels.

5.4 Mounted type

The granule applicator shall be mounted to the vehicle or tractor through the three-point hitch linkages or the drawbar.

5.4.1 Three-point hitch type granule applicator

The metering device of the granule applicator shall be attached to the PTO shaft of the tractor. The rotation of the PTO shaft shall actuate the screw type or the spinner plate of the applicator. Granules shall be applied at the pre-set rate of the applicator

5.4.2 Trailing granule applicator

The same principle applies as that of the walk-behind type where the screw or the spinner plate shall be actuated by the rotation of the ground wheels.

6 Manufacturing Requirements

All specifications indicated below are minimum requirements.

6.1 Handheld type

6.1.1 The tank applicator shall be made resistant polyvinylchloride or better material.

6.1.2 The lever arm shall be made of mild steel (e.g. AISI 1020) or better material with a thickness of at least 6 mm (1/4”).

6.1.3 Discharge outlet shall be made of mild steel (e.g. AISI 1020) or better material with a thickness of at least 6 mm (1/4”).

6.2 Knapsack type

6.2.1 The knapsack type granule applicator shall adapt to the operator’s body, distributing weight evenly, presenting operating controls in a reasonable location and configuration, in such a way that the operator is not exhausted after sustained usage.

6.2.2 It shall have a net weight of not more than 15 kg.

6.2.3 The wand shall be made of corrosion resistant polyvinylchloride or better material. It shall have a length of at least 0.3 m (12”).

6.2.4 An adjustment knob shall be attached to the wand.

6.2.5 The tank shall be made of resistant polyvinylchloride or better material.

6.2.6 The tank cover and the gasket shall be made of chemical resistant polyvinylchloride or better material.

6.2.7 A flexible hose shall be used to attach the discharge outlet to the tank. It shall be made of chemical resistant polyvinylchloride or better material.

6.2.8 Hose clamps shall be made of corrosion resistant material.

6.2.9 The load bearing part of the strap shall be at least 50 mm (2”) wide. A load bearing waist strap is desirable.

6.2.10 The strap shall be made of durable and non-absorbent material (e.g. nylon fabric) with at least 1.5 mm thickness and 35 mm width.

6.2.11 Strap pads shall be provided for operator’s comfort. It shall have a thickness of at least 10 mm (3/8”) and a width of at least 65 mm (2 ½”).

6.2.12 There shall be provision for adjustment of the strap.

6.2.13 A quick release mechanism shall be provided for emergency purposes.

6.2.14 The discharge outlet shall be made of corrosion resistant material.

6.2.15 The cut-off valve shall be installed on the handle of the powered type for instant stopping of the blower.

6.2.16 The fuel tank for powered type shall be made of polyethylene or better material. It shall have provision for filtration of foreign materials.

6.2.17 The lever arm of the mechanical type shall be made of mild steel (e.g. AISI 1020) or better material. The handle shall be covered with non-slip and corrosion resistant material (e.g. rubber).

6.2.18 Screw or spinner plate shall be made of mild steel (e.g. AISI 1020) or better material with a thickness of at least 6 mm (1/4”).

6.3 Walk-behind type

6.3.1 The chassis assembly shall be made of mild steel (e.g. AISI 1020) or better material. It shall be constructed from 51 mm x 51 mm (2”x 2”) angular bar with at least 6 mm (1/4”) thickness.

6.3.2 The hopper shall be made of mild steel (e.g. AISI 1020) or better material. It shall have a thickness of at least 6 mm (1/4”).

6.3.3 The screw or spinner plate shall be made of mild steel (e.g. AISI 1020) or better material.

6.3.4 The agitator shall be made of mild steel (e.g. AISI 1020) or better material with a thickness of at least 6 mm (1/4”).

6.3.5 The handle shall be made of galvanized steel or better material. It shall have a diameter of at least 13 mm (1/2”). It shall be covered with a non-slip and corrosion resistant material (e.g. rubber).

6.4 Mounted type

6.4.1 The chassis assembly shall be made of mild steel (e.g. AISI 1020) or better material. It shall be constructed from 76 mm x 102 mm (3”x 4”) square tube or channel bar or 76 mm (3”) angular bar with at least 6 mm (1/4”) thickness. It shall have a provision for attachment to the tractor as specified in PAES 118:2001.

6.4.2 The hopper shall be made of metal plate (e.g. AISI 1020) or better material. It shall have a thickness of at least 3 mm (1/8”).

6.5 The tractor engagement assembly shall be bolted on the chassis assembly. It shall be made of mild steel (e.g. AISI 1020) or better material with a thickness of at least 6 mm (1/4”).

6.5.1 The screw or spinner plate shall be made of mild steel (e.g. AISI 1020) or better material with a thickness of at least 6 mm (1/4”).

6.5.2 All welded parts shall be in accordance with the criteria set in AWS D1.1:2000.

6.5.2.1 There shall be no crack on welded area.

6.5.2.2 There shall be fusion between adjacent layers of weld metal and base metal.

6.5.2.3 Welded joints shall not be less than 4 mm size fillet weld.

6.5.2.4 Undercut shall not exceed 2 mm for any length of weld.

7 Performance Requirements

7.1 There shall be at least 80% field efficiency.

7.2 The granule applicator shall be easy to mount and dismount from the tractor linkages.

7.3 The granule applicator shall not produce noise higher than 92 db(A) measured one meter away from the source of noise[1].

8 Safety, Workmanship and Finish

8.1 The granule applicator shall be painted and shall have a rust-free finish.

8.2 The granule applicator shall be free from manufacturing defects.

8.3 All bolts shall conform with PAES 311:2001 for strength application and shall be made of hot-galvanized steel for corrosion resistance.

9 Warranty of Construction

9.1 The granule applicator'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 prime mover, 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 102:2000 shall be provided.

11 Testing

Testing of the granule applicator shall be conducted on-site. The granule applicator shall be tested for performance in accordance with PAES 166:2011.

[1] Permissible noise exposures as required by the Occupational Safety and Health Act (OSHA), Federal Register. Vol 37.No.202. Oct.18, 1972.

12 Marking and Labeling

12.1 The granule applicator shall be marked in English with the following information:

12.1.1 Brand name or Registered trademark of the manufacturer (optional)

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)

12.2 Safety/precautionary markings shall be provided. Markings shall be stated in English and shall be printed in red color with a white background.

12.3 The markings shall have a durable bond with the base surface material and shall be water and heat resistant under normal cleaning procedures, it shall not fade, discolor, crack or blister and shall remain legible.

12.4 Reflectors shall be attached at the rear of the mounted granule applicator for safety during transport.

Philippine Agricultural Engineering Standards

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

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