PHILIPPINE NATIONAL STANDARD

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Agricultural machinery – Spring-tooth Harrow – Specifications

BUREAU OF PRODUCT STANDARDS

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National Foreword

This Philippine Agricultural Engineering Standards PAES 163:2011, Agricultural machinery – Spring-tooth Harrow – 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:

ABT 49 Field Equipment Operation

ASAE D497.4 – Agricultural Machinery Management Data

ASAE S414.1 – Terminology and Definitions for Agricultural Tillage Implements

http://www.sare.org/publications/steel/glossary.htm

http://www.indiamart.com/gs-auto/agricultural-implements.html

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

http://www.efunda.com/materials/alloys/alloy_steels/show_alloy.cfm?ID=AISI_5160&show_prop=all&Page_Title=AISI%205160

Agricultural Machinery – Spring-tooth Harrow – Specifications

1 Scope

This standard specifies the manufacturing and performance requirements for a spring-tooth harrow.

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 106:2000 Agricultural Machinery – Soil Tillage and Equipment – Terminology

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

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

PAES 164:2011 Agricultural Machinery – Spring-tooth Harrow – Methods of Test

3 Definitions

For the purpose of this standard, the definitions given in PAES 106:2000 and the following definitions shall apply:

3.1
field efficiency
ratio between the productivity of a machine under field conditions and the theoretical maximum productivity

3.2
harrowing
operation which breaks the clods, levels and makes the soil ready for planting

3.3
lever assembly
mechanism that adjusts the tooth depth to fit the soil condition

3.4
main frame
part of the spring-tooth harrow that holds the transverse toolbars and lever assembly together

3.5
runner
auxiliary part of spring-tooth harrow attached at the bottom of the main frame to facilitate easy turning

3.6
secondary tillage implement
implement used for tilling the soil to a shallower depth than primary tillage implements, provide additional pulverization, mix pesticides and fertilizers into the soil, level and firm the soil, close air pockets, and eradicate weeds

3.7
spring-tooth harrow
secondary tillage implement consisting of long and curved teeth made of spring steel which are fastened on the transverse toolbars with the other end pointed to give good soil penetration

3.8
tooth
tine
part of the spring-tooth harrow that engages with the soil during operation (Fig.1)

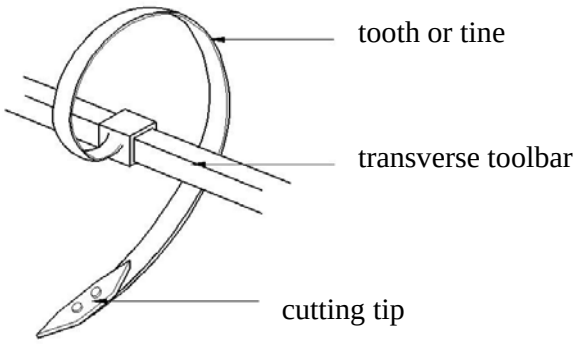

Figure 1a. Tooth with replaceable cutting tip

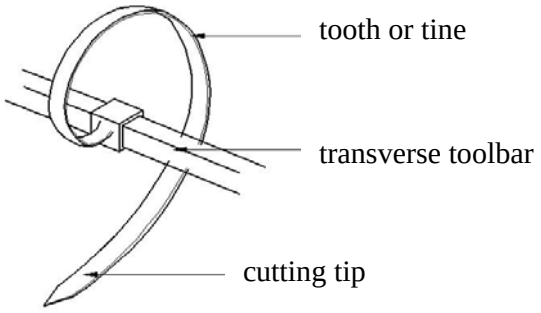

Figure 1b. Tooth with permanent cutting tip

3.9
transverse tool bar
part of the main frame to which shank assemblies are attached

4 Classification

4.1 Trailing spring-tooth harrow
Type of spring-tooth harrow wherein main frame is towed behind the tractor (Fig.2).

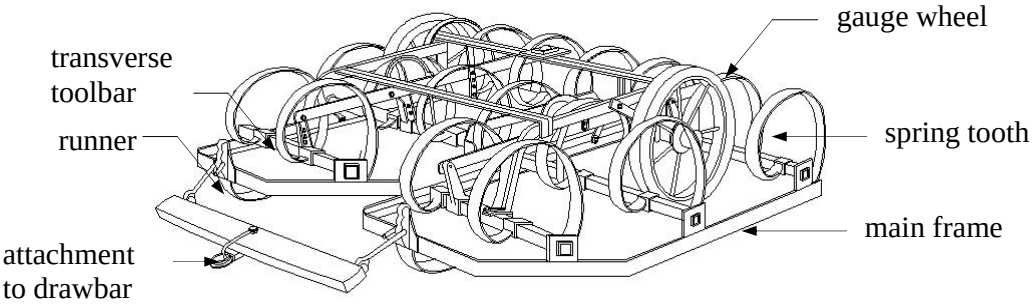

Figure 2. Trailing spring-tooth harrow

4.2 Three-point hitch-mounted spring-tooth harrow
Type of spring-tooth harrow wherein main frame is mounted to the rear of the tractor using the three-point hitch linkages (Fig.3).

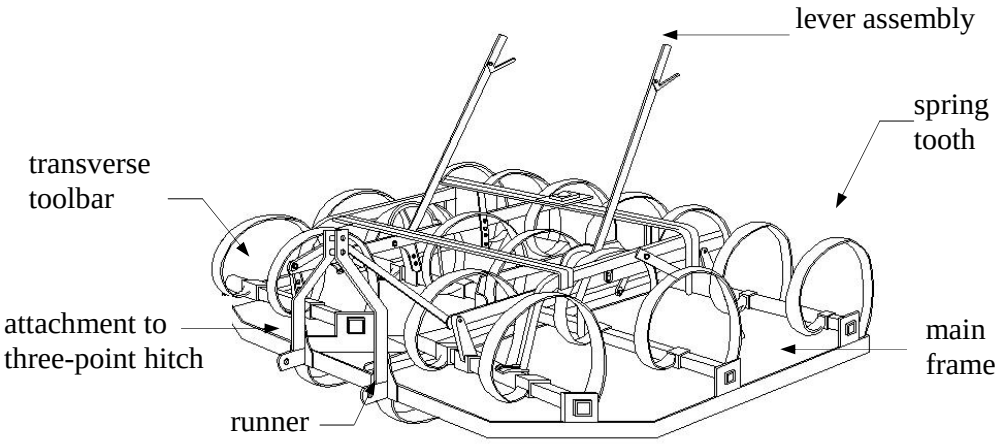

Figure 3. Three-point hitch-mounted spring-tooth harrow

5 Principle of Operation

The spring-tooth harrow shall be mounted on the tractor. After being transported to the field, the implement shall be lowered on the soil. The desired operating depth shall be set by adjusting the lever or the gauge wheels. Adjusting the lever to vertical position shall provide maximum harrowing depth. For light harrowing, lever shall be set at a slanting position. Trailing spring-tooth harrow shall be towed by the tractor to cut through the soil. For three-point hitch mounted type, the spring-tooth shall be lowered to engage with the soil. As the spring-tooth harrow passes through the strip of soil, the soil shall be pulverized.

6 Manufacturing Requirements

Generally, the spring-tooth harrow shall consist of main frame, transverse tool bars, runners, lever assembly and spring-tooth assembly. All specifications indicated below are minimum requirements.

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

6.2 Transverse tool bars shall be made of mild steel (e.g. AISI 1020). It shall be constructed from 76 mm x 102 mm (3” x 4”) square tube or channel bar or from a 76 mm (3”) angle bar with at least 6 mm (1/4”) thickness.

6.3 The spring-tooth assembly shall consist of spring-tooth and spring-tooth clamp.

6.3.1 Spring-teeth and cutting tips shall be made of alloy steel (e.g. AISI 5160) with at least 5 mm (3/16”) thickness and with a width of at least 51 mm (2”).

6.3.2 Spring-teeth shall be spaced 115 mm to 127 mm (4.5” to 5”) in a staggered pattern. It shall be attached to the frame by bolt or shall be fully welded. The teeth shall be secured by spring-tooth clamps.

6.3.3 The spring-tooth clamps shall be made of alloy steel (e.g. AISI 5160) or better material.

6.4 Gauge wheels should have an adjustable axle to allow modification of operating depth.

6.5 Lever assembly shall be made of mild steel (e.g. AISI 1020) or better material.

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

6.6.1 There shall be no crack on welded area.

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

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

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

7 Performance Requirements

7.1 The spring-tooth harrow shall have an operating depth of 50 to 150 mm (2” to 6”).

7.2 There shall be a uniform depth of cut on the soil.

7.3 There shall be at least 80% field efficiency.

7.4 The spring-tooth assembly shall be intact after the test.

7.5 During operation, the spring-tooth harrow shall not be detached from the tractor.

7.6 The spring-tooth harrow shall be able to pass through obstructions in the soil.

7.7 The spring-tooth harrow shall be easy to mount and dismount from the tractor linkages.

8 Safety, Workmanship and Finish

8.1 The spring-tooth harrow shall be painted and shall have a rust-free finish.

8.2 The spring-tooth harrow shall be free from manufacturing defects that maybe unsafe.

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 Manufacturing and Durability

9.1 The spring-tooth harrow’s construction shall be rigid and durable without breakdown of its major components excluding the teeth 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

10.1 An operator's manual which conforms to PAES 102:2000, shall be provided.

10.2 Tools for adjustment of spring-tooth assembly shall be provided.

11 Testing

Testing of the spring-tooth harrow shall be conducted on-site. The spring-tooth harrow shall be tested for performance in accordance with PAES 164:2011.

12 Marking and Labeling

12.1 The spring-tooth harrow 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 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 spring-tooth harrow 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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DEPARTMENT OF TRADE & INDUSTRY PHILIPPINES

BUREAU OF PRODUCT STANDARDS

3F Trade and Industry Building
361 Sen. Gil J. Puyat Avenue, Makati City 1200, Metro Manila, Philippines
T/ (632) 751.3125 / 751.3123 / 751.4735
F/ (632) 751.4706 / 751.4731
E-mail : bps@dti.gov.ph
www.dti.gov.ph