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ICS 65.060.01

Agricultural machinery – Subsoiler – Specifications

BUREAU OF PRODUCT STANDARDS

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National Foreword

This Philippine Agricultural Engineering Standards PAES 149:2010, Agricultural machinery – Subsoiler – 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

Andrus, C.W. 1982. Tilling compacted forest soils following ground-based logging in Oregon. Oregon State University.

American Society of Agricultural Engineers S414.1 – Terminology and Definitions for Agricultural Tillage Implements

Froelich, H.A. and D.W.R. Miles. 1984. Winged subsoiler tills compacted forest soil. Miller Freeman Publications.

Philippine Agricultural Engineering Standard 106:2000 – Agricultural Machinery – Soil Tillage and Equipment – Terminology

Temesgen,W., J. Hoogmoed, H.Rockstrom and H.G. Savenije. Conservation agriculture implements for smallholder farmers in semi-arid Ethiopia.

United States Patent 3578090

United States Patent 5695012

http://zj.shuidao.cn/IRRI/landPrep/Landprep_lesson04.htm

http://www.krukowiak.com.pl/en/maszyny/glebosz.html

http://www.bwimp.com/products_item_chise_3point_2bar_Subsoiler.php

Agricultural Machinery – Subsoiler – Specifications

1 Scope

This standard specifies the manufacturing and performance requirements for a subsoiler.

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 150:2010 Agricultural Machinery – Subsoiler – Methods of Test

3 Definitions

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

3.1
gauge wheel
auxiliary component of the subsoiler that helps maintain uniform operating depth and for adjusting depth of cut

3.2
main frame
part of the subsoiler that holds the transverse toolbars together (Fig. 1)

3.3
primary tillage
tillage which constitutes the initial major soil-working operation, normally designed to reduce soil strength, cover plant materials, and rearrange aggregates

3.4
ripper point
tool attached to the shank of the subsoiler to cut through the soil (Fig. 1)

3.5
shank
structural member primarily used for attaching a tillage tool to a beam (Fig. 1)

3.6
soil abrasion
scratching, cutting, or abrasing of materials caused by the action of soil

3.7
subsoiler
implement for intermittent tillage at depths sufficient to shatter compacted subsurface layers, equipped with widely spaced shanks either in-line or staggered on a V-shaped frame (Fig. 1)

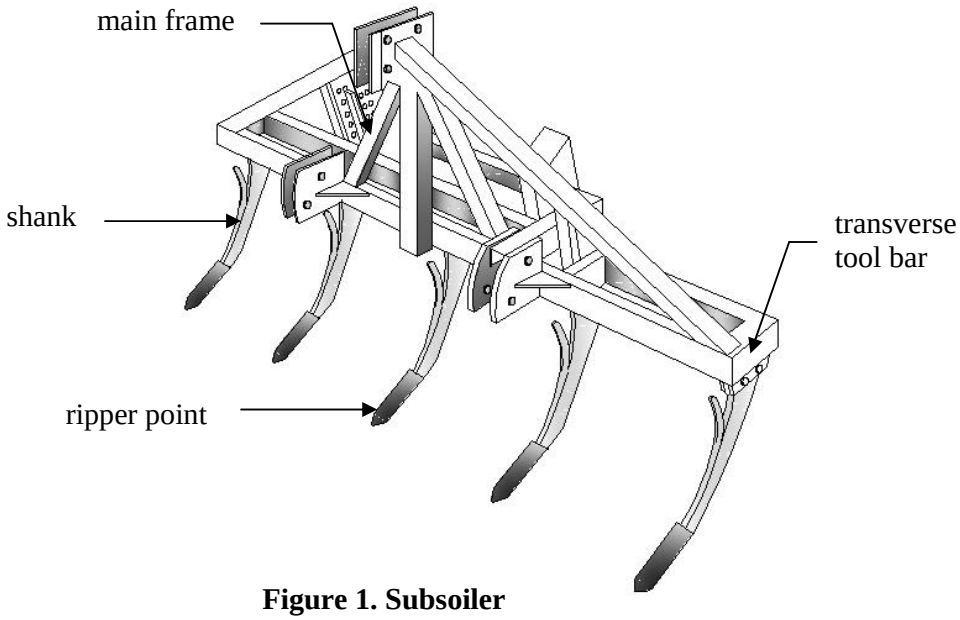

Figure 1. Subsoiler

3.8
subsoiling
deep tillage with at least 350 mm depth for the purpose of loosening soil for root growth and/or water movement

3.9
transverse tool bar
part of the main frame to which shank assemblies are attached (Fig. 1)

3.10
wear shin
metal plate attached to the shank to reduce abrasion and enhance durability of the shank (Fig. 5)

4 Classification

4.1 According to type of mounting

4.1.1 Drawn type subsoiler

Type of subsoiler wherein main frame is mounted far behind the tractor. Guide wheels are necessary for transport (Fig. 2)

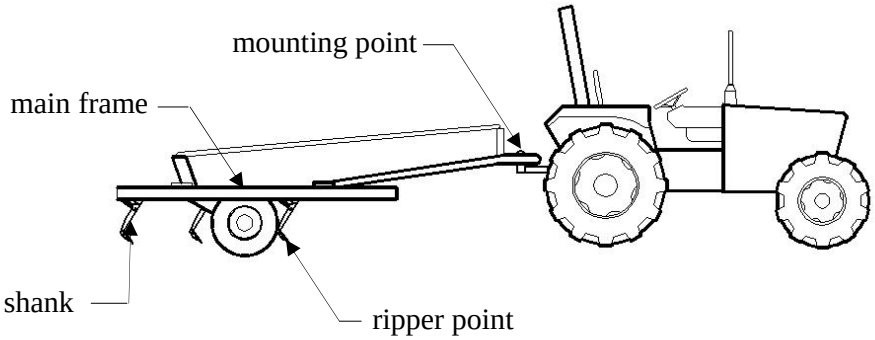

Figure 2. Drawn type subsoiler

4.1.2 Three-point hitch mounted

Type of subsoiler wherein main frame is mounted to the rear of the tractor using the 3-point hitch linkages (Fig. 3)

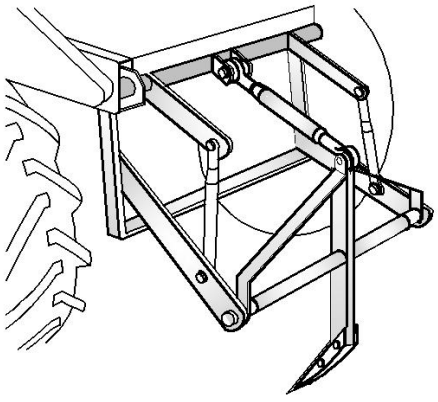

Figure 3. Three-point hitch mounted type subsoiler

4.2 According to type of shank

4.2.1 Straight shank

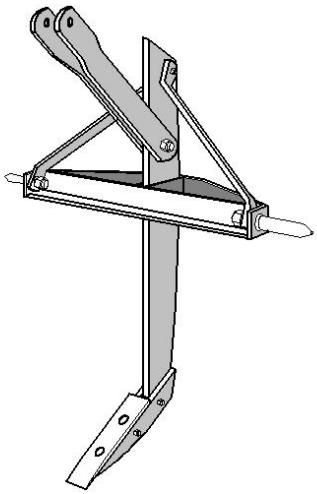

Figure 4. Straight shank subsoiler

4.2.2 Curved or parabolic shank

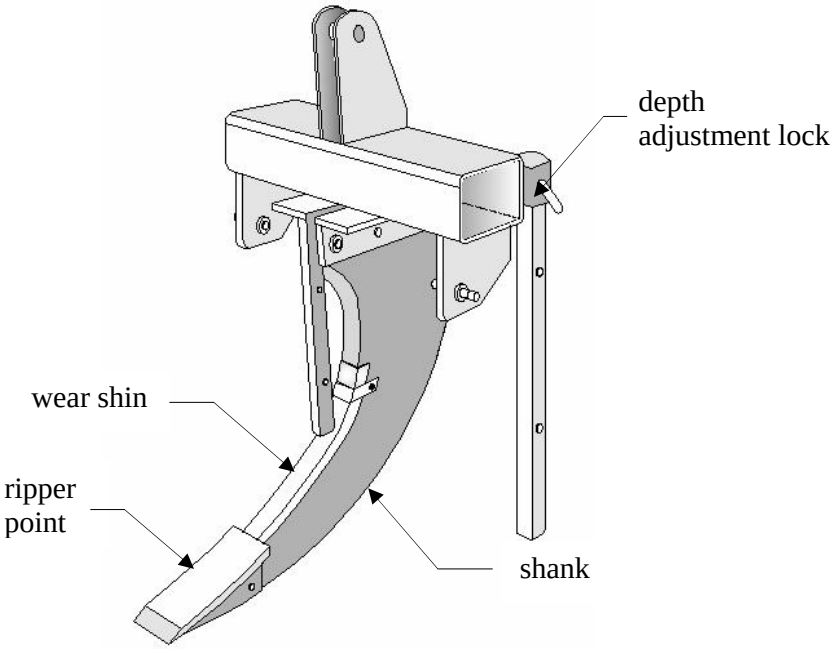

Figure 5. Curved shank subsoiler

5 Principle of Operation

The subsoiler shall be attached 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 gauge wheels or through the action of hydraulic cylinders. The subsoiler shall be pulled by the tractor to cut through the soil.

6 Manufacturing Requirements

Generally, the subsoiler shall consist of main frame, transverse tool bars and shank assembly.

6.1 The main frame shall be made of mild steel (e.g. AISI 1020). These shall be constructed from 152 mm x 254 mm (6" x 10") square tube or channel with at least 6 mm thickness. It shall have a provision for attaching to the tractor as specified in PAES 118. Frame sections shall be folded to facilitate ease of transport.

6.2 The transverse toolbars 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 angular bar with at least 6 mm thickness.

6.3 The shank assembly shall consist of shank, shank protection mechanism and ripper point.

6.3.1 Shanks shall be made of alloy steel (e.g. AISI 5160) with at least 20 mm thickness. It shall be attached to the frame by bolt or shall be fully welded.

6.3.2 Holes shall be punched at the ends of the shanks where the ripper points shall be attached.

6.3.3 The ripper points shall be made of heat-treated carbon steel (e.g. AISI 1080). It shall be bolted on the end of the shanks to allow replacement. It shall have a width of at least 44 mm (1 ¾").

6.3.4 Wear shin shall be installed in the shank assembly to provide protection for the shank during tillage. It shall be made of alloy steel (e.g. AISI 5160) with a thickness of at least 6 mm (¼") and at least 152 mm (6") length.

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

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

6.5.1 There shall be no crack on welded area.

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

6.5.3 All craters shall be filled to provide the specified weld size, except for the end of intermittent fillet welds outside of their effective length.

6.5.4 Weld profiles shall be in its acceptable form.

6.5.5 Welded joints shall not be less than 4 mm site fillet weld.

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

7 Performance Requirements

7.1 The subsoiler shall have a operating depth of at least 350 mm in accordance with PAES 106.

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

7.3 Surface of the soil shall have minimal disturbance during the operation.

7.4 There shall be at least 80% field efficiency.

7.5 The hydraulic cylinder shall be able to adjust the operating depth of the subsoiler.

7.6 The shank assembly and the gauge wheel assembly shall be intact after the test.

7.7 The subsoiler shall be easy to mount and dismount from the tractor linkages.

8 Safety, Workmanship and Finish

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

8.2 The subsoiler shall be free from manufacturing defects that maybe unsafe.

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

9 Warranty of Construction

9.1 The subsoiler's construction shall be rigid and durable without breakdown of its major components within three (3) years from the date of original purchase.

9.2 Warranty shall be provided for parts and services within three (3) years after installation and acceptance by the consumer.

10 Maintenance and Operation

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

10.2 Grease points for shank protection mechanism shall be provided.

10.3 Tools for adjustment of shank assembly shall be provided.

11 Testing

Testing of the subsoiler shall be conducted on-site. The subsoiler shall be tested for performance in accordance with PAES 150.

12 Marking and Labeling

12.1 The subsoiler 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 or Filipino 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 subsoiler 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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