PHILIPPINE AGRICULTURAL ENGINEERING STANDARD PAES 501: 2007
Slaughterhouse Equipment – Hog Restrainer – Specifications

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 Slaughterhouse Equipment (for hogs)" which was funded by Department of Agriculture-National Meat Inspection Service (DA- NMIS).

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:

Baumeister, T., E.A. Avallone and T. Baumeister III. 1978. *Marks' Standard Handbook for Mechanical Engineers.* 8th ed. McGraw- Hill, Inc.

Grandin, T. 1993. *Livestock handling and Transport.* 2nd ed. CAB International. UK.

Grandin, T. G., 2005. *Recommended Animal Handling Guidelines and Audit Guide for Cattle, Pigs, and Sheep (2005 Edition)*. American Meat Institute Foundation. 2005.

PAES 407: 2001 Agricultural Structures – Slaughterhouse for Swine, Small and Large Animals – General Requirements

http://www.wikipedia.en

1 Scope

This standard specifies the requirement for a hog restrainer.

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 502: 2007 Slaughterhouse Equipment – Hog Restrainer - Methods of Test

3 Definitions

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

3.1
counterweight
piece of mass that has a weight almost equal to that the of the entrance gate attached at one end of the cable that acts as operating lever of the vertical entrance gate

3.2
counterweight guide
keeps the counterweight in its line of motion

3.3
discharge wall
part of the restrainer which can be tilted on one side, known as dumping side, to release hog after stunning

3.4
drop floor
flooring of the hog restrainer designed to suspend the hog during disengagement

3.5
drop floor lever
lever used to reset drop floor

3.6
dump lever
opens the dumping side wall of the restrainer to release the hog from the restrainer

3.7
entrance gate
opening that allows livestock access into the restrainer

3.8
false floor
solid floor at the bottom of the automatic restrainer for the animals to walk down to the entrance ramp

3.9
floor lock
keeps the drop floor in its locked position

3.10
hydraulic cylinder
mechanical device used to give a linear force through a linear stroke using the energy of the hydraulic fluid under pressure

3.11
pneumatic cylinder
mechanical device which produces force, often in combination with movement, and are powered by compressed gas (typically air)

3.12
restrainer
slaughterhouse equipment used to secure and restrict the body movements of the animal in upright position prior to stunning (Fig.1)

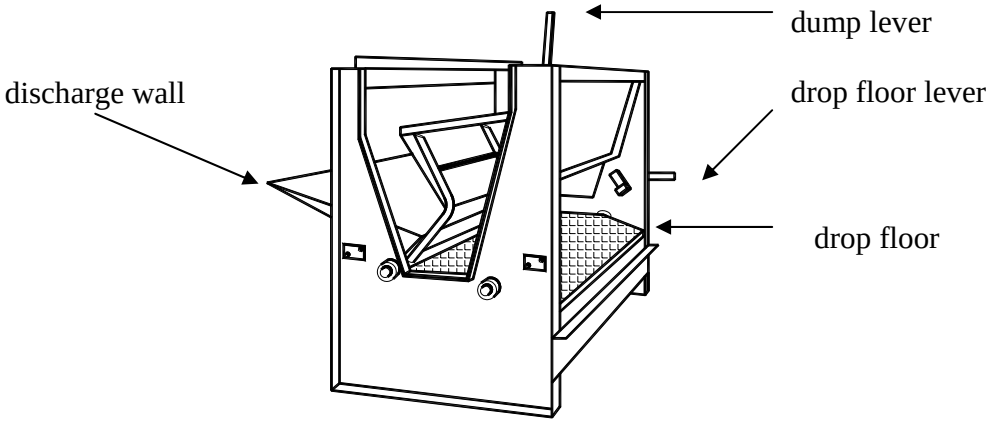

Figure 1. Hog restrainer (entrance gate detached)

3.13
stroke
length of displacement of the cylinder rod which is equivalent to the length of the rod in the cylinder in its extended position less the length once retracted (Fig. 2)

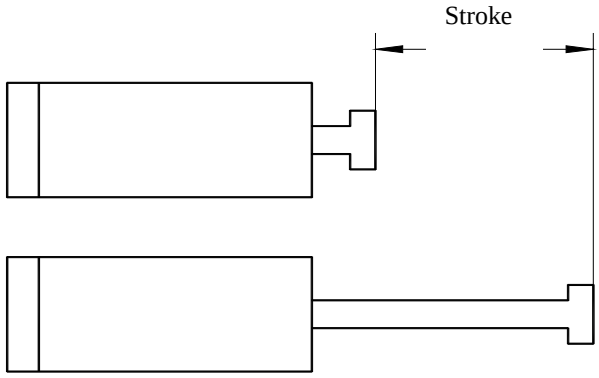

Figure 2. Cylinder stroke.

3.14
stunner
device that is used to make an animal unconscious prior to sticking and bleeding

3.15
stunning
process of rendering an animal unconscious prior to sticking and bleeding

4 Classification

The classification of hog restrainer are as follows:

4.1 Manually operated

Type of hog restrainer that has a dump lever (see Fig.3)

4.2 Semi-automatic

Type of hog restrainer that uses compressed fluid to actuate movements of discharge wall by cylinder actuation (see Fig.4)

4.2.1 Hydraulic type

Makes use of pressurized hydraulic fluid such as oil or water as source of power to actuate movements

4.2.2 Pneumatic

Makes use of compressed gas such as air as source of power to actuate movements

4.3 Automatic

Type of hog restrainer that uses conveyor system for moving, restraining, stunning and dumping the animal to the sticking and bleeding area (Fig 5)

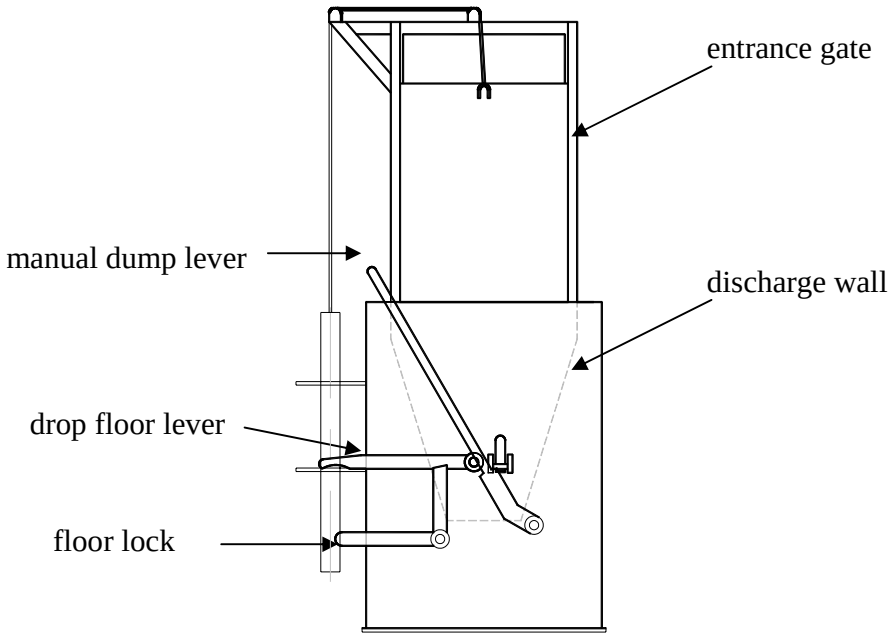

Figure 3. Manually Operated Hog restrainer

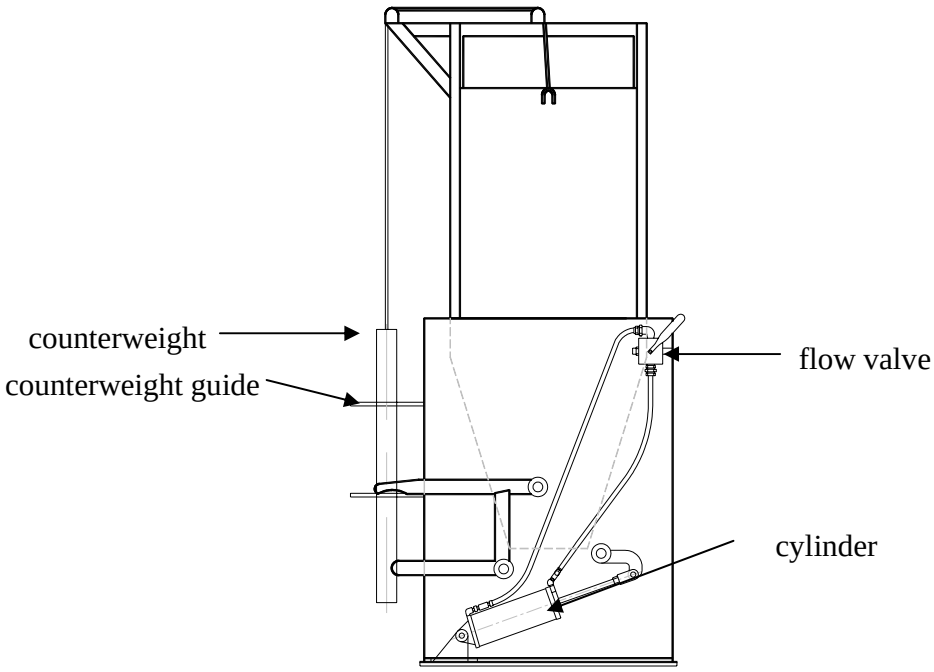

Figure 4. Semi-automatic Hog restrainer

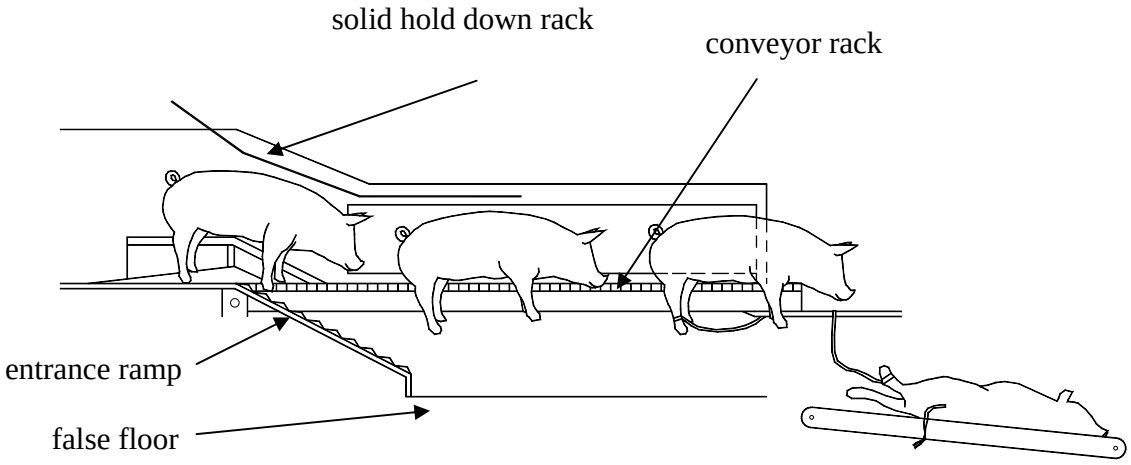

Figure 5a. Automatic/Conveyor Restrainer

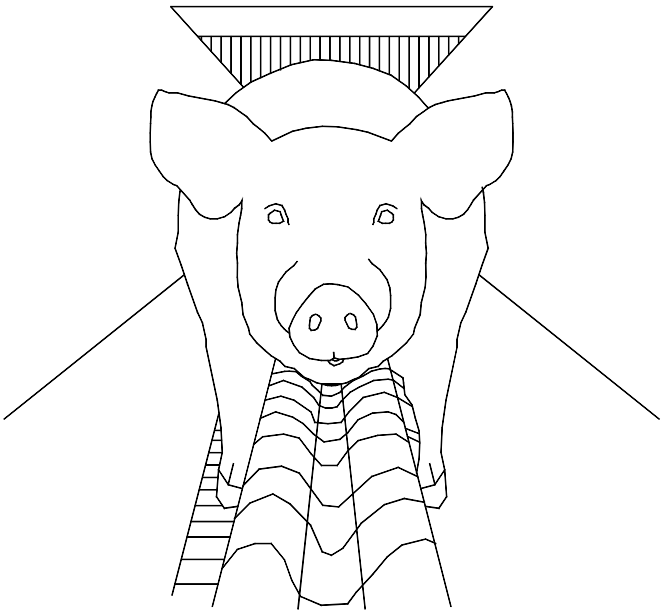

Figure 5b. Hog Riding on a Center- Rack Conveyor

5 Principle of Operation

The hog restrainer ensures that the hog is secured with less stress, restricting its movements prior to humane stunning.

5.1 Manually Operated

The entrance gate is opened by lowering the counterweight of the gate thus making the entrance gate slide upward. As the hog enters the restrainer, the entrance gate is closed to secure the hog inside. The floor lock is then released to disengage the drop floor thus suspending the hog's body on the walls of the restrainer. The operator can proceed to stunning through the top access of the restrainer. The discharge wall is tilted on its dumping side to discharge the hog out of the restrainer.

5.2 Semi-automatic

Using the same principle as that of the manually operated type, the semi-automatic restrainer makes use of a cylinder (hydraulic or pneumatic) in tilting the discharge wall.

5.3 Automatic

The hog is carried into the conveyor system for stunning, after which the hogs will be dumped out at the end of the conveyor.

6 Fabrication Requirements

6.1 Manually operated

6.1.1 The restrainer shall consist of entrance gate, counterweight, counterweight guide, drop floor, drop floor lever, floor lock, discharge wall, and a dump lever.

6.1.2 The restrainer shall have an opened top for stunning and an opened side for discharge wall.

6.1.3 The walls shall have smooth surfaces and rounded edges or corners to avoid uncomfortable pressure points.

6.1.4 Mud guards shall be installed on the top of the walls to avoid electrocution of the operator.

6.1.5 The entrance gate shall have a frame assembly for counterweight to guide motion.

6.1.6 The restrainer shall be constructed such that it will still hold the hog upright after being stunned.

6.1.7 Vertical entrance gate shall be connected to the counterweight by a cable that runs through pulleys.

6.1.8 The vertical entrance gate shall be provided with rubber pad on its lower end to reduce impact during closing.

6.1.9 The drop floor shall have rubber pads that underneath to reduce impact of dropping.

6.1.10 Moving parts of the restrainer such as the discharge wall, entrance gate assembly shall have grease points for lubrication.

6.1.11 The dump lever shall have safety lock to avoid accidental opening of the dumping cradle.

6.1.12 The drop floor shall have a non- slip flooring.

6.1.13 The framing, entrance gate, drop floor and other major parts shall be constructed from bent stainless steel plates (e.g. stainless steel 304 or higher) or other non- corrosive steel plates.

6.1.14 The counterweight shall be made of non-corrosive steel or concrete.

6.2 Semi-automatic

6.2.1 The restrainer shall consist the same components requirements as that of the manually operated type except for the absence of the dump lever which shall be replaced by actuating cylinders in the semi-automatic type.

6.2.2 Pressure gauges with gauge range of 10 bars and with at least 70 mm diameter shall be installed in near the flow valve.

6.2.3 Silencers shall be installed to reduce noise.

6.2.4 The framing, entrance gate, drop floor and other major parts shall be constructed from bent stainless steel plates (e.g. stainless steel 304 or higher) or other non- corrosive steel plates.

6.2.5 The counterweight shall be made of non-corrosive steel or concrete.

6.3 Automatic

6.3.1 The conveyor shall have no sharp edges that may injure the hog.

6.3.2 The conveyor shall secure the hog while being moved into the stunning area.

6.3.3 The walls shall be adjustable to allow different sizes of hogs to be stunned.

6.3.4 A solid hold- down rack shall be attached on the top part of the restrainer.

6.3.5 A solid false floor shall be present underneath the conveyor to eliminate "visual cliff effect" that results to balking.

6.3.6 The entrance ramp shall be non- slip and shall be sloping downward.

6.3.7 Stainless steel (e.g. stainless steel 304 or higher) or other non- corrosive steel shall be used for the construction of the major components of the restrainer.

6.4 All welded parts shall be water- tight and/or air- tight and smoothly polished and it shall pass the visual inspection criteria (AWS D1.1:2000) for discontinuity of material.

6.4.1 There shall be no crack on welded area.

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

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

6.4.4 Weld profiles shall be in its acceptable form.

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

6.4.6 Undercut shall not exceed 2mm (1/16 inch) for any length of weld.

7 Performance Requirements

The hog restrainer shall perform sanitary operation and shall comply with the Good Manufacturing Practices (GMP), Sanitation Standard Operating Procedures (SSOP) and Hazard Analysis Critical Control Points (HACCP) principles and requirements. The hog restrainer shall not produce noise higher than the maximum permissible noise level (96dBA) for four (4) hours of continuous operation.[1]

7.1 Manually operated

7.1.1 Lowering of the dump lever shall tilt the discharge wall to its effective tilting angle.

7.1.2 The restrainer shall hold the hog securely without giving stress to the animal.

7.2 Semi-automatic

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

7.2.1 The pressure from the pump or compressor shall be sufficient to tilt the discharge wall and to restore it to its original position.

7.2.2 The operating pressure of the hog restrainer shall comply with the operating pressure specified by the fabricator.

7.2.3 The cylinder of the semi-automatic hog restrainer shall be able to maintain the position of the discharge wall whether it is in upright or in dumping position.

7.2.4 The discharge wall shall be tilt to its effective tilting angle when dumping the hog and shall be able to return to its upright position.

7.2.5 The cylinder shall function normally when the hog is inside the restrainer.

7.3 Automatic

7.3.1 The conveyor belt shall be able to carry and secure the hog continuously while being moved into the stunning area.

7.3.2 The speed of the conveyor shall commensurate to the exposure time required by the stunner per linear restraining length.

8 Safety, Workmanship and Finish

8.1 The restrainer shall be free from manufacturing defects.

8.2 Surface of the hog restrainer shall not be painted.

8.3 Parts of the restrainer that touches the hog's body shall not have sharp edges that may injure the animal.

8.4 The top edge of the walls of the restrainer shall have insulation to protect the personnel when using electric stunner.

9 Warranty of Construction

9.1 The restrainer'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

10.1 For local fabricators, an operator's manual which conforms to PAES 102, shall be provided.

10.2 Grease points for lubrication of axles shall be provided.

10.3 Food grade grease shall be used.

11 Testing

Testing of the hog restrainer shall be conducted on-site during commissioning. The hog restrainer shall be tested for performance in accordance with PAES 502.

12 Marking and Labeling

12.1 The hog restrainer 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 fabricator (optional)

12.1.2 Model and/or Serial number

12.1.3 Maximum weight capacity

12.1.4 Name, address and contact number of the fabricator

12.1.5 Country of manufacture (if imported)/ "Made in the Philippines" (if manufactured in the Philippines)

12.2 Other additional markings shall be provided and shall include the name and address of the importer, if imported (optional).

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

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