

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. G., 2005. *Recommended Animal Handling Guidelines and Audit Guide for Cattle, Pigs, and Sheep (2005 Edition)*. American Meat Institute Foundation. 2005. pp. 25-27, 29-36, 42-43, 52-55.

Ministry of Agriculture, Fisheries and Food.2000. *Captive Bolt Stunning Equipment and the Law – How it Applies to You*. The National Assembly for Wales. Cathays Park.. 6pp.

OIE *ad hoc* Group. 2003. Report Of The First Meeting Of The OIE *ad hoc* Group On The Humane Killing Of Animals For Disease Control Purposes. Paris. Oct. 14-16, 2003.

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

Trent, N., et.al.2003. *The State of Meat Production in Developing Countries: 2002*. The State of the Animals II: 2003. pp 175 -191.

U.S. Department of Agriculture. 1998. *Special Survey on Humane Slaughter and Ante-mortem Inspection*. U.S. Department of Agriculture. Food Safety and Inspection Service.

<http://www.kochequipment.com>

1 Scope

This standard specifies the classification, specifications, fabrication and performance requirements for hog electric stunners.

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 501: 2007 | Slaughterhouse Equipment – Hog Restrainer – Specifications |
| PAES 504: 2007 | Slaughterhouse Equipment – Hog Electric Stunner – Methods of Test |

3 Definitions

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

3.1

blood splash

blood spots or clots formed on the muscle tissue

3.2

conveyor restrainer

type of hog restrainer that uses conveyor system for moving, restraining, stunning and dumping the animal to the sticking and bleeding area

3.3

hot wandling

charging of the electric prods prior to application of stunner

3.4

knurling

a series of small ridges or grooves on the surface or edge of the prods to improve contact during application of the electric stunner

3.5

prod

tip of the electric stunner to which the revolving spur is attached

3.6

restrainer

slaughterhouse equipment used to secure and restrict the body movements of the animal in upright position prior to stunning

3.7

revolving spurs

spiked wheel attached to the head-only type electric stunner used to improve contact with the head of the animal to be stunned

3.8

stunner

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

3.8

stunning

process of rendering an animal unconscious prior to sticking and bleeding

4 Classification

4.1 Manual Application Type

4.1.1 Head-only Type

Type of electric stunner that allows current to pass through the brain of the hog rendering the animal unconscious

4.1.1.1 Tong Type (Fig.1)

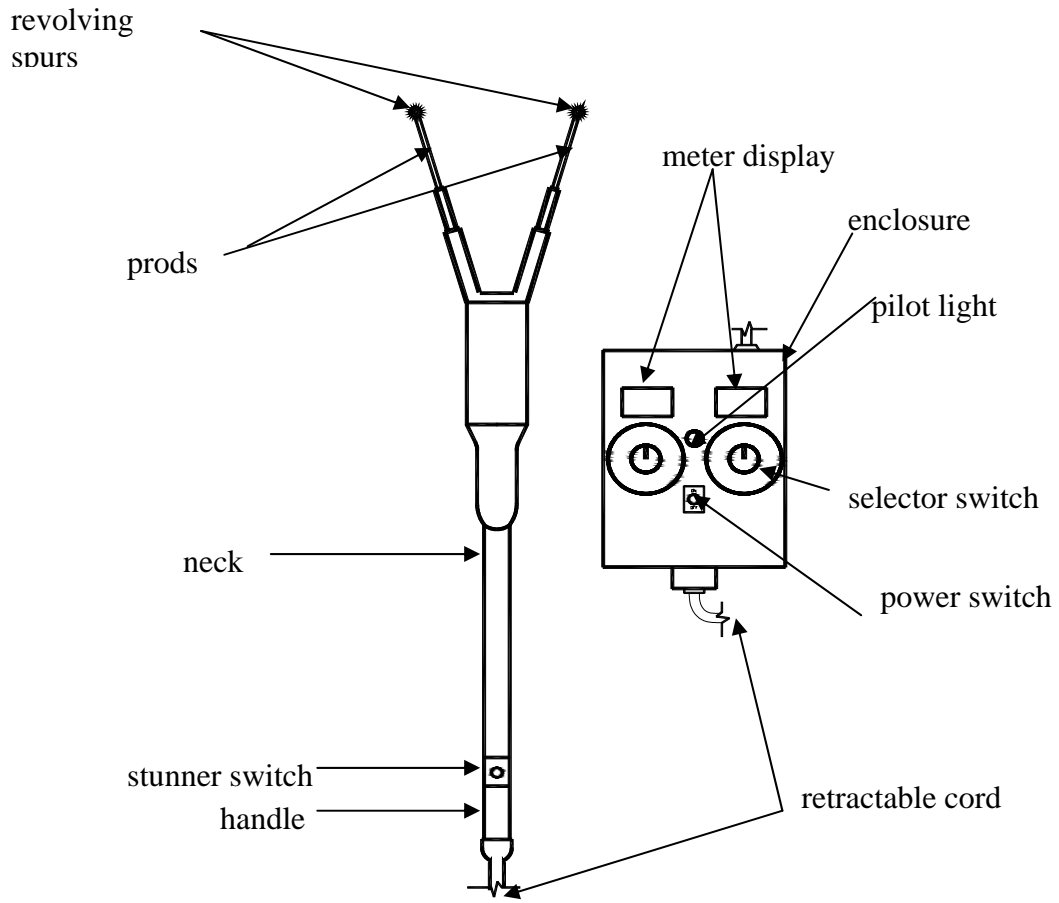


Figure 1. Tong type head-only stunner.

4.1.1.2 Caliper Type (Fig.2)

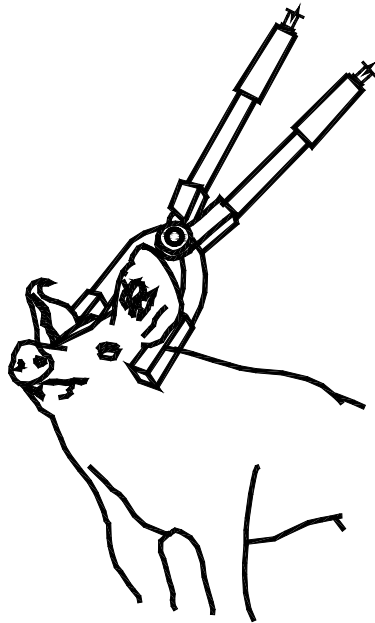


Figure 2a. Caliper type stunner

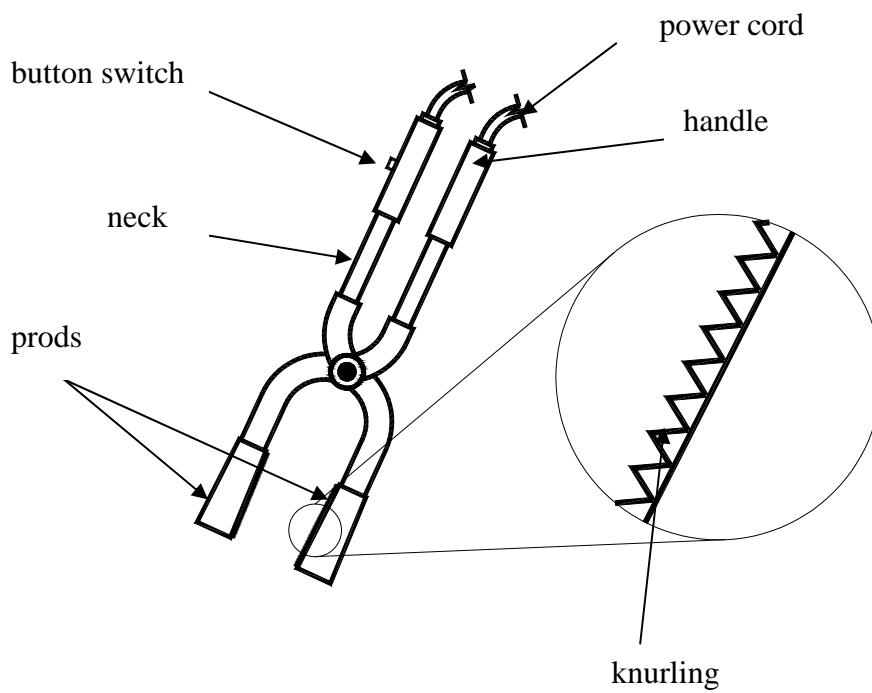


Figure 2b. Caliper type stunner parts

4.1.2 Head-to-Back Type

Type of electrical stunner in which one of the prods is positioned on the head and the other prod is positioned on the body of the hog (Fig. 3)

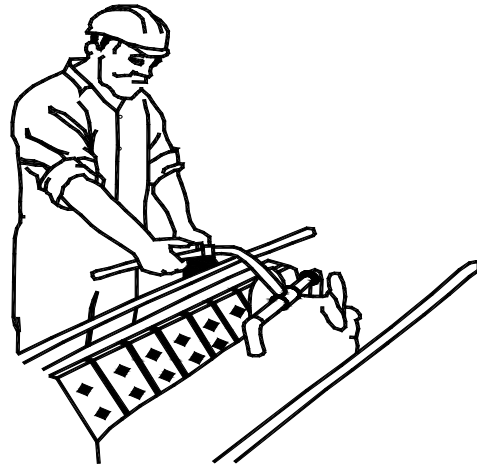


Figure 3a. Head-to-back electric stunner.

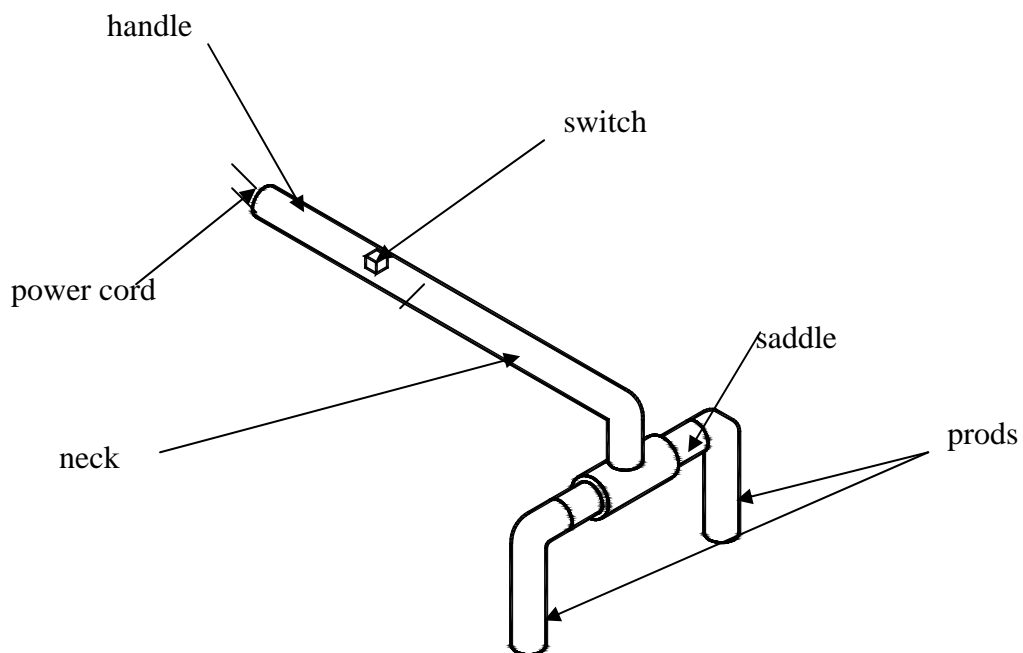


Figure 3b. Head-to-back electric stunner parts.

4.2 Automatic / Head-to-Foreleg Type

Type of electric stunner integrated in the conveyor restrainer wherein the electrodes are made in contact with the forehead and forelegs of the animal (Fig.4)

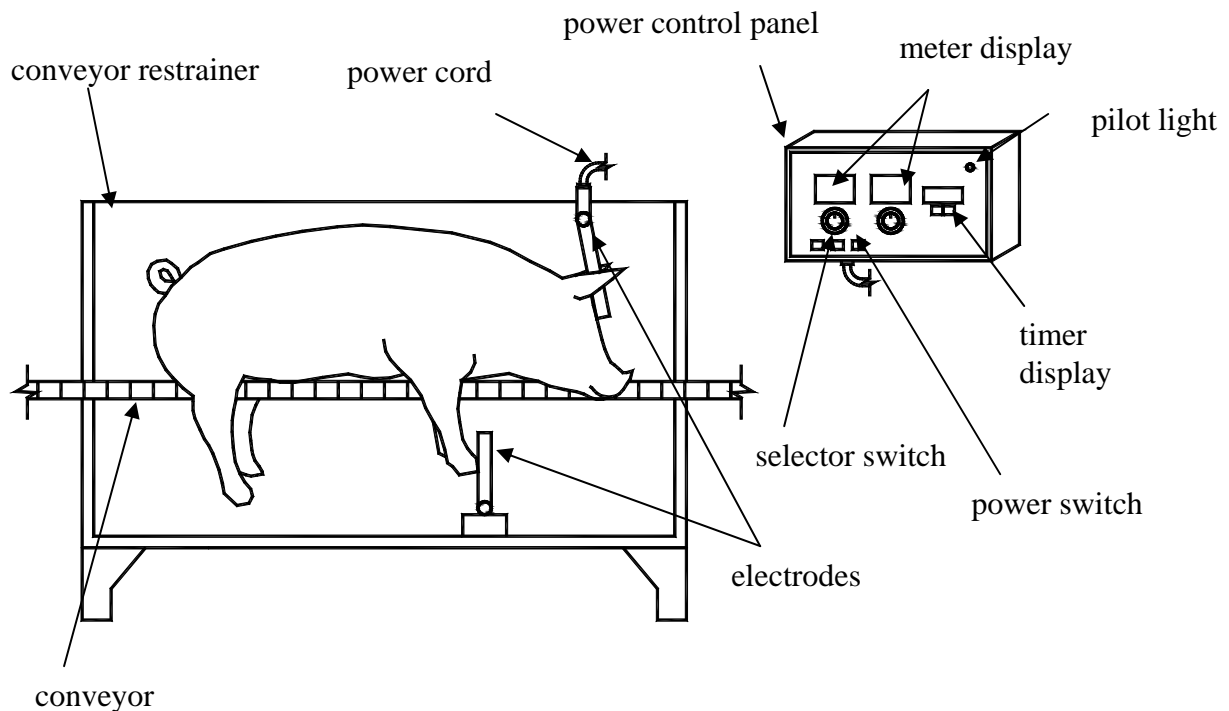


Figure 4. Automatic Stunner.

5 Principle of Operation

The hog shall be withheld inside a restrainer to restrict unnecessary movements. After positioning the hog, stunning shall follow immediately. This shall be done by using an electric stunner. The stunning process shall be done correctly to avoid inhumane stunning of the animal. The animal shall be unconscious after the stunning process.

6 Fabrication Requirements

6.1 Manual application type

6.1.1 The electric stunner shall consist of power control panel (consisting of enclosure, built-in ammeter, built-in voltmeter, and voltage selector switches), power cord, handle and neck, prods and spurs (for tong type) and saddle (for head-to-back type).

6.1.2 The neck shall be made of hollow round tube that is a non-conductive and a non-corrosive material. The length of the neck shall be at least 700 mm to avoid electrocution of the operator while using the electric stunner.

- 6.1.3** The revolving spurs of tong type and the prods shall be made from copper or metal that is of good conductor of electricity. The distance between the prods of the electric stunner shall be sufficient to place the prods on the opposite sides of the head of the hog.
- 6.1.4** Voltage selector switch shall be provided for adjustments and shall have a corresponding voltmeter with calibration knob to set the proper voltage.
- 6.1.5** An ammeter shall be provided to indicate actual current usage.
- 6.1.6** Insulated button switch shall be installed for electric stunner to avoid hot wandering.
- 6.1.7** The size of the power cord shall correspond to the maximum power rating supplied by the stunner.
- 6.1.8** Pilot light and sound emitting device shall be provided for power signal notification.
- 6.1.9** The power control panel shall be designed such that it can be mounted on the wall.
- 6.1.10** Enclosure shall be splash- proof and shall be made of non-corrosive material (e.g. stainless steel 316 or higher).
- 6.2 Automatic type**
 - 6.2.1** The automatic type shall consist of electrodes, power control panel (which includes power switch, timer, built-in voltmeter and ammeter, overload protector and preset selector switches for voltage settings) and enclosure.
 - 6.2.2** The electrodes shall be integrated in the conveyor restrainer and shall be positioned such that it will be in contact with the forelegs and forehead. The electrodes shall be made of copper or other metals that are good conductor of electricity.
 - 6.2.3** The enclosure shall be splash proof and shall be made of non-corrosive material (e.g. stainless steel 316 or higher).
 - 6.2.4** Pilot light and sound emitting device shall be provided for power signal notification.
 - 6.2.5** Voltage selector switch shall be provided for adjustments and shall have a corresponding voltmeter with calibration knob to set the proper voltage.
 - 6.2.6** The size of the power cord shall correspond to the maximum power rating supplied by the stunner.
 - 6.2.7** The timer shall have variable settings expressed in seconds.
- 6.3** 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.
 - 6.3.1** There shall be no crack on welded area.

- 6.3.2 There shall be fusion between adjacent layers of weld metal and between weld metal and base metal.
- 6.3.3 All craters shall be filled to provide the specified weld size, except for the end of intermittent fillet welds outside of their effective length.
- 6.3.4 Weld profiles shall be in its acceptable form.
- 6.3.5 Welded joints shall not be less than 4mm site fillet weld.
- 6.3.6 Undercut shall not exceed 2mm (1/16 inch) for any length of weld.

7 Performance Requirements

- 7.1 The stunner shall render the hog unconscious only. It shall render the hog insensible with a single application.
- 7.2 There shall be no blood splashes on the muscle tissue of the hog after stunning.
- 7.3 The electrical stunner shall operate at a constant frequency of 60 Hz.
- 7.4 The stunner shall operate at various settings for different size of hogs (within the limits specified by the fabricator) with a constant current of 1.25 amps (see Table 1).

Table 1. Stunning voltage chart¹.

Hog weight (kg)	Voltage (V)
45.6 – 113.64	280
113.65 – 159.09	320
159.10 – 227.27	400
227.28 – 295.45	500
295.46 – 363.64	520
364.65 – 545.45	620

8 Safety, Workmanship and Finish

8.1 Manual application type

- 8.1.1 Parts that are in contact with the animal during the stunning process shall have provisions for cleaning and shall be free from foreign matters that may affect good contact.
- 8.1.2 The handle and the neck of the stunner shall be properly insulated to protect the operator.

¹ Stunning voltage requirements from Koch Equipment - Best and Donovan Model ES Electric Stunners.

- 8.1.3 The stunner shall be free from manufacturing defects.
- 8.1.4 Low voltage or control voltage shall be provided for the safety of the operator.
- 8.1.5 Double pole switch shall be installed to totally disconnect the stunner from the power source.
- 8.1.6 Prods shall not be painted.
- 8.1.7 The stunner shall have proper insulation and shall have provision for proper grounding.
- 8.1.8 The power control panel shall be mounted on the wall.
- 8.1.9 Safety fuse or power overload breakers shall be integrated in the power control system for safety.
- 8.1.10 Mechanism to warn the operator prior to actual introduction of voltage shall be provided.
- 8.1.11 Double insulations (e.g. royal cord) for cord shall be used.

8.2 Automatic type

- 8.2.1 All welded parts shall be fully weld to achieve water- tight and/ or air- tight fabrication and shall be smoothly polished.
- 8.2.2 The stunner shall be free from manufacturing defects.
- 8.2.3 Electrodes shall not be painted.
- 8.2.4 The stunner shall have proper insulation and shall have provision for proper grounding.
- 8.2.5 Power cord shall be connected to the power control panel using a twist-type plug such that it can be detached when not in use.
- 8.2.6 Safety fuse or power overload breakers shall be integrated in the power control system for safety.

9 Warranty of Construction

- 9.1 The stunner'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** An operator's manual which conforms to PAES 102, shall be provided.
- 10.2** Fabricator shall provide maintenance manual which includes calibration of voltmeter and ammeter, proper cleaning and checkup of the equipment.
- 10.3** Spurs or tips of the prods and electrodes shall be regularly cleaned for better contact with the hog.
- 10.4** The handle of the manual application type stunner shall have a sturdy and safe place to be hung. The hanger shall be insulated.
- 10.5** Parts shall be readily serviceable.

11 Testing

Testing of the hog stunner shall be conducted in the slaughterhouse during commissioning. The hog stunner shall be tested for performance in accordance with PAES 504.

12 Marking and Labeling

- 12.1** The hog stunner 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 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. The markings shall be water and heat resistant under normal cleaning procedures, it shall not fade, discolor, crack or blister and shall remain legible.