

Foreword

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled “Development of Technical Standards for Poultry Dressing/Slaughtering Plant” which was funded by the Department of Agriculture – National Meat Inspection Service (DA-NMIS)

This standard has been technically prepared in accordance with PAES 010-2 – 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 preparation of this standard, the following documents/publications were considered:

PAES 020:2005 General – Metrication Guidelines

PAES 411:2000 Agricultural Structures – Slaughterhouse for Swine, Small and Large Animals – General Requirements

PAES 503:2007 Slaughterhouse Equipment –Hog Electrical stunner – Specifications

PAES 515:2008 Slaughterhouse Equipment – Captive Bolt – Specifications

Mead, G.C. 2004.*Poultry meat processing and quality*.Woodhead Publishing in Food Science and Technology.Woodhead Publishing Limited. Cambridge England

Small Poultry Abattoir Operation.www.humdeyn.co.za/Abattoir.pdf.<Accessed May 02, 2012>

Cash Poultry Killer.www.mcdonnells.ie/cashp.pdf<Accessed May 02, 2012>

Poultry Slaughterhouse
http://www.zhauns.com/pdf/CHICKEN_POULTRY_SLAUGHTER_HOUSE.pdf<Accessed May 02, 2012>

Cardiac Arrest Stunning Of Livestock And Poultry With 1997
Updates<http://www.grandin.com/humane/cardiac.arrest.html>.<Accessed May 17, 2012>

Terrestrial Animal Health Code: Slaughter of Animals.
<http://www.grandin.com/OIE.Terrestrial.Animal.Welfare.Guideline.1.7.5.pdf><Accessed May 09, 2012>

1 Scope

This standard specifies the requirements on manufacture, installation and performance of mechanical and electrical stunner for poultry animals such as chicken, geese, turkeys, ducks, ostriches, and others.

2 References

The following normative documents contain provisions, which through the references 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 103:2000 | Agricultural Machinery – Method of Sampling |
| PAES 528:2012 | Slaughterhouse Equipment – Poultry Stunner – Methods of Test |
| PAES 525:2012 | Slaughterhouse Equipment – Overhead Rail System for Poultry Dressing/Slaughtering Plant - Specifications |

3 Definitions

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

3.1

ampere (A)

metric system unit for measuring electric current

3.2

blank cartridge

type of cartridge used in mechanical stunner that contains gunpowder but without bullet (Fig. 1)

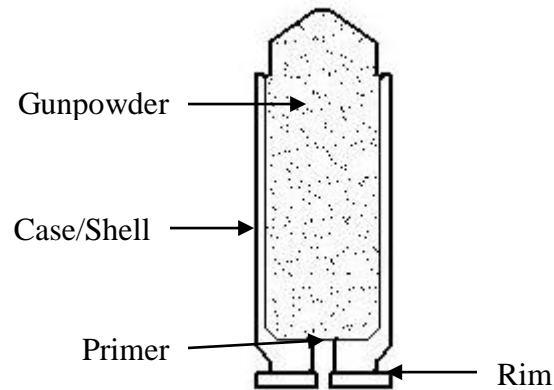


Figure 1. Blank cartridge

3.3

bolt

metal rod that extrudes from the cylindrical type of mechanical stunner during stunning operation

3.4

cartridge

metallic case containing the bullet, gunpowder and the primer on the pistol type stunner

3.5

conducting shoe

part of the electrode assembly in automatic type stunner that is adapted to make sliding contact with the electrode rail (Fig. 9b)

3.6

current

flow of electric charge through a conductive medium

3.6.1

alternating current

movement of electric charge periodically reverses direction

form of current in which electric power is delivered to businesses and residences

3.6.2

direct current

unidirectional flow of electric charge that are usually produced by sources such as batteries, thermocouples, solar cells, and commutator-type electric machines of dynamo type

3.7

electric prods

tips of electrical stunner that can deliver an electric charge to the animal

3.8

electrodes

electrical conductors that are being used in electrical stunner to deliver certain amount of current during stunning operation

3.9

frequency

frequency of the oscillations of alternating current in an electric power grid transmitted from a power plant to the end-user

3.10

poultry

birds that are usually domesticated for their eggs, meat and feathers (e.g. chicken, geese, turkeys, ducks, and ostriches)

3.11

powerload

measurement of the size and amount of powder in a blank cartridge, expressed in grain

3.12

stunner

device/equipment used to render the poultry animal unconscious before dress/slaughter

3.13

stunning

process of rendering the poultry animal unconscious before they are dressed/slaughtered

3.14

voltage (V)

electromotive force required to move a small electric charge along a path

3.15

water vat

part of water-bath stunner where water as conductor of electricity is being contained and where the poultry animals are being submerged during stunning operation

4 Classification

Stunner shall be classified according to the following:

4.1 Mechanical Stunner

Type of stunner that drives a bolt to the poultry animal's head to render it unconscious.

Mechanical stunner shall be further classified according to:

4.1.1 Type of bolt

4.1.1.1 Penetrating

Type of mechanical stunner that drives a concave bolt tip to penetrate the skull of the animal to sever the brain.

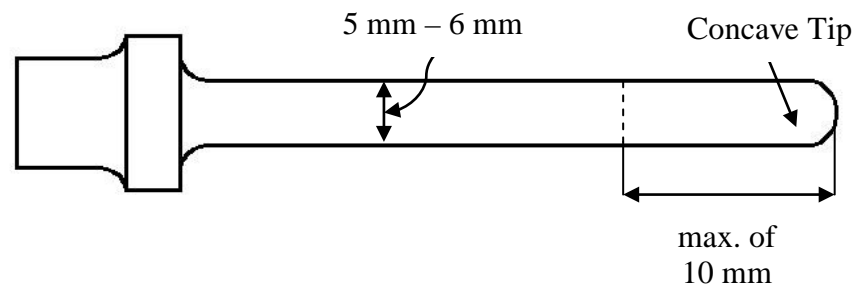


Figure 2. Penetrating bolt

4.1.1.2 Non-penetrating/Percussion

Type of mechanical stunner that drives a mushroom-shaped bolt head against the forehead of the animal that causes concussion on the cranium and the brain without penetrating the skull.

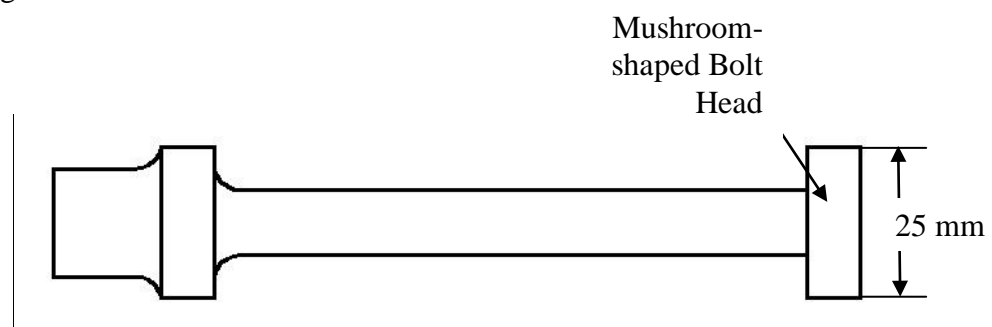


Figure 3. Non-penetrating bolt

4.1.2 Type of driver part

4.1.2.1 Blank cartridge

Mechanical stunner that uses explosion from blank cartridge with gunpowder to drive the bolt.

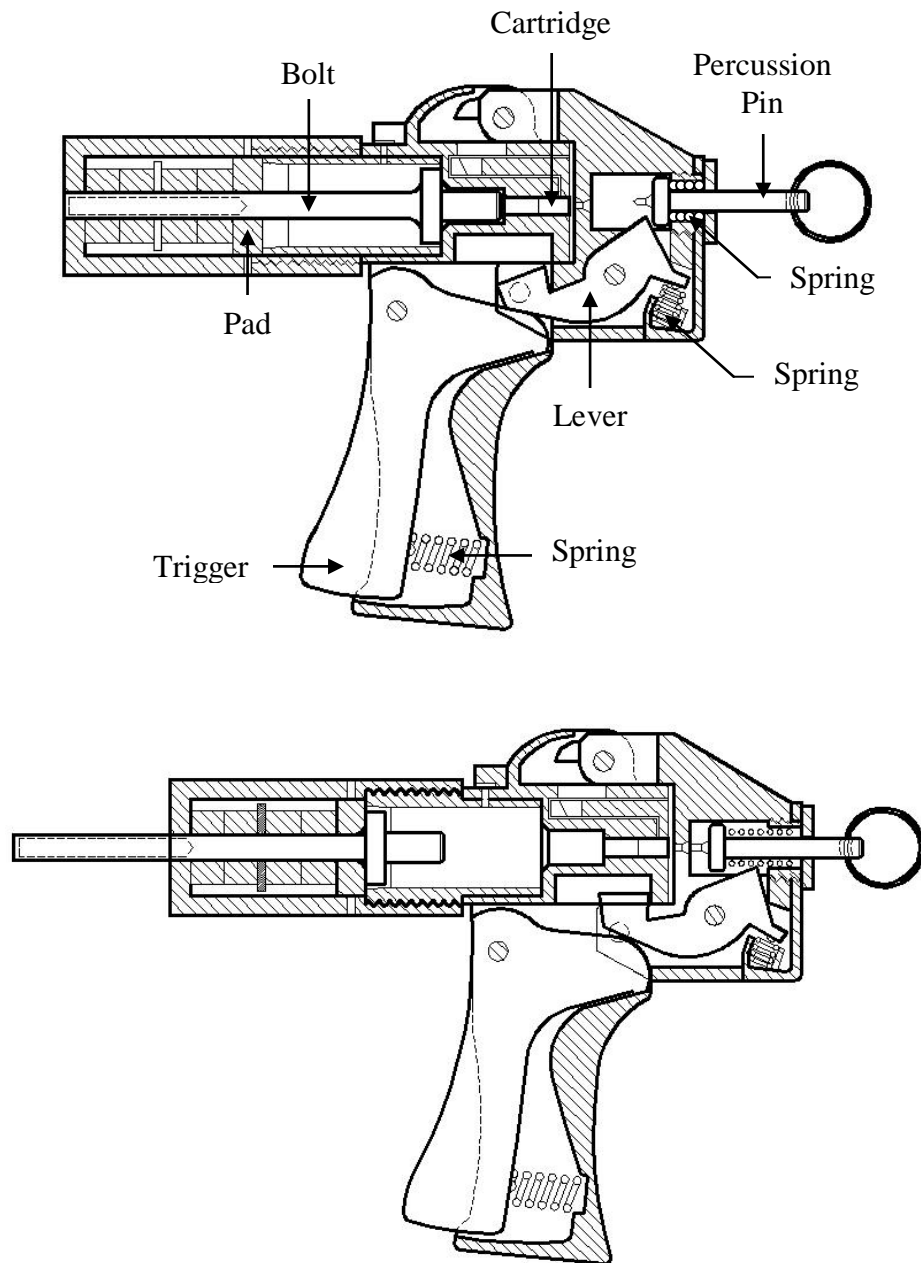


Figure 4. Pistol type mechanical stunner

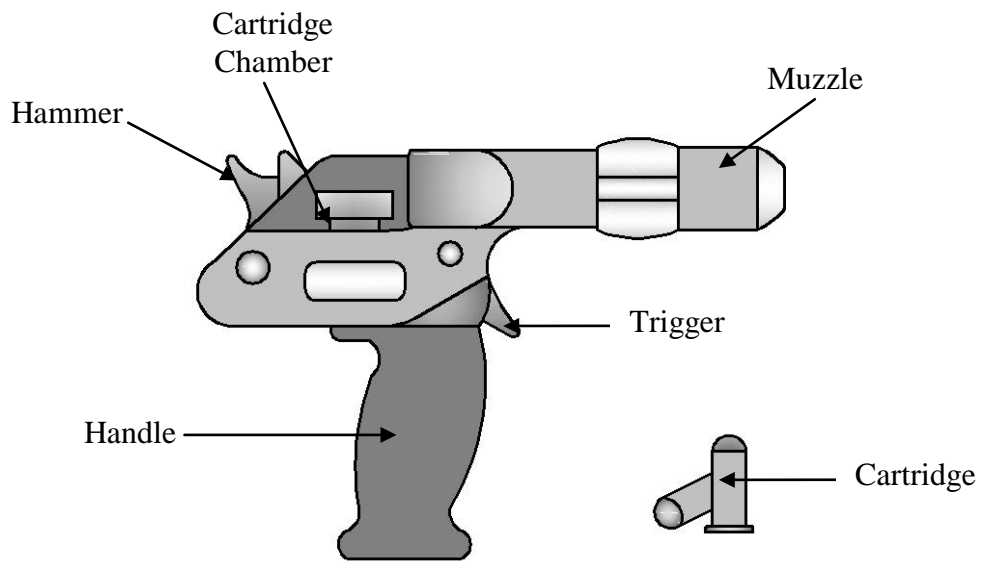


Figure 5. Pistol type mechanical stunner (2D view)

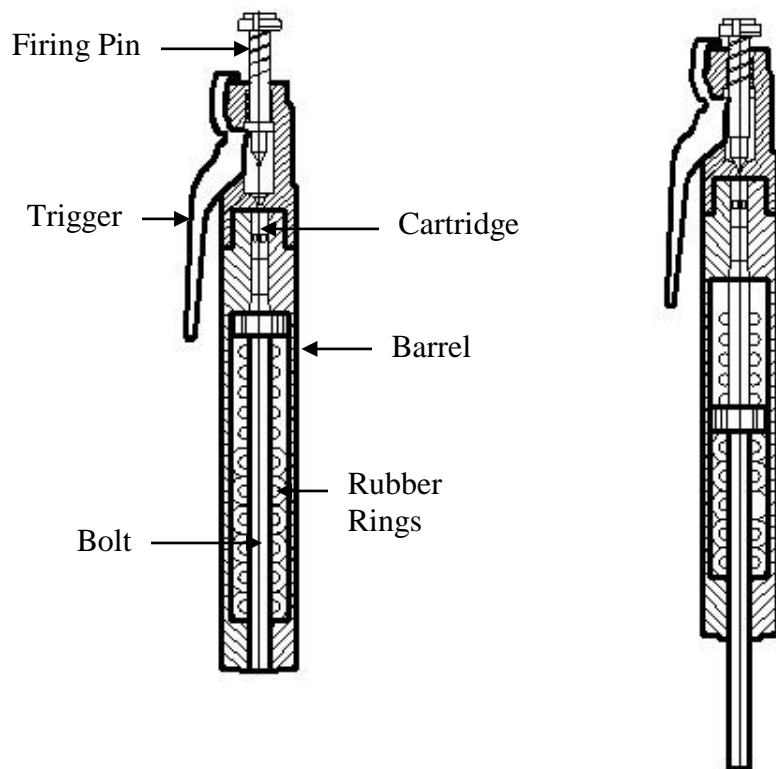


Figure 6. Cylinder type mechanical stunner (section view)

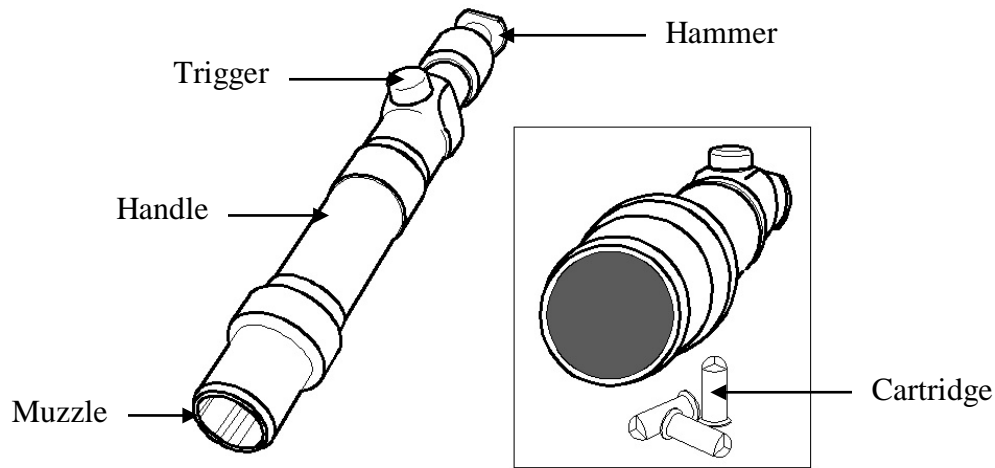


Figure 7. Cylinder type mechanical stunner (3D view)

4.1.2.2 Pneumatic

Mechanical stunner that uses compressed air to drive the bolt.

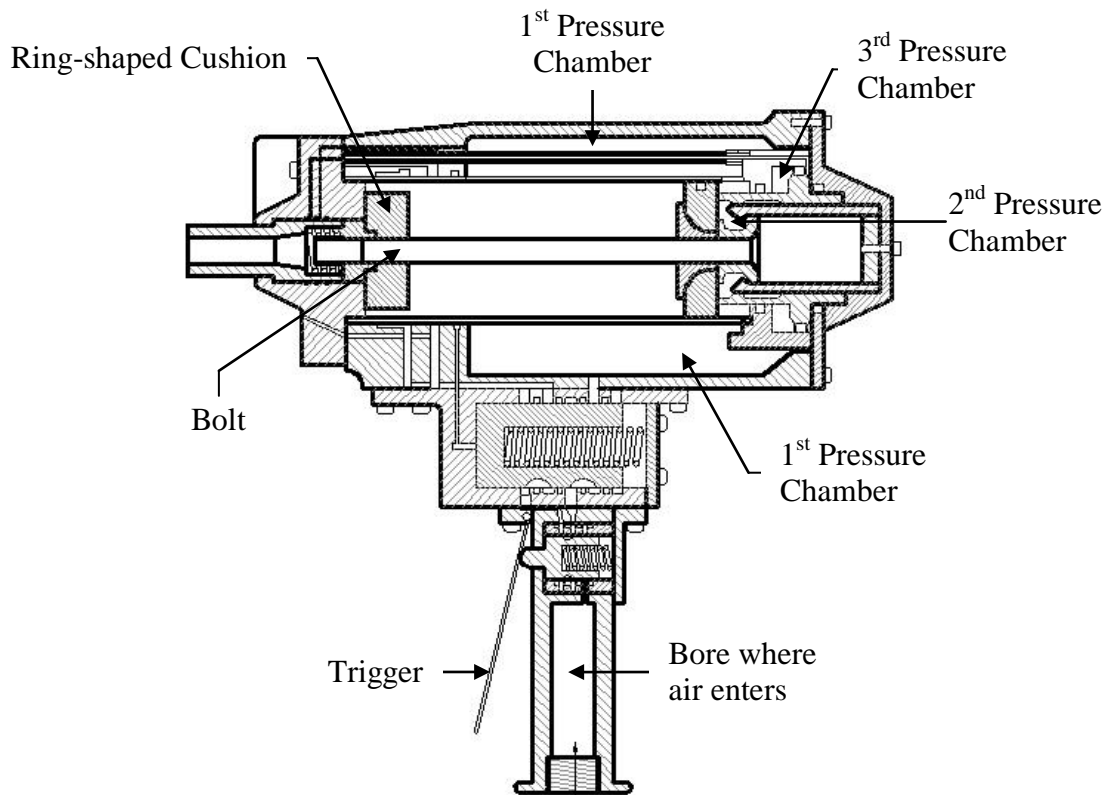


Figure 8. Pneumatic mechanical stunner

4.2 Electrical Stunner

Type of stunner that allows the current to pass through the poultry animals to render it unconscious.

Electrical stunner shall be further classified according to application of electricity to poultry animals.

4.2.1 Automatic

Type of electrical stunner that automatically applies electricity to the poultry animals. Automatic electrical stunner shall be classified according to type of electric conductor.

4.2.1.1 Waterbath

Type of electrical stunner that uses water to allow the flow of current from the equipment to the submerged poultry animals.

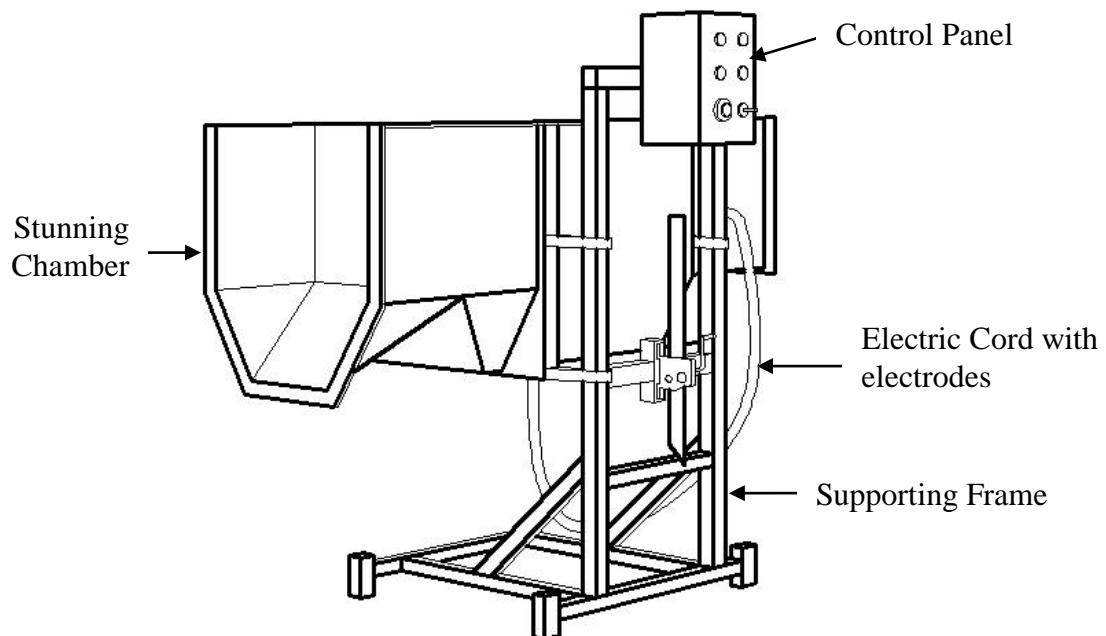


Figure 12. Stationary water bath electrical stunner

Waterbath shall be further classified according to stunning operation.

4.2.1.1.1 Head only

Type of waterbath stunner that applies electricity on the head of the poultry animals.

4.2.1.1.2 Whole body

Type of waterbath stunner that applies electricity on the whole body of the poultry animals.

4.2.1.2 Electrode assembly

Type of electrical stunner that uses electrode assembly to allow flow of current from the equipment to the poultry animals to be stunner.

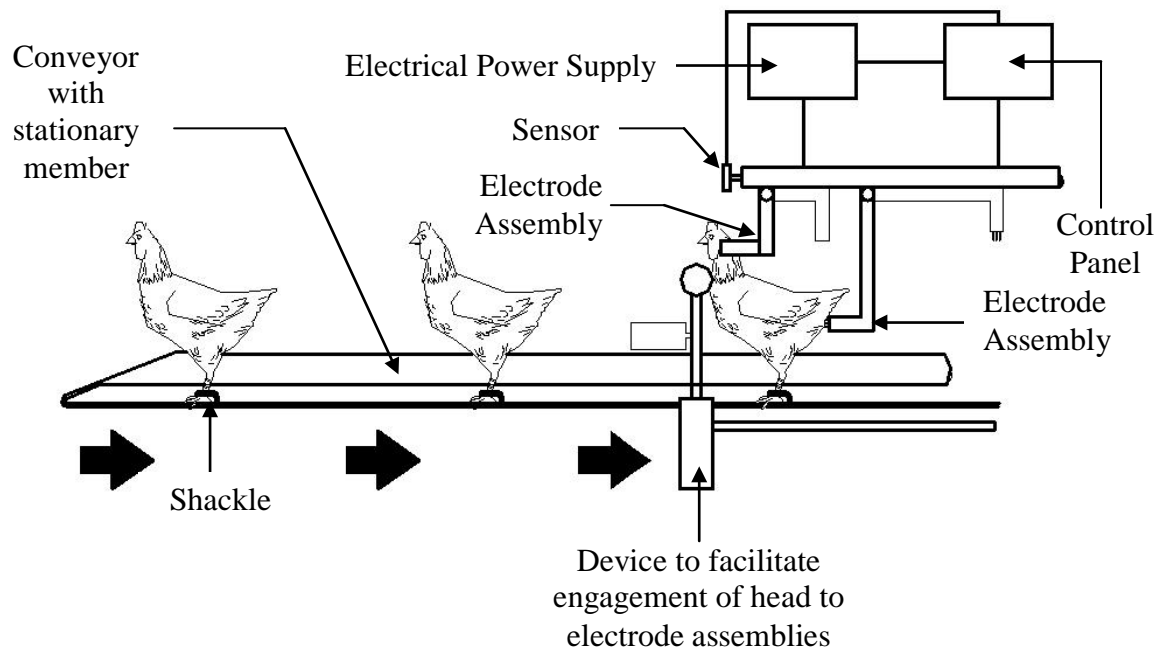


Figure 13. Side view of automatic electrical stunner

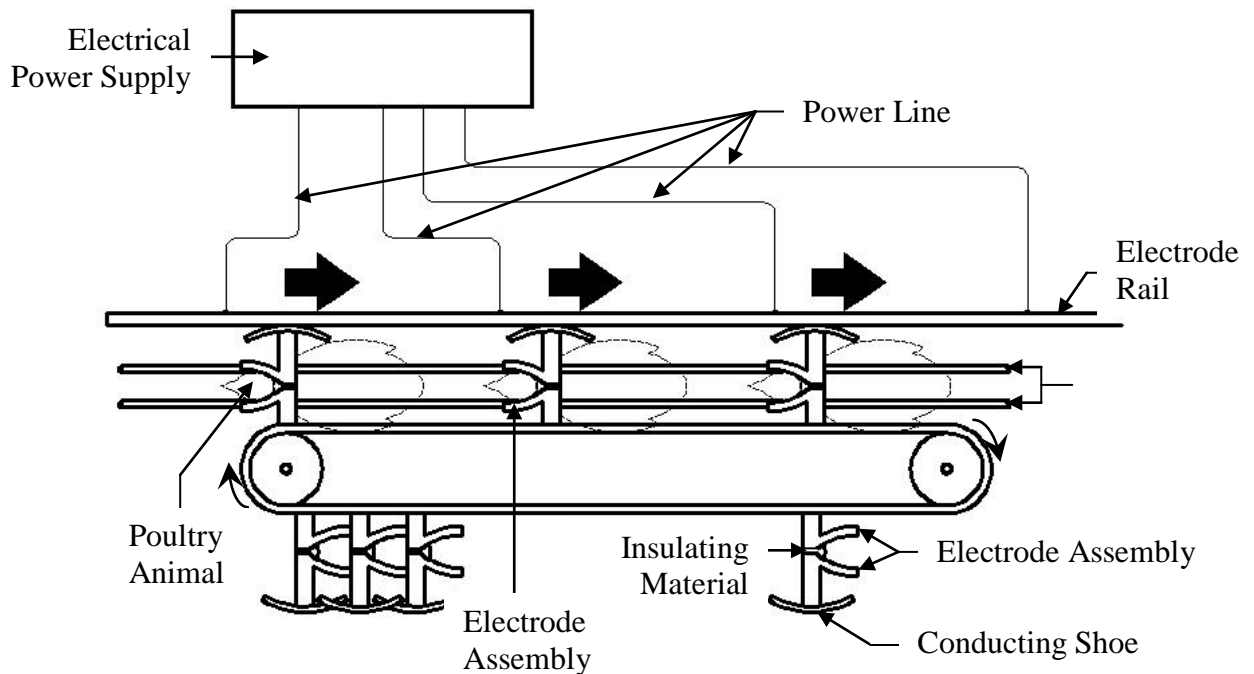


Figure 14. Top view of automatic electrical stunner

4.2.2 Manual

Type of electrical stunner wherein the conductor of electricity is manually applied to the head of the poultry animal. Manual electrical stunner shall be classified as follows:

4.2.2.1 Wall-mounted

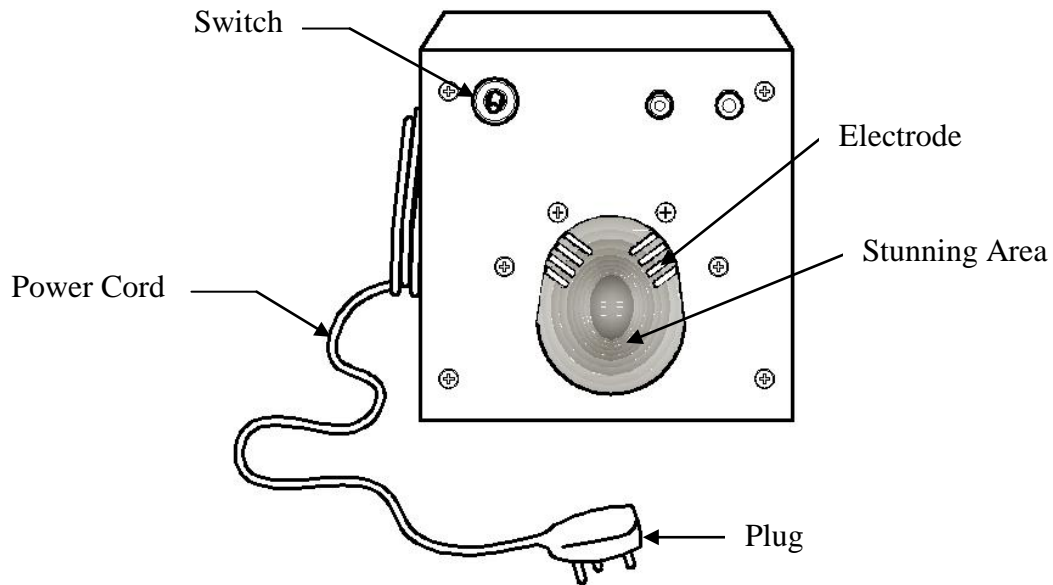


Figure 15. Wall-mounted electrical stunner

4.2.2.2 Handheld

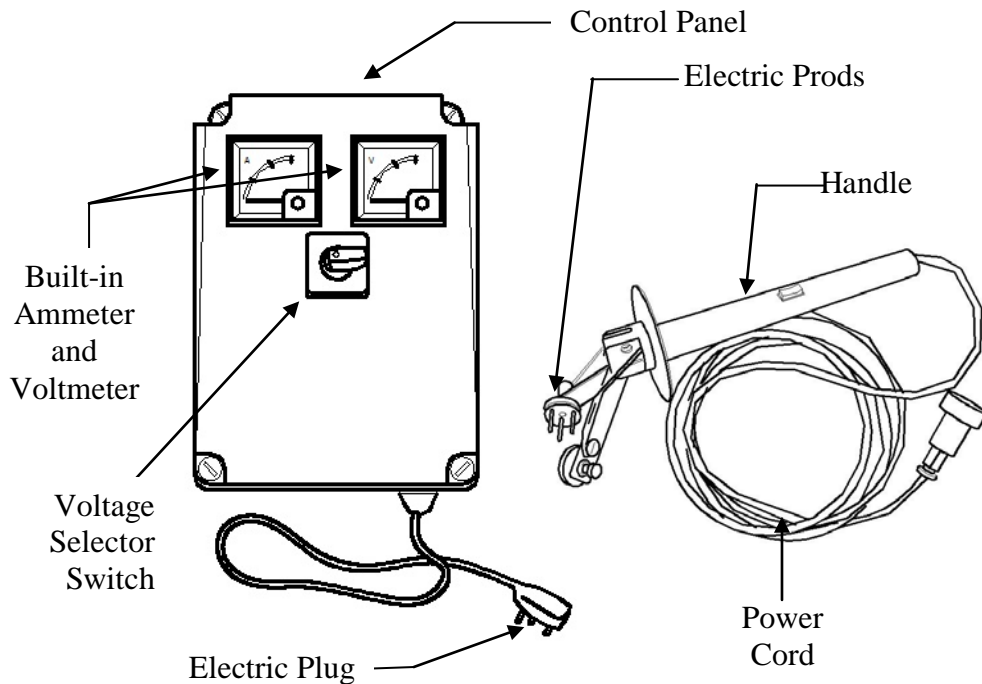


Figure 16. Handheld electrical stunner

4.2.2.3 Portable

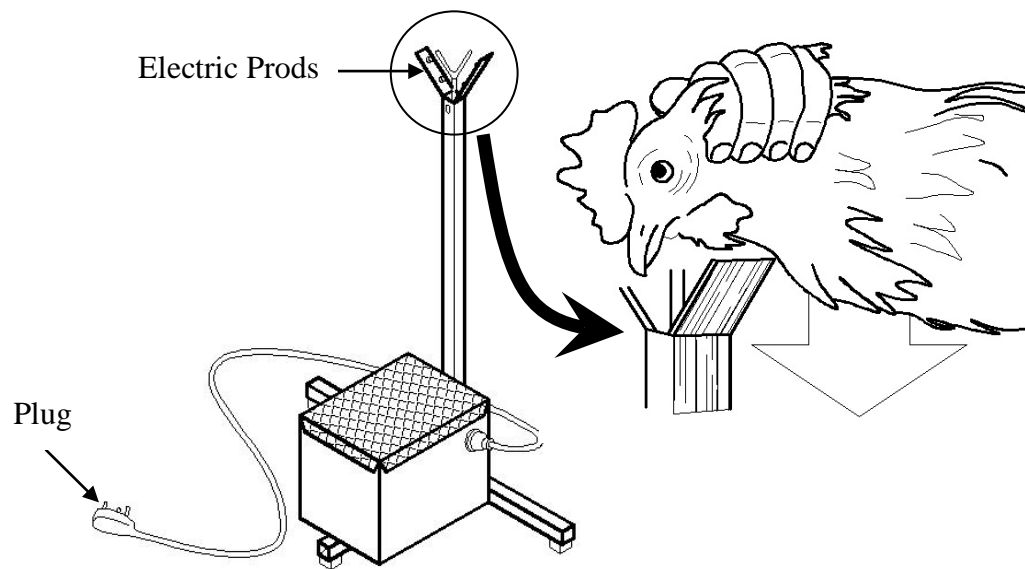


Figure 17. Portable electrical stunner

5 Principle of Operation

The poultry animals, except for ostrich, shall be hung on the shackle for maximum of 3 minutes (hanging time) before stunning to minimize the flapping of the wings thus, decreasing the risk of hemorrhages and bruising.

5.1 Mechanical Stunner

5.1.1 The poultry animal shall be properly restrained. For ostrich, a restraining box shall be used (e.g. Fig. 9). For small poultry animal, lightly hold the comb or sides of the beak between thumb and forefinger.

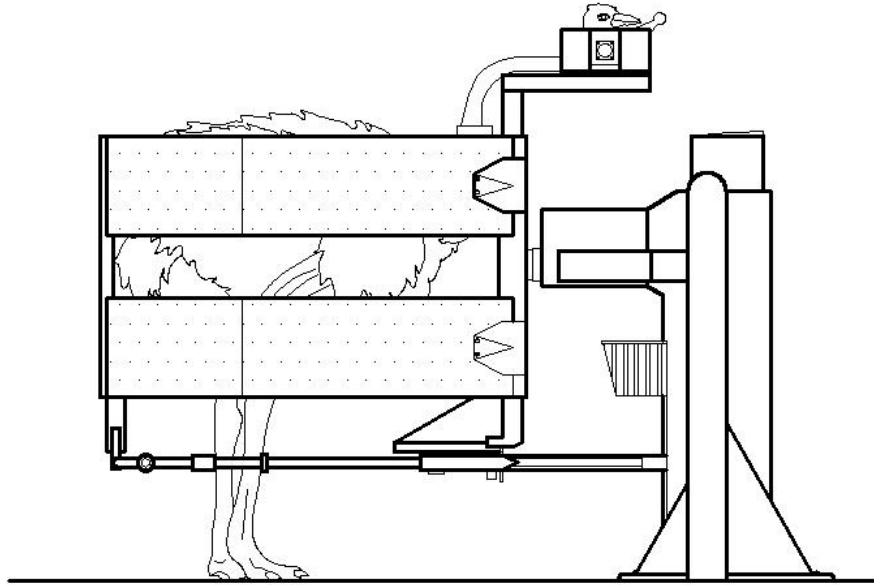


Figure 9. Ostrich restrained before stunning

- 5.1.2** After restraining, stunning shall follow by placing the stunner at right angle to the top of the poultry animal's head (frontal bone) on the midline before firing.

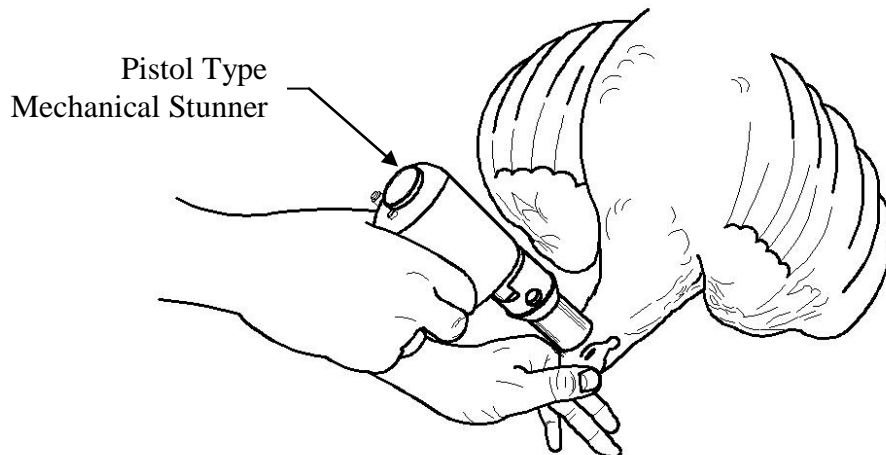


Figure 10. Stunning using pistol type mechanical stunner

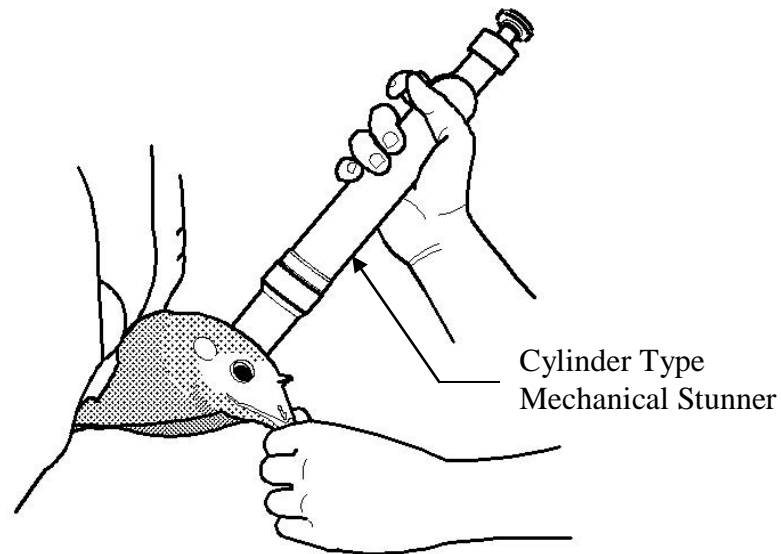


Figure 11. Stunning using cylinder type mechanical stunner

5.1.3 The stunner shall be fired to drive the bolt/cartridge. The poultry animal's head shall be allowed to propel out of the hand upon firing.

5.1.4 For cartridge type stunner, the equipment shall be reloaded for next operation.

5.2 Electrical Stunner

5.2.1 For automatic electrical stunner, the following operation shall be followed:

5.2.1.1 For automatic electrical stunner using water vat

5.2.1.1.1 The poultry animals shall be suspended on the conveyor rail as specified in PAES 531 and/or shall be restrained.

5.2.1.1.2 Switch shall be turned and the level of current to be used shall be set depending on the electrical frequency and the type of the poultry animals to be stunned (Table 1).

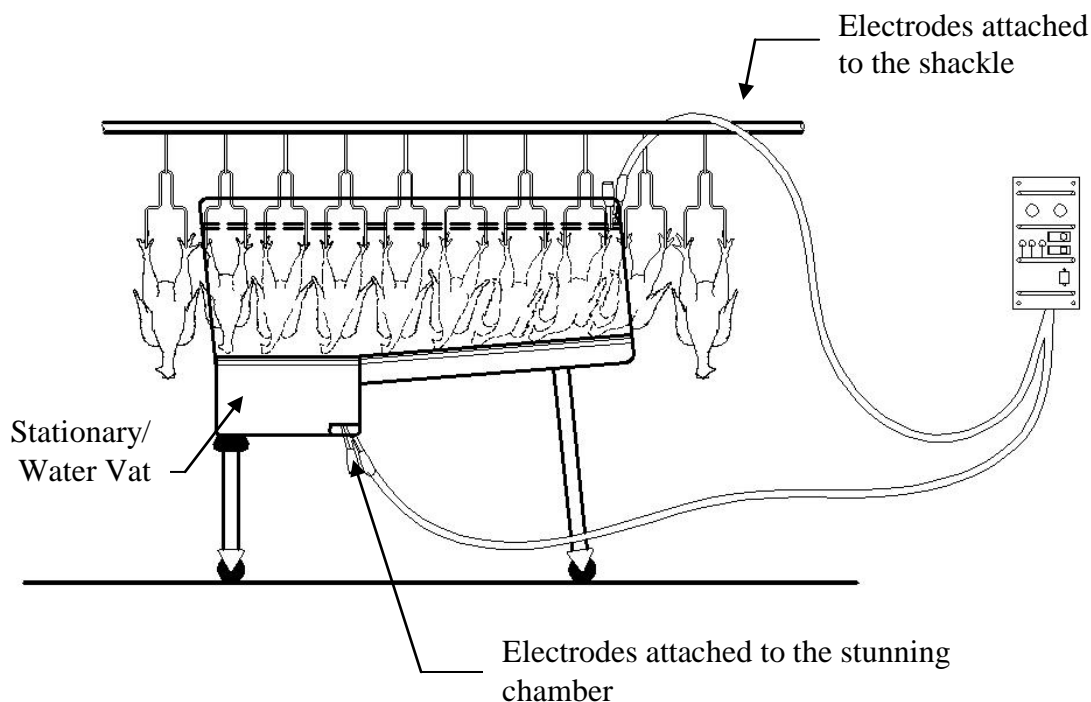


Figure 18. Stunning using stationary water bath electrical stunner

5.2.1.1.3 The poultry animals hanging to the overhead rail shall be submerged up to the base of its wings to the stunner containing water to allow electricity to pass through the poultry animals (Fig. 18).

5.2.1.2 For automatic electrical stunner using electrode assembly

5.2.1.2.1 The moving leg restrainer of the stunner shall be arranged to pass between the poultry animal's legs.

5.2.1.2.2 The legs of the poultry animals shall be shackled and be oriented to face in the same direction.

5.2.1.2.3 The poultry animals shall be conveyed to pass through the electrode assemblies mounted to the overhead track for the stunning operation as shown in Figures 13 and 14.

5.2.1.2.4 The level of current to be used shall be set depending on the electric frequency and the type of the poultry animals to be stunned (Table 1).

5.2.2 For manual electrical stunner, the following operation shall be followed:

5.2.2.1 For handheld electrical stunner

5.2.2.1.1 The neck of the poultry animal shall be lightly held between thumb and forefinger.

- 5.2.2.1.2 The electrodes of the stunner shall be placed and shall be in contact on both sides of the poultry animal's head.

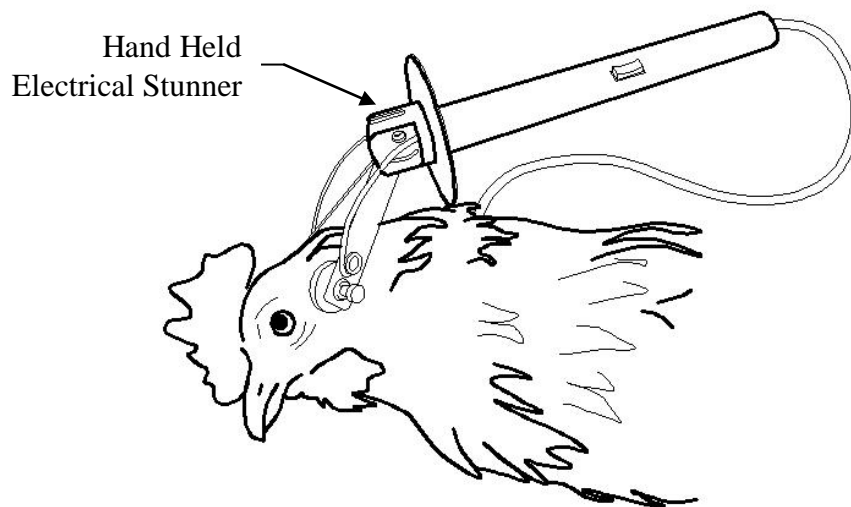


Figure 19. Stunning using handheld electrical stunner

- 5.2.2.1.3 The level of current to be used shall be set depending on the electric frequency and the type of the poultry animal to be stunned (Table 1).

- 5.2.2.1.4 Switch shall be turned on upon securing the head of the poultry animal on the stunner.

- 5.2.2.2 **For wall-mounted and portable electrical stunner, the following operation shall be followed:**

- 5.2.2.2.1 The poultry animal shall be restrained by lightly holding the neck between thumb and forefinger.

- 5.2.2.2.2 The head of the poultry animal shall be placed in contact between the electrodes of the stunner.

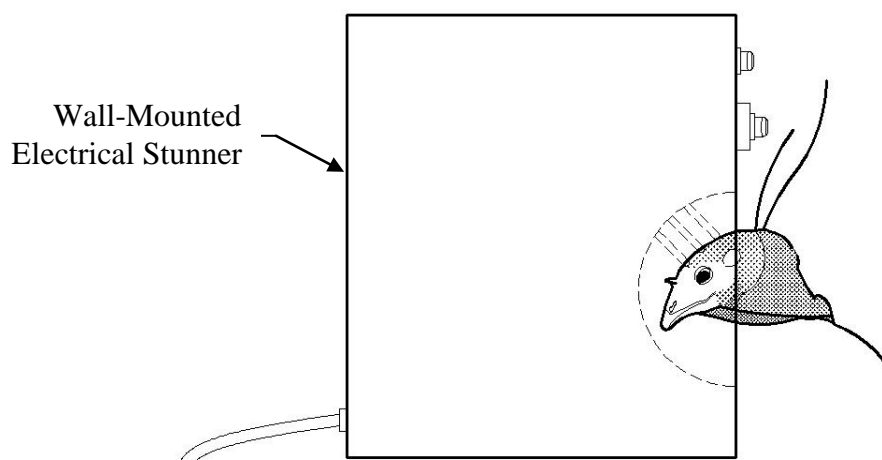


Figure 20. Stunning using wall-mounted electrical stunner

- 5.2.2.2.3 The level of current to be used shall be set depending on the electric frequency and the type of the poultry animal to be stunned (Table 1).
- 5.2.2.2.4 Switch shall be turned on upon securing the head of the poultry animal on the stunner.

6 Manufacturing Requirements

6.1 Mechanical Stunner

The mechanical stunner shall generally consist of barrel, bolt, trigger lock and handle. Parts of the stunner shall be made of non-corrosive material.

- 6.1.1 The bolt shall be made of non-corrosive material (e.g. stainless steel 304 or higher) with diameter ranging from 5 mm to 6 mm (0.197 in to 0.236 in). Penetrating type shall have penetrating rod with maximum length of 10 mm. Maximum diameter of the mushroom-shaped tip of non-penetrating bolt shall be 25 mm (1 in.). The impact energy shall be at least 21 N-m/s² for both penetrating and non-penetrating.
- 6.1.2 Pressure in pneumatic mechanical stunner shall be 620 kPa (90 psi) to 825 kPa (120 psi).
- 6.1.3 The recommended size of the cartridge is 22 mm (0.866 in.) caliber with 1 grain of gunpowder.
- 6.1.4 The bolt shall have a concave piercing bolt tip for penetrating type or a mushroom-shaped bolt head for non-penetrating type.
- 6.1.5 The stunner shall be designed for easy operation.
- 6.1.6 The stunner shall be constructed such that it can be disassembled and reassembled for cleaning and maintenance of moving parts.
- 6.1.7 The barrel or body of the mechanical stunner shall be able to withstand high impact resulting from firing of the equipment during stunning operation. It shall be made from high impact resistant and non-corrosive materials (e.g. stainless steel)
- 6.1.8 Rubber rings shall be installed inside the barrel to minimize the impact created during firing.

6.2 Electrical Stunner

6.2.1 Handheld and Wall-mounted

- 6.2.1.1** The handheld electrical stunner shall consist of control panel (consisting of enclosure, built-in ammeter, built-in voltmeter, and current/voltage selector switches), power cord, electric prods, and handle.
- 6.2.1.2** For handheld, the handle shall be made of hollow round tube that is a non-conductive and a non-corrosive material. The length of the handle shall be at least 300 mm to avoid electrocution of the operator while using the electrical stunner.
- 6.2.1.3** For wall-mounted stunner, the stunning area shall be large enough to accommodate any size of poultry animals and for better contact of poultry animal's head to the electrode assembly.
- 6.2.1.4** The prods or electrodes shall be made from copper or metal that is good conductor of electricity. The distance between the prods of the stunner shall be sufficient to place them on the opposite sides of the head of the poultry animal.
- 6.2.1.5** Insulated button switch shall be installed.
- 6.2.1.6** The size of the power cord shall correspond to the maximum power rating supplied by the stunner.
- 6.2.1.7** Pilot light and/or sound emitting device shall be provided for power signal notification.
- 6.2.1.8** The power control panel shall be designed such that it can be mounted on the wall.
- 6.2.1.9** Electrical power source shall be adjustable to suit the needs of the poultry animals to be stunned.
- 6.2.1.10** Electrical power source should have auto off function to ensure that the device will turn off when not in use.

6.2.2 Stationary and water bath

- 6.2.2.1** The electrical stunner shall consist of control panel (consisting of enclosure, built-in ammeter, built-in voltmeter, and current/voltage selector switches), electrodes, power cord, stunning chamber and water vat.
- 6.2.2.2** The stunning chamber shall be made of non-corrosive materials (e.g. stainless steel 304 or higher or food grade plastic).
- 6.2.2.3** The entry ramp to the vat shall be insulated to avoid pre-electric shocks.

- 6.2.2.4 Height shall be adjustable to accommodate different sizes of poultry animals.
- 6.2.2.5 Valve for filling and draining of water shall be provided for ease of operation.
- 6.2.2.6 Switches shall be insulated.
- 6.2.2.7 The size of the power cord shall correspond to the maximum power rating supplied by the stunner.
- 6.2.2.8 Pilot light and/or sound emitting device shall be provided for power signal notification.
- 6.2.2.9 Enclosure of the control panel shall be splash-proof and shall be made of non-corrosive material (e.g. stainless steel 304 or higher).
- 6.2.2.10 Electrical power source shall be adjustable to suit the needs of the poultry animals to be stunned.
- 6.2.2.11 Electrical power source should have auto off function to ensure that the device will turn off when not in use.

7 Installation Requirements

- 7.1 Base of automatic and stationary electrical stunner shall be securely fastened to the floor. Wall-mounted stunner shall be bolted on the wall having height of 800 mm to 1000 mm (31.5 in. to 39.4 in.).
- 7.2 Stationary and automatic stunner shall be properly installed.
- 7.3 For electrical stunner, wirings and parts that are in contact to the operator shall be properly insulated.

8 Performance Requirements

- 8.1 The stunner shall render all test animal unconscious with a single application for mechanical stunner and for at least 5 seconds for electrical stunner.
- 8.2 The poultry animal stunned shall exhibit the physical signs of effective stunning as follows:
 - 8.2.1 Presence of constant rapid body tremors
 - 8.2.2 Rhythmic breathing shall be absent.
 - 8.2.3 Eyes shall be open and third eyelid reflex shall be absent.
 - 8.2.4 Neck stiffening shall be absent.

- 8.2.5** Legs shall be extended when not shackled.
- 8.2.6** Wings shall be held tightly against the poultry animal's body.
- 8.3** Stunning efficacy shall be at least 90% and stunning efficiency shall be at least 95%.
- 8.4** The electrical stunner shall operate at various settings for different size of poultry animals. Voltage shall be 220 V for alternating current. Table 1 shows the minimum current to be used for specific poultry animal.

Table 1. Minimum current for stunning different poultry animals (Chapter 7.5 of Terrestrial Animal Health Code by World Organization for Animal Health)

| Frequencies | Current (milliamperes per poultry animal) | | | |
|----------------|---|--------------|---------------|---------------|
| | 50 Hz | 51 to 199 Hz | 200 to 400 Hz | 401 to 1500Hz |
| Species | | | | |
| Broilers | 100 | 100 | 150 | 200 |
| Layers | 100 | 100 | 150 | 200 |
| Turkeys | 150 | 250 | 400 | 400 |
| Duck and geese | 130 | - | - | - |
| Quail | 45 | - | - | - |

- 8.5** For ostrich, minimum current level for stunning shall be 400 miliamperes.

9 Safety, Workmanship and Finish

9.1 Mechanical Stunner

9.1.1 Safety

Trigger lock shall be present in the mechanical stunner to avoid accidental firing.

9.1.2 Workmanship

9.1.2.1 Handle shall be made of high impact non-slip material.

9.1.2.2 The blank cartridges shall be delivered in a properly labelled dry packaging

9.1.3 Finish

The barrel and bolt shall have a rust-free finish and shall not be painted.

9.2 Electrical Stunner

9.2.1 Safety

9.2.1.1 The handle of the stunner shall be properly insulated.

- 9.2.1.2 Percent variation of the rated amperage shall be within the range of $\pm 5\%$.
- 9.2.1.3 Double pole switch shall be installed to totally disconnect the stunner from the power source.
- 9.2.1.4 The stunner shall have proper insulation and shall have provision for proper grounding.
- 9.2.1.5 Safety fuse or power overload breakers shall be integrated in the power control system.
- 9.2.1.6 Pilot light and/or sound emitting device shall be provided for power signal notification.
- 9.2.1.7 Double insulated cord shall be used.
- 9.2.1.8 All electrical components shall be water-tight to avoid short circuit.

9.2.2 Workmanship

- 9.2.2.1 The stunner shall be free from any manufacturing defects.
- 9.2.2.2 All welded parts shall be air-tight, smoothly polished, and shall pass visual inspection criteria (AWS D1.1). Welded joints shall not be less than 4 mm (1/8 inch) side fillet welded. Undercut shall not exceed 2 mm (1/16 inch) for any length of weld.

9.2.3 Finish

- 9.2.3.1 Prods and electrodes shall not be painted.
- 9.2.3.2 Parts that are in contact with the animal during the stunning shall be free from foreign materials and shall be easy to clean.

10 Maintenance

- 10.1 An operator's manual which conforms to PAES 102, shall be provided.
- 10.2 Grease points for lubrication of mechanical parts shall be provided. Food grade grease and oil shall be used.
- 10.3 The manufacturer/dealer shall provide tools for cleaning and maintenance.
- 10.4 Manufacturer shall provide maintenance manual which includes calibration of voltmeter and ammeter and proper cleaning and check-up of the equipment.
- 10.5 Tips of electric prods and electrodes shall be regularly cleaned.

- 10.6** The handle of the mechanical and electrical stunner shall have a sturdy, safe and insulated place to be hung.

11 Warranty of Construction and Durability

11.1 Mechanical and Electrical Handheld and Wall-mounted Stunner

Warranty shall be provided for parts within six (6) months and for services within one (1) year after installation and acceptance by the consumer.

11.2 Water-bath and Automatic Electrical Stunner

- 11.2.1** The construction of the stunner shall be rigid and durable without breakdown of its major components within one (1) year after installation and acceptance by the consumer.

- 11.2.2** Warranty shall be provided for parts and services within one (1) year after installation and acceptance by the consumer.

12 Testing and Sampling

The stunner to be tested shall be randomly selected from a lot in accordance with PAES 103. It shall be tested in accordance with PAES 528.

13 Marking and Labelling

- 13.1** Each stunner shall be marked in English with the following information using a plate, stencil or by directly punching it at the most conspicuous part:

- 13.1.1** Brand name or Registered trademark of the manufacturer (optional)

- 13.1.2** Model and/or Serial Number

- 13.1.3** Month and year installed (optional)

- 13.2** The packaging of the stunner shall be labelled with the following information:

- 13.2.1** Name, address and contact number of the manufacturer shall be indicated in the packaging

- 13.2.2** Country of manufacture (if made in other country)/ “Made in the Philippines” (if manufactured locally)

- 13.2.3** Safety precaution markings shall be provided when appropriate. Marking shall be stated in English and Filipino and shall be printed in red color with a white background.
- 13.2.4** Other additional markings shall be provided and shall include the name and address of the importer, if imported (optional).
- 13.3** The markings shall be securely fastened and shall be all-weather resistant. Under normal cleaning procedures, it shall not fade, discolor, crack or blister and shall remain legible.