

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 Services (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 504:2007 Slaughterhouse Equipment – Hog Electric Stunner – Methods of
Test

PAES 516:2008 Slaughterhouse Equipment – Captive Bolt – Methods of Test

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

Electrical Waterbath Stunning of Turkeys.

http://www.aviagenturkeys.com/media/147651/atl_electrical_stunni_000f.pdf<Accessed June 04, 2012>

CONTENTS		Page
1	Scope	3
2	References	B-56
3	Definitions	3
4	General Conditions for Test and Inspection	4
4.1	Role of the manufacturer/dealer	B-57
4.2	Role of the operator	4
4.3	Test site conditions	5
4.4	Test instruments	B-58
4.5	Test material	B-58
4.6	Termination of test	B-58
5	Test and Inspection	B-58
5.1	Verification of technical data and information of the manufacturer	B-58
5.2	Condition of test material	B-58
5.3	Performance test	5
5.4	Test trials	8
6	Formula	8
7	Test Report	9

ANNEXES

A	Suggested List of Minimum Test Instruments	10
B	Specifications of Stunner	11
C	Performance Test Data Sheet	15
D	Formula Used During Calculation and Testing	18

1 Scope

This standard specifies the methods of test and inspection for mechanical and electrical stunner for poultry animals such as chicken, geese, turkeys, ducks, ostriches, and others. Specifically, it shall be used to:

- 1.1** verify the mechanism, dimensions, materials, installation, accessories of the stunner and the list of specifications submitted by the manufacturer;
- 1.2** determine the performance of the device/equipment;
- 1.3** evaluate the ease of operation and safety features;
- 1.4** report the results of the tests

2 References

The following normative documents contain provisions, which through the references in this text constitute provisions of these standards:

PAES 102:2000	Agricultural Machinery – Operator’s Manual – Content and Presentation
PAES 411:2000	Agricultural Structures – Slaughterhouse for Swine, Small and Large Animals – General Requirements
PAES 527:2012	Slaughterhouse Equipment – Poultry Stunner– Specifications

3 Definitions

For the purpose of this standard, the definitions given in PAES 527 and the following shall apply:

3.1

caliber

measure of the bullet’s diameter relative to the bore of the firearm in a pistol type stunner

3.2

extraction length

total length of the bolt measured from the muzzle of the stunner to the tip or head of the bolt

3.3

insensibility

state of an animal's response specifically to pain

3.4

overall weight

total weight of the stunner assembly excluding the blank cartridge or powerload and hose

3.5

stunning efficacy

3.5.1

mechanical

ratio of the number of animals stunned successfully with single application to the total number of animals stunned, expressed in percentage

3.5.2

electrical

ratio of the number of animal stunned successfully within 5 seconds to the total number of animal stunned, expressed in percentage

3.6

stunner efficiency

3.6.1

mechanical

measures the protrusion length consistency of the stunner's bolt with and without load

3.6.2

electrical

measures the consistency of the range of current delivered by the stunner with and without load

4 General Conditions for Test and Inspection

4.1 Role of manufacturer/dealer

The manufacturer shall submit specifications and other relevant information about the stunner and shall abide with the terms and conditions set forth by an official testing agency.

4.2 Role of the operator

An officially designated operator shall be skilled and shall be able to demonstrate, operate, adjust and repair as the case may be related to the operation of the equipment.

4.3 Test site conditions

The stunner shall be tested on site. The site should have ample provisions for material handling, temporary storage and work space conforming to PAES 411.

4.4 Test instruments

The instruments to be used shall have been calibrated and checked by testing agency prior to the conduct of testing. The suggested list of minimum test instruments and materials needed to carry out the stunner test is shown in Annex A.

4.5 Test materials

Test materials to be used shall be of the same species. There shall be at least thirty (30) test materials to conduct the test. For ostrich, one (1) or more test materials shall be used.

4.6 Termination of Test

If there is major component breakdown during testing, the test engineer from the official testing agency shall terminate the test.

5 Test and Inspection

5.1 Verification of technical data and information of the manufacturer

5.1.1 This inspection is carried out to verify the mechanisms, dimensions, materials, and accessories of the stunner in comparison with the list of technical data and information of the manufacturer. The items to be inspected and verified shall be recorded in Annex B.

5.2 Condition of test material

Initial data of the poultry animals shall be obtained prior to testing of the stunner. Data shall be recorded in Annex C.

5.3 Performance test

5.3.1 This is carried out to obtain actual data on overall performance of stunner.

5.3.2 Visual inspection shall be made on the welded parts of the stunner and shall be recorded in Annex C.2.

5.3.3 Electrical Stunner Efficiency

5.3.3.1 The electrical stunner shall be tested for constant delivery of voltage and current. The voltage and current passing through the electric prods shall be measured using voltmeter and ammeter, respectively. Observations shall be

done for 5 seconds per trial. Line voltage and load current shall also be measured.

5.3.3.2 The frequency of the electric stunner shall be measured using an electric frequency meter.

5.3.3.3 The process shall be repeated during the actual stunning involving poultry animals.

5.3.3.4 The stunning efficiency shall be computed using the formula in Annex D.

5.3.4 Mechanical Stunner Efficiency

5.3.4.1 The mechanical stunner shall be tested for constant bolt penetrating length. The length of the bolt protrude to stunner shall be measured. Observations shall be done for 3 trials.

5.3.4.2 The process shall be repeated during the actual stunning involving poultry animals.

5.3.4.3 The stunning efficiency shall be computed using formula in Annex D.

5.3.5 Operation of the Stunner and Stunning Efficacy

5.3.5.1 Mechanical Stunner

The poultry animal shall be properly restrained before stunning. After the hanging duration specified in section 5 of PAES 525, the stunner shall be properly positioned and shall stun the poultry animal instantly. Observation of the physical signs of effective stunning shall be conducted to verify the efficacy of the stunner. This procedure shall be repeated for the succeeding trial(s).

5.3.5.1.1 The stunner shall be placed very firmly against the skull at right angle (90°) to the forehead of the animal.

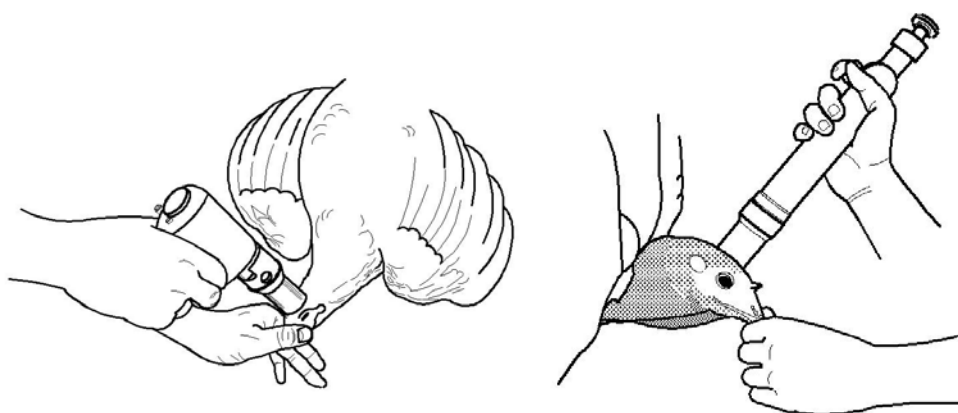


Figure 1. Ideal position for mechanical stunner

5.3.5.1.2 After correctly positioning the stunner on the test animal, it shall be fired once.

5.3.5.1.3 The stunning efficacy shall be computed using the formula in Annex D.

5.3.5.2 Electric Stunner

The body of the poultry animals shall be sprayed with water to improve the electrical conduction. The poultry animals shall be properly restrained and hung as specified in section 5 of PAES 525 and shall be immediately stunned. This procedure shall be repeated for the succeeding trials. The stunning efficacy shall be computed using formula in Annex D.

5.3.5.2.1 Handheld and Wall-Mounted

5.3.5.2.1.1 The electrical stunner shall be tested at the current specified in Table 1 of PAES 525.

5.3.5.2.1.2 The electrical prods/electrodes shall be positioned on the head of the poultry animal to allow the current to pass through the brain.

5.3.5.2.1.3 Time of stunning a single poultry animal shall be taken and recorded in Annex C.

5.3.5.2.1.4 Observations shall be recorded in Annex C.

5.3.5.2.2 Stationary/Waterbath

5.3.5.2.2.1 The current and the voltage shall be set before submerging the poultry animals in the water.

5.3.5.2.2.2 The poultry animals shall be automatically stunned when submerged to the waterbath stunner.

5.3.5.2.2.3 The electrical stunner shall be tested at the current specified in Table 1 of PAES 525.

5.3.5.2.2.4 Time of stunning single batch of poultry animals shall be taken and recorded in Annex C.

5.3.5.2.2.5 Observations shall be recorded in Annex C.

5.3.5.2.3 Automatic Electric Stunner

5.3.5.2.3.1 The current and the voltage shall be set before starting the stunning operation.

5.3.5.2.3.2 The test animals shall be conveyed to the electrode assemblies and shall be automatically stunned.

- 5.3.5.2.3.3** The speed of the conveyor and time to stun a single poultry animal shall be obtained and recorded in Annex C.

5.3.6 Insensibility Test

The poultry animal stunned shall exhibit the physical signs of effective stunning as follows:

- 5.3.6.1** Constant rapid body tremors shall be present.
- 5.3.6.2** Rhythmic breathing shall be absent.
- 5.3.6.3** Eyes shall be open and third eyelid reflex shall be absent.
- 5.3.6.4** Neck stiffening shall be absent.
- 5.3.6.5** Legs shall be extended when not shackled.
- 5.3.6.6** Wings shall be held tightly against the poultry animal's body.
- 5.3.6.7** Observations shall be recorded in Annex C.
- 5.3.6.8** Number of poultry animals successfully stunned shall be gathered.
- 5.3.6.9** The procedure shall be repeated for the succeeding test trials.

5.3.7 Effectiveness of stunning

After the stunning procedure, the poultry animal stunned shall be observed for any signs of recovery as follows:

- 5.3.7.1** Return of rhythmic breathing
- 5.3.7.2** Return of tension in the neck
- 5.3.7.3** Presence of third eyelid reflex
- 5.3.6.4** The recovery time shall be obtained and recorded in Annex C.

5.4 Test Trials

There shall be at least three (3) test trials with ten (10) poultry animals per trial. For ostrich, one (1) test trial shall be used.

6 Formula

The formula to be used during calculations and testing shall be given in Annex D.

7 Test Report

The test report shall include the following information in the order given:

7.1 Title

7.2 Summary

7.3 Purpose and Scope of Test

7.4 Methods of Test

7.5 Description of the Equipment

Table 1 – Equipment Specifications

7.6 Results and Discussions

7.7 Observations (include pictures)

Table 2 – Performance test data

7.8 Name(s), signature(s) and designation of test engineer(s)

Annex A

Suggested List of
Test Instruments and Materials

A.1	Test Poultry Animal Characteristics	Quantity
A.1.1	digital weighing scale, capacity: 20 kg	1
A.1.2	tape measure	1
A.2	Stunner Characteristics	
A.2.1	steel tape	1
A.2.2	weighing scale, capacity: 100 kg	1
A.2.3	vernier caliper: 0.05mm accuracy, 200mm length	1
A.3	Calculations	
	scientific calculator	1
A.4	Current Measurement	
	digital ammeter	1
A.5	Frequency	
	digital frequency meter	1
A.6	Voltage Measurement	
	digital voltmeter	1
A.7	Insensibility Test	
A.7.1	pin	1
A.7.2	digital timer: 60 minutes range, 0.1 second accuracy	1

Annex B

Specifications of Stunner

Name of Applicant/Distributor: _____

Address: _____

Tel No: _____

Name of Manufacturer: _____

Address: _____

Tel No: _____

General Information

Classification: _____

Serial No: _____ Type: _____

Installation date of stunner to be tested (if automatic or stationary): _____

Testing Agency: _____ Test Engineer: _____

Date of Test: _____ Location of Test: _____

Items to be inspected

ITEMS	Manufacturer's Specification	Verification by the Testing Agency
B.1 Mechanical Stunner		
B.1.1 Overall dimensions, mm		
B.1.1.1 length		
B.1.1.2 width		
B.1.1.3 weight, kg		
B.1.2 Materials of construction		
B.1.2.1 main body		
B.1.2.2 muzzle		
B.1.2.3 handle		
B.1.3 Blank cartridge calibre, mm		
B.1.4 Penetrating rod		
B.1.4.1 Dimensions, mm		
B.1.4.1.1 penetrating length		
B.1.4.1.2 diameter		
B.1.4.2 Materials of construction		
B.1.4.3 Weight, kg		
B.1.5 Non-penetrating rod		
B.1.5.1 Dimensions, mm		
B.1.5.1.1 extraction length		
B.1.5.1.2 diameter		
B.1.5.2 Bolt head		
B.1.5.2.1 diameter, mm		
B.1.5.2.2 thickness, mm		
B.1.5.2 Materials of construction		
B.1.5.3 Weight, kg		
B.1.6 Cartridge		

ITEMS	Manufacturer's Specification	Verification by the Testing Agency
B.1.6.1 Size, caliber		
B.1.6.2 Amount of gunpowder, grain		
B.1.7 Range of air pressure, kPa (pneumatic)		
B.2 Electric Stunner		
B.2.1 Control Panel/Power Supply		
B.2.1.1 Voltmeter		
B.2.1.1.1 range, V		
B.2.1.1.2 sensitivity		
B.2.1.2 Ammeter		
B.2.1.2.1 range, A		
B.2.1.2.2 sensitivity		
B.2.1.3 Materials of construction		
B.2.2 Handheld		
B.2.2.1 Materials of construction		
B.2.2.1.1 Prods/Electrodes		
B.2.2.1.2 Neck		
B.2.2.1.3 Handle		
B.2.2.1.4 Cord		
B.2.2.2 Overall Dimensions, mm		
B.2.2.2.1 Prod/electrode length		
B.2.2.2.2 Prod/electrode diameter		
B.2.2.2.3 Neck length		
B.2.2.2.4 Neck diameter		
B.2.2.2.5 Handle length		
B.2.2.2.6 Handle diameter		
B.2.2.2.7 Cord length		
B.2.2.2.8 Cord size		
B.2.3 Wall-mounted		
B.2.3.1 Materials of construction		
B.2.3.1.1 Stunning box		
B.2.3.1.2 Prods/Electrodes		
B.2.3.1.2 Cord		
B.2.3.2 Overall Dimensions, mm		
B.2.3.2.1 Stunning box		
B.2.3.2.1.1 length		
B.2.3.2.1.2 width		
B.2.3.2.1.3 height		
B.2.3.2.2 Prod/electrode length		
B.2.3.2.3 Prod/electrode diameter		
B.2.3.2.4 Cord length		
B.2.3.2.5 Cord size		
B.2.4 Stationary/Waterbath		
B.2.4.1 Materials of construction		

ITEMS	Manufacturer's Specification	Verification by the Testing Agency
B.2.4.1.1 Stunming chamber		
B.2.4.1.2 Frames		
B.2.4.1.3 Power cord		
B.2.4.2 Overall dimensions, mm		
B.2.4.2.1 Stunming chamber		
B.2.4.2.1.1 length		
B.2.4.2.1.2 width		
B.2.4.2.1.3 height		
B.2.4.2.2 Frames		
B.2.4.2.2.1 length		
B.2.4.2.2.2 width		
B.2.4.2.2.3height		
B.2.4.2.2.4thickness		
B.2.4.2.3 Power cord		
B.2.4.2.3.1 length		
B.2.4.2.3.2 size		
B.2.5 Automatic		
B.2.5.1 Electrode assembly		
B.2.5.1.1 Main member		
B.2.5.1.1.1 Material of construction		
B.2.5.1.1.2 Dimensions, mm		
B.2.5.1.1.2.1 length		
B.2.5.1.1.2.2 width		
B.2.5.1.1.2.3 thickness		
B.2.5.1.2 Conducting shoe		
B.2.5.1.2.1 Material of construction		
B.2.5.1.2.2 Dimensions, mm		
B.2.5.1.2.2.1 length		
B.2.5.1.2.2.2 width		
B.2.5.1.2.2.3 thickness		
B.2.5.1.3 Insulating material used		
B.2.5.1.4 Electrodes		
B.2.5.1.4.1 Material of construction		
B.2.5.1.4.2 Dimensions, mm		
B.2.5.1.4.2.1 length		
B.2.5.1.4.2.2 width		
B.2.5.1.4.2.3 thickness		
B.2.5.2 Electrode rail		
B.2.5.2.1 Material of construction		
B.2.5.2.2 Dimensions, mm		
B.2.5.2.2.1 length		
B.2.5.2.2.2 width		
B.2.5.2.2.3 thickness		
B.2.5.5 Conveyor		

ITEMS	Manufacturer's Specification	Verification by the Testing Agency
B.2.5.5.1 Materials of construction		
B.2.5.5.2 Dimensions, mm		
B.2.5.5.2.1 length		
B.2.5.5.2.2 width		
B.2.5.5.2.3 height from ground		
B.2.6 Operating frequency, Hz		
B.3 Other Observations		
B.3.1 Safety features, specify		
B.3.2 Other features, specify:		

B.4 Welding Acceptance test	Remarks/Observations
B.4.1 Crack prohibition	
B.4.2 Weld/base-metal fusion	
B.4.3 Crater cross section	
B.4.4 Weld profile	
B.4.5 Time of inspection	
B.4.6 Undersize welds (if any)	
B.4.7 Undercut	
B.4.8 Porosity (presence of air holes on the welded part)	

Annex C

Performance Test Data Sheet

Test Engineer: _____ Date: _____
 Assistants: _____ Location: _____
 Test Location: _____
 Test Requested by: _____
 Manufacturer: _____

	Trial			Average
	1	2	3	
C.1 Information on the Test Materials				
C.1.1 Type				
C.2 Observation before and after stunning	Remarks/Observations			
C.2.1 Safety				
C.2.2 Ease of cleaning parts				
C.2.3 Ease of adjusting and repair of parts				
C.2.4 Statically balance (for stationary/water bath or automatic)				
C.2.5 Dynamically balance (for automatic)				

C.3 Stunner Efficiency

	Trial 1			Trial 2			Trial 3		
	1	2	3	1	2	3	1	2	3
C.3.1 Without poultry animal									
C.3.1.1 Electric Stunner									
C.3.1.1.1 Test for constant current and voltage delivered (electrical)									
C.3.1.1.1.1 Frequency, Hz									
C.3.1.1.1.2 Voltage, V									
C.3.1.1.1.3 Current, A									
C.3.1.1.1.4 Coefficient of variance, %									
C.3.1.1.1.5 Stunner efficiency, %									
C.3.1.2 Mechanical Stunner									

	Trial 1			Trial 2			Trial 3		
	1	2	3	1	2	3	1	2	3
C.3.1.2.1.1 Length of penetrating rod, mm									
C.3.1.2.1.2 Coefficient of variance, %									
C.3.1.2.1.3 Stunner Efficiency, %									
C.3.2 With poultry animal									
C.3.2.1 Electrical Stunner									
C.3.2.1.1 Test for constant current and voltage delivered (electrical)									
C.3.2.1.1.1 Frequency, Hz									
C.3.2.1.1.2 Voltage, V									
C.3.2.1.1.3 Current, A									
C.3.2.1.1.4 Coefficient of variance, %									
C.3.2.1.1.5 Stunner Efficiency, %									
C.3.2.2 Mechanical Stunner									
C.3.2.2.1 Test for constant protrusion length (mechanical)									
C.3.2.2.1.1 Length of penetrating rod, mm									
C.3.2.2.1.2 Coefficient of variance, %									
C.3.2.2.1.3 Stunner efficiency, %									

C.4 Stunning Efficacy

	Trial		
	1	2	3
C.4.1 Mechanical Stunner			
C.4.1.1 Total of poultry animal stunned			
C.4.1.2 No. of successfully stunned animal with single application (if mechanical)			
C.4.1.3 Stunning efficacy, %			
C.4.1.4 Recovery time of the poultry animal after being stunned, s			

	Trial		
	1	2	3
C.4.2.1 Total of poultry animal stunned			
C.4.2.3 No. of successfully stunned animal within 5 seconds per application (if electrical)			
C.4.2.4 Stunning efficacy, %			
C.4.2.5 Time required to stun a single poultry animal (if hand-held, wall-mounted or automatic electric stunner)			
C.4.2.6 Time required to stun one batch of poultry animals (if waterbath)			
C.4.3 Other comments and observations:			

C.5 Insensibility	Remarks/Observations*		
	Trial 1	Trial 2	Trial 3
C.5.1 Rhythmic breathing			
C.5.2 Third eyelid reflex			
C.5.3 Neck stiffening			
C.5.4 Legs extended when not shackled			
C.5.5 Constant rapid body tremors			
C.5.6 Wings held tightly against body			
C.5.4 Other observations:			
C.6 Recovery			
C.6.1 Return of rhythmic breathing			
C.6.2 Return of tension in the neck			
C.6.3 Presence of third eyelid reflex			
C.6.4 Other observations:			
C.6.4 Time of recovery after stunning, s			

* Present or Absent

C.8 Other Observations:

Annex D

Formula Used During Calculations and Testing

D.1 Coefficient of Variation of Current (for Electrical Stunner) and Length of Protrusion (for Mechanical Stunner)

$$CV = \frac{s}{M}$$

$$\text{Mean of } x = M = \frac{\sum x_j}{n}$$

$$s = \sqrt{s^2}$$

$$s^2 = \frac{\sum x_j^2 - n(M^2)}{n-1}$$

where:

CV	=	coefficient of variation
s	=	standard deviation
s ²	=	variance
x _j	=	individual sample
n	=	total number of samples
M	=	mean of x (current or length of protrusion)

D.2 Stunner Efficiency (for electrical) – with and without load

$$E_{ff} = 100 - CV$$

where:

E _{ff}	=	efficiency of the stunner, %
CV	=	coefficient of variation of current

D.3 Stunner Efficiency (for mechanical) – with and without load

$$E_{ff} = 100 - CV$$

where:

E_{ff}	=	efficiency of the stunner, %
CV	=	coefficient of variation of protrusion length

D.4 Stunning Efficacy (for mechanical)

$$E_f = \frac{H_p}{H_s} \times 100$$

where:

E_f	=	efficacy of the stunner, %
H_p	=	number of animal stunned successfully with single application
H_s	=	total number of animal stunned

D.5 Stunning Efficacy (for electrical)

$$E_f = \frac{H_p}{H_s} \times 100$$

where:

E_f	=	efficacy of the stunner, %
H_p	=	number of animal stunned successfully within 5 seconds to the total number of animal stunned, expressed in percentage
H_s	=	total number of animal stunned