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 Large Ruminants" which was funded by the 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:

European Food Safety Authority. 2004. Welfare Aspects of Animal Stunning and Killing Methods. Scientific Report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of animal stunning and killing methods. pp 82 – 95.

Australian Veterinary Emergency Plan. 2006. Destruction of Animals. A Manual of Techniques of Humane Destruction. Operational Procedures Manual. V.3. pp. 16-17, 24-25.

Grandin T. G. 2001. Livestock- Handling Quality Assurance. J. Animal Sci. 79. (E. Suppl.):E239–E248

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.

Grandin, T. and P.G. Chambers. 2001. Guidelines for humane handling, transport and slaughter of livestock. Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific. Pp. 55-60.

Meat Technology Update.1999. Stunning of Cattle. Food Science Australia.99/2.5 pp.

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.

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ANNEXES

Slaughterhouse Equipment – Captive Bolt– Methods of Test

1 Scope

This standard specifies the methods of test and inspection for captive bolt used for rendering a large ruminant unconscious prior to sticking and bleeding. Specifically, it shall be used to:

1.1 verify the mechanism, dimensions, materials, accessories of the captive bolt and the list of specifications submitted by the manufacturer;

1.2 determine the performance of the device;

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 reference 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 515:2008	Slaughterhouse Equipment – Captive Bolt – Specifications

3 Definitions

For the purpose of this standard, the definitions given in PAES 515 and the following shall apply:

3.1
caliber
measure of the bullet's diameter relative to the bore of the firearm

3.2
extraction length
total length of the bolt measured from the muzzle of the captive bolt to the tip or head of the bolt

3.3
insensibility
state of an animal's response specifically to pain

3.4
overall length
total length of the captive bolt measured from the bolt head or tip to the opposite end of the equipment including all protruding parts

3.5
overall weight
total weight of the captive bolt assembly excluding the blank cartridge or powerload and hose

3.6
stunning efficacy
ratio of the number of animals stunned successfully with single application to the total number of animals stunned, expressed in percentage

3.7
vocalization
animal sound such as bellowing in cattle

4 General Conditions for Test and Inspection

4.1. Role of manufacturer/dealer

The manufacturer shall submit the operator's manual for captive bolt conforming to PAES 102 and shall abide with the terms and conditions set forth by the official testing agency.

4.2. Role of the representative of the manufacturer/dealer

An officially designated representative of the manufacturer shall be skilled and shall be able to demonstrate, operate, adjust and repair matters related to the operation of the equipment.

4.3. Test site conditions

The captive bolt shall be tested on site. The site should have ample provisions for material handling, temporary storage and workspace conforming to PAES 411.

4.4. Test instruments

The suggested list of minimum test instruments needed to carry out the captive bolt test is shown in Annex A.

4.5. Test material

The test animal to be used shall have a live weight of at least 500 kg. There shall be at least three (3) animals to conduct the test.

4.6 Termination of test

If during the test, the captive bolt stops malfunctions due to major component breakdown, the test engineer shall terminate the test.

5 Test and Inspection

5.1. Verification of the manufacturer's technical data and information

This inspection is carried out to verify the mechanism, dimensions, materials and accessories of the captive bolt in comparison with the list of manufacturer's technical data and information. Inspection of the minor components of the captive bolt shall also be conducted.

5.2. Condition of test material

Initial data of the animal shall be obtained prior to testing of the captive bolt. Data shall be recorded in Annex C.

5.3. Performance test

This is carried out to obtain actual data on overall performance of the equipment.

5.3.1 Operation of the captive bolt

The animal shall be properly restrained before stunning. The captive bolt shall be properly positioned and shall stun the animal instantly. Observation of the physical signs of effective stunning shall be conducted to verify the efficacy of the captive bolt. This procedure shall be repeated for the succeeding trial(s).

5.3.1.1 The captive bolt shall be placed very firmly against the skull at right angle (90°) to the forehead of the animal (Fig.1).

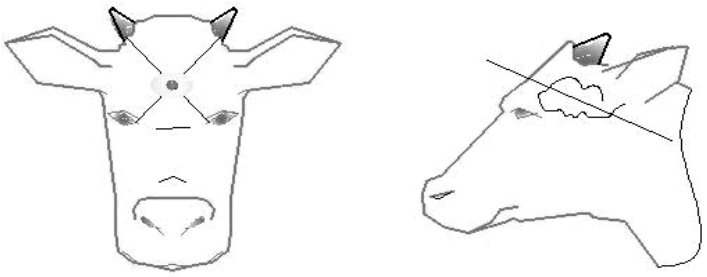

Figure 1a. Ideal position for captive bolt pistol stunning for penetrating type

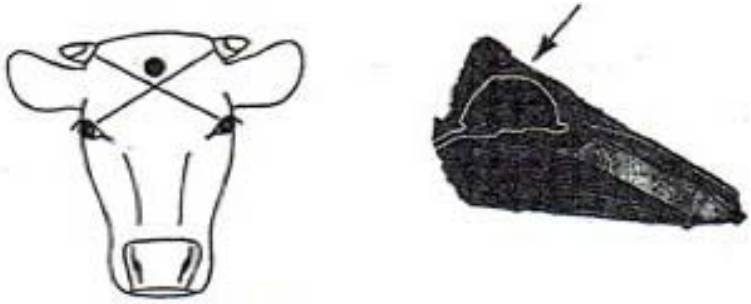

Figure 1b. Ideal position for captive bolt pistol stunning for non-penetrating type

5.3.1.2 After correctly positioning the captive bolt on the test animal, it shall be fired once.
5.3.1.3 The efficacy of the captive bolt shall be computed using the formula in Annex D.

5.3.2 Insensibility test

The animal stunned with the captive bolt shall exhibit the physical signs of effective stunning as follows:

5.3.2.1 The animal shall collapse instantly.

5.3.2.2 Rhythmic breathing shall be absent.

5.3.2.3 Eyes shall be fixed and shall have a glazed expression.

5.3.2.4 Corneal reflexes shall be absent.

5.3.2.5 The jaw of the animal shall be relaxed.

5.3.2.6 The tongue of the animal shall be hanging out.

5.3.2.7 Vocalization shall be observed.

5.3.2.8 Observations shall be recorded in Annex C.

5.3.2.9 This procedure shall be repeated for the succeeding test trials.

5.4 Test trial

There shall be three (3) test trials with one animal per trial.

6 **Test Report**

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

6.1 Title

6.2 Summary

6.3 Purpose and Scope of Test

6.4 Methods of Test

6.5 Description of the Machine

Table 1 – Machine Specifications

6.6 Results and Discussions

6.7 Observations (include pictures)

Table 2 –Performance test data

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

Annex A

Suggested List of Minimum Test Instruments

Items	Quantity
A.1 Test animal characteristics	
weighing scale, capacity: 1000 kg	1
tape measure, capacity: 3 m	1
A.2 Overall Dimension	
A.2.1 steel tape, capacity: 5 m	1
A.2.2 weighing scale, capacity: 10 kg	1
A.3 Pressure	
pressure gauge: 0-20 bars	1
A.4 Captive bolt characteristics	
A.4.1 Vernier caliper: 0.05mm accuracy, 200mm length	1
A.4.2 weighing scale, capacity: 500 g	1
A.5 Calculations	
scientific calculator	1

Annex B
(informative)

Specifications of Captive bolt

Name of Applicant/ Distributor: _____
Address: _____
Tel No: _____
Name of Manufacturer: _____
Address: _____
Tel No: _____

GENERAL INFORMATION

Make: _____ Type: _____
Serial No: _____ Brand/Model: _____
Production Date of Captive Bolt to be Tested: _____
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 Overall dimensions		
B.1.1 overall length, mm		
B.1.2 overall weight, kg		
B.2 Material		
B.2.1 main body		
B.2.2 muzzle		
B.2.3 handle		
B.3 Blank cartridge caliber, mm		
B.4 Penetrating rod		
B.4.1 extraction length, mm		
B.4.2 diameter, mm		
B.4.3 material		
B.4.4 weight, kg		
B.5 Non- penetrating rod		
B.5.1 extraction length, mm		
B.5.2 diameter, mm		
B.5.3 material		
B.5.4 weight, kg		

B.6 Other observations	**Remarks**
B.6.1 safety features	
B.6.2 ease of disassembling	
B.6.3 Others:	

ANNEX C

Performance Test Data Sheet

Items to be Measured and Inspected

C.1 Test Material	**Remarks**			
C.1.1 breed of animal				
C1.2 animal condition	**Trials**			
	1	**2**	**3**	**Ave**
C.1.1 weight of animal, kg				
C.1.2 girth of animal, cm				
C.1.3 length of animal, cm				

C.2 Insensibility *	**Trials**			
	1	**2**	**3**	**Ave**
C.2.1 head insensibility				
C.2.2 corneal reflexes and eye expressions				
C.2.3 rhythmic breathing				
C.2.4 relaxed jaw				
C.2.5 tongue hanging out				
C.2.5 vocalization				
C.2.6 other observations:				

C.3 Captive bolt data sheet	**Remarks**
C.3.1 Total no. of animal stunned	
C.3.2 No. of successfully stunned animal with single application	
C.3.3 Stunning efficacy, %	
C.3.4 Other comments:	

***** 1 – yes 2 – no

ANNEX D

Formula Used During Calculation and Testing

D.1 Stunning Efficacy

$$Ef = \frac{Hp}{Hs} \quad x\ 100$$

where:

Ef efficacy of the stunner, %

Hp number of animal stunned successfully with single application

Hs total number of animal stunned