

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.

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1 Scope

This standard specifies the methods of test and inspection for hog restrainer used to secure the animal movements prior to stunning. Specifically, it shall be used to:

- 1.1** verify the mechanism, dimensions, materials, accessories of the hog restrainer and the list of specifications submitted by the fabricator;
- 1.2** determine the performance of the machine;
- 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 407:2001 Agricultural Structures – Slaughterhouse for Swine, Small and Large Animals – General Requirements

PAES 501:2007 Slaughterhouse Equipment – Hog Restrainer - Specifications

3 Definitions

For the purpose of this standard, the definitions given in PAES 501 and the following shall apply:

3.1

bore

diameter of the piston inside the cylinder

3.2

breed

species of hog used as test material

3.3

bruises

physical damages or wounds on the skin of the test hog caused by the restraining equipment

3.4

dumping angle

optimum angle that the discharge wall can tilt measured from its initial position up to its dumping position

3.5

dumping position

position of the discharge wall that allows discharge of stunned hog from the restrainer

3.6

dumping time

time it takes the semi-automatic restrainer to tilt the discharge wall

3.7

girth

measurement around the hog's body just behind the forelegs that is used to compute for the estimated weight of the hog in the absence of the scale

3.8

live weight

weight of hog prior to slaughter

3.9

overall height

measurement from the top of the walls of restraining equipment to its base

3.10

overall length

measurement from the gate of the restrainer to the opposite end of the equipment including all the protruding parts (e.g. dumping lever, etc.)

3.11

overall width

measurement between the side wall of the hog restraining equipment and the discharge wall in its original position

4 General Conditions for Test and Inspection

4.1 Role of fabricator/dealer

The fabricator shall submit the operator's manual for hog restrainer 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 hog restrainer shall be tested as installed in the slaughterhouse. The site should have ample provisions for material handling, temporary storage and workspace conforming to PAES 407.

4.4 Test instruments

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

4.5 Test material

The hogs that shall be used for testing of the equipment shall have a body length of 1.2 m to 1.5 m and shall have a live weight of at least 75 kg to 250 kg depending on the capacity of the machine as specified by the fabricator.

4.6 Quantity to be supplied

The live weight of hogs that shall be used in performing the test shall depend on the fabricator's specified minimum and maximum weight capacity of the hog restrainer. At least three (3) hogs with live weight that falls in the minimum limit and at least three (3) with live weight falling under the maximum limit shall be used. The operators shall be skilled to perform the test.

4.7 Termination of test

If during the test run, the hog restrainer encounters major component breakdown or malfunctions, the test engineer shall terminate the test.

5 Test and Inspection

5.1 Verification of the fabricator's technical data and information

This inspection is carried out to verify the mechanism, dimensions, materials and accessories of the hog restrainer in comparison with the list of fabricator's technical data and information presented in Annex B.

5.2 Performance test

5.2.1 This is carried out to obtain actual data on overall machine performance.

5.2.2 Measurement of initial data

Initial data, such as weight of the test hogs shall be obtained and recorded in Annex C first before the test operation.

5.2.3 Operation of the hog restrainer

5.2.3.1 The hog restrainer shall be tested by performing actual restraining and stunning of the test hogs. After the stunning process, the test hogs shall be inspected for bruises, hemorrhages or hematoma to confirm the possible injuries incurred in the restraining and stunning process.

5.2.3.2 Inspection of the output carcass after splitting shall be conducted.

5.2.3.3 This procedure shall be repeated for the succeeding trial(s).

5.2.3.4 Manually operated

5.2.3.4.1 The entrance gate shall be opened.

5.2.3.4.2 The test hog shall be allowed to enter the restrainer for stunning.

5.2.3.4.3 The drop floor shall be released to disengage the animal.

5.2.3.4.4 The dump lever shall be lowered to tilt the discharge wall to release the hog.

5.2.3.4.5 The discharge wall shall be reset to its upright position after removing the stunned hog.

5.2.3.4.6 The drop floor shall be raised and locked again for the next animal.

5.2.3.4.7 Inspection of the output carcass shall be performed after the slaughtering process for the presence of broken legs or ribs and presence of blood clots.

5.2.3.4.8 The noise emitted by the hog restrainer shall be measured 50 mm away from the operator's ear level.

5.2.3.4.9 Observations shall be recorded in Annex C.

5.2.3.5 Semi-automatic

5.2.3.5.1 The hog shall be allowed to enter the entrance gate of the hog restrainer.

5.2.3.5.2 The floor lock shall be released to lower the drop floor.

5.2.3.5.3 The hog shall be stunned then the discharge wall shall be tilted to release the hog from the restrainer by opening the valve to allow fluid to flow into the cylinder.

5.2.3.5.4 The actual pressure reading on the gauge shall be noted and shall be compared to the operating pressure specified by the fabricator.

5.2.3.5.5 The dumping time of the hog restrainer shall be obtained.

5.2.3.5.6 Inspection of the output carcass shall be performed after the slaughtering process for the presence of broken legs or ribs and presence of blood clots.

5.2.3.5.7 The noise emitted by the hog restrainer shall be measured 50 mm away from the operator's ear level.

5.2.3.5.8 The capacity of the restrainer shall be computed using the formula in Annex E.

5.2.3.5.9 All data shall be recorded in Annex C.

5.2.3.5.10 The same procedure shall be done for the next set of hogs.

5.2.3.6 Automatic

5.2.3.6.1 The hogs shall be allowed to enter the gate of the restrainer continuously as specified by the fabricator.

5.2.3.6.2 The hog shall be restrained by the equipment by allowing the conveyor to support the hog's body.

5.2.3.6.3 The conveyor shall move the hog into the stunning area to render the animal unconscious.

5.2.3.6.4 The hog shall be stunned and shall be discharged out of the restrainer.

5.2.3.6.5 Sticking shall be done immediately and the output carcass shall be inspected.

5.2.3.6.6 Presence of broken legs and ribs shall be noted.

5.2.3.6.7 Speed of the conveyor when loaded with hog shall be noted and shall be compared with the indicated speed by the fabricator.

5.2.3.6.8 Percent speed reduction shall be computed using the formula in Annex E.

5.2.3.6.9 The capacity of the restrainer shall be computed using the formula in Annex E.

5.2.3.6.10 All data shall be recorded in Annex C.

5.2.3.6.11 The same procedure shall be done for the next set of hogs.

5.2.4 Performance after test

The equipment shall be tested for performance after the slaughtering process. All data shall be recorded in Annex D.

5.2.4.1 Manual type

5.2.4.1.1 The dumping angle shall be obtained and shall be compared with the dumping angle without load.

5.2.4.1.2 The noise level shall be obtained and shall be compared with the initial noise level without load.

5.2.4.1.3 Welded joints shall be checked for detachments.

5.2.4.2 Semi- automatic type

5.2.4.2.1 The dumping angle shall be obtained and shall be compared with the dumping angle without load.

5.2.4.2.2 The noise level shall be obtained and shall be compared with the initial noise level without load.

5.2.4.2.3 Welded joints shall be checked for detachments.

5.2.4.2.4 The dumping time shall be obtained and shall be compared with the initial dumping time.

5.2.4.2.5 The operating pressure shall be noted and shall be compared with the initial operating pressure.

5.2.4.3 Automatic type

5.2.4.3.1 The conveyor speed shall be observed and shall be compared with initial conveyor speed.

5.3 Test Trial

There shall be at least three (3) trials for the each set of weight capacity.

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 Minimum List of Test Equipments

Items	Quantity
A.1 Test hog characteristics	
A.1.1 weighing scale, capacity: 500 kg	1
A.1.2 tape measure, capacity: 5 ft (1.52 m)	1
A.1.3 camera	1
A.2 Overall dimension	
A.2.1 caliper	1
A.2.2 steel tape, capacity: 5m	1
A.3 Dumping time	
timer	1
A.4 Dumping angle	
protractor	1
steel tape, capacity: 5m	1
A.5 Calculations	
scientific calculator	1
A.6 Noise Level	
noise level meter	1

Annex B
(informative)

Specifications of Hog Restrainer

Name of Dealer/ Importer: _____
 Address: _____
 Tel No: _____
 Name of Fabricator: _____
 Address: _____
 Tel No: _____

GENERAL INFORMATION

Classification: _____ Maximum Weight Capacity: _____
 Serial No: _____ Brand/Model: _____
 Production date of Hog restrainer to be tested: _____
 Testing Agency: _____ Test Engineer: _____
 Date of Test: _____ Location of Test: _____

Items to be inspected

ITEMS	Fabricator's Specification	Verification by the Testing agency
B.1 Manually Operated		
B.1.1 Main structure		
B.1.1.1 Overall dimensions		
B.1.1.1.1 length, mm		
B.1.1.1.2 width, mm		
B.1.1.1.3 height, mm		
B.1.1.2 Construction material		
B.1.2 Entrance gate		
B.1.2.1 Overall dimensions		
B.1.2.1.1 height, mm		
B.1.2.1.2 weight, kg		
B.1.2.2 Counterweight		
B.1.2.2.1 mass, kg		
B.1.2.2.2 material		
B.1.3 Drop floor		
B.1.3.1 Material		
B.1.3.2 Dimensions		
B.1.3.2.1 height from the floor, mm		
B.1.3.2.2 thickness, mm		
B.1.3.2.3 width, mm		
B.1.3.2.4 length, mm		
B.1.3.3 Reinforcements		
B.1.3.3.1 construction material		
B.1.3.3.2 thickness, mm		

ITEMS	Fabricator's Specification	Verification by the Testing agency
B.1.3.3.3 interval, mm		
B.1.4 Restrainer wall		
B.1.4.1 Material		
B.1.4.2 Dimensions		
B.1.4.2.1 length, mm		
B.1.4.2.2 height, mm		
B.1.4.2.3 angle of inclination		
B.1.5 Dump lever		
B.1.5.1 Material		
B.1.5.3 Length of lever arm, mm		
B.1.6 Floor lock		
B.1.6.1 Material		
B.1.6.2 Dimension		
B.1.6.2.1 thickness, mm		
B.1.6.2.2 length of lever arm, mm		
B.1.7 Discharge wall		
B.1.7.1 Material		
B.1.7.2 Dimensions		
B.1.7.2.1 length, mm		
B.1.7.2.2 angle of inclination, deg		
B.1/7.2.3 dumping angle, deg		
B.2 Semi-automatic		
B.2.1 Main structure		
B.2.1.1 Overall dimensions		
B.2.1.1.1 length, mm		
B.2.1.1.2 width, mm		
B.2.1.1.3 height, mm		
B.2.1.2 Construction material		
B.2.2 Entrance gate		
B.2.2.1 Overall dimensions		
B.2.2.1.1 height, mm		
B.2.2.1.2 weight, kg		
B.2.2.2 Counterweight		
B.2.2.2.1 mass, kg		
B.2.2.2.2 material		
B.2.3 Drop floor		
B.2.3.1 Material		
B.2.3.2 Dimensions		
B.2.3.2.1 height from the floor, mm		
B.2.3.2.2 thickness, mm		
B.2.3.2.3 width, mm		
B.2.3.2.4 length, mm		
B.2.3.3 Reinforcements		
B.2.3.3.1 construction material		
B.2.3.3.2 thickness, mm		

ITEMS	Fabricator's Specification	Verification by the Testing agency
B.2.3.3.3 interval, mm		
B.2.4 Restrainer wall		
B.2.4.1 Material		
B.2.4.2 Dimensions		
B.2.4.2.1 length, mm		
B.2.4.2.2 height, mm		
B.2.4.2.3 angle of inclination, deg		
B.2.5 Floor lock		
B.2.5.1 Material		
B.2.5.2 Dimension		
B.2.5.2.1 thickness, mm		
B.2.5.2.2 length of lever arm, mm		
B.2.6 Discharge wall		
B.2.6.1 Material		
B.2.6.2 Dimensions		
B.2.6.2.1 length, mm		
B.2.6.2.2 angle of inclination, deg		
B.2.6.2.3 dumping angle, deg		
B.2.7 Cylinder		
B.2.7.1 Type		
B.2.7.2 Bore, mm		
B.2.7.3 Stroke, mm		
B.2.7.4 Operating pressure range, Pa		
B.3 Automatic		
B.3.1 Main structure		
B.3.1.1 Overall dimensions		
B.3.1.1.1 length, mm		
B.3.1.1.2 width, mm		
B.3.1.1.3 height, mm		
B.3.1.2 Construction material		
B.3.2 Entrance gate		
B.3.2.1 Height, mm		
B.3.2.2 Width, mm		
B.3.3 Entrance ramp		
B.3.3.1 Slope		
B.3.3.2 Length, mm		
B.3.3.3 Thickness, mm		
B.3.3.4 Width, mm		
B.3.3.5 Construction material		
B.3.4 Hold Down Rack		
B.3.4.1 Length, mm		
B.3.5 Conveyor		
B.3.5.1 Length, mm		
B.3.5.2 Width, mm		
B.3.5.3 Speed, m/s		

ITEMS	Fabricator's Specification	Verification by the Testing agency
B.3.6 False floor		
B.3.6.1 Length, mm		
B.3.6.2 Width, mm		
B.3.6.3 Slope, deg		
B.4 Welding points		
B.4.1 Texture/ Finish		
B.4.2 Type		

ANNEX C

Performance Test Data Sheet

Items to be Measured and Inspected

ITEMS	Trials			Average
	1	2	3	
C.1. Hog characteristics				
C.1.1 minimum weight level				
C.1.1.1 girth of hog, mm				
C.1.1.2 weight, kg				
C.1.1.3 length of hog, mm				
C.1.2 maximum weight level				
C.1.2.1 girth of hog, mm				
C.1.2.2 weight, kg				
C.1.2.3 length of hog, mm				
C.2 Performance Test for Manually Operated Hog Restrainer				
C.2.1 noise level without load, dB				
C.2.2 noise level with load, dB				
C.2.2.1 minimum weight level				
C.2.2.2 maximum weight level				
C.3 Performance Test for Semi-automatic Hog Restrainer				
C.3.1.1 dumping time without load, secs				
C.3.1.2 pressure required to tilt cradle without load, Pa				
C.3.1.3 reset pressure without load, Pa				
C.3.1.4 noise level without load, dB				
C.3.2 Performance test with load				
C.3.2.1 minimum weight level				
C.3.2.1.1 actual pressure required, Pa				
C.3.2.1.2 efficiency *				-----
C.3.2.1.3 capacity, hogs per hour				
C.3.2.1.4 noise level, dB				
C.3.2.2 maximum weight level				
C.3.2.2.1 actual pressure required, Pa				
C.3.2.2.2 efficiency *				-----
C.3.2.2.3 capacity, hogs per hour				
C.3.2.2.4 noise level, dB				
C.4 Performance Test for Automatic Hog Restrainer				
C.4.1 noise level without load, dB				
C.4.2 conveyor speed with load, m/s				
C.4.2.1 small hog				
C.4.2.2 large hog				
C.4.3 percent speed reduction, %				
C.4.3.1 small hog				
C.4.3.2 large hog				

C.5 Observations	Rating**			
	Trials			Average
	1	2	3	
C.5.1 Presence of safety features/ locks				
C.5.2 Accessibility of grease points				
C.5.3 Presence of bruises on the body of hog				
C.5.4.1 manually operated				
C.5.4.1.1 absence of broken legs				
C.5.4.1.2 absence of ruptured ribs				
C.5.4.2 semi-automatic				
C.5.4.2.1 absence of broken legs				
C.5.4.2.2 absence of ruptured ribs				
C.5.4.3 automatic				
C.5.4.3.1 absence of broken legs				
C.5.4.3.2 absence of ruptured ribs				
C.5.5 Other observations:				

* efficiency: 1 – efficient (functioned properly)
2 – inefficient (did not function properly)

**

1 - very good	4 - poor
2 – good	5 – very poor
3 – satisfactory	

ANNEX D

Performance After Test Data Sheet

Items to be Measured and Inspected:

D.1 Performance After Test for Manual Hog Restrainer	
D.1.1	dumping angle, deg
C.1.2	noise level without load, dB
C.1.3	condition of welded joints
D.2 Performance After Test for Semi- automatic Hog Restrainer	
D.2.1	dumping angle, deg
D.2.2	noise level without load, dB
D.2.3	condition of welded joints
D.2.4	dumping time, sec
D.2.5	operating pressure range, Pa
D.3 Performance After Test for Automatic Hog Restrainer	
D.3.1	conveyor speed without load, m/s

ANNEX E

Formula Used During Calculation and Testing

E.1 Percent Speed Reduction

$$R_S = 1 - \frac{S_1}{S_2} \times 100$$

where:

R_S percent speed reduction, %

S_1 speed of the conveyor without load, m/s

S_2 speed of the conveyor with load, m/s

E.2 Capacity

$$C = \frac{H}{T}$$

where:

C capacity of the air operated hog restrainer in hogs per hour

H number of hogs that was held in the restrainer

T dumping time, hours