Foreword

The pursuance 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 the Department of Agriculture - National Meat Inspection Services (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:

Marks' Standard Handbook for Mechanical Engineers. 8th ed. 1978. McGraw-Hill Book Company. New York.

PAES 407:2005 Agricultural Structures – Slaughterhouse for Swine, Small and Large Animals-General Requirements.

PAES 509:2007 Slaughterhouse Equipment - Splitting Saw for Hog Carcass - Specifications

National Meat Inspection Commission. Guidelines on Meat Hygiene, Inspection and Preservation and Meat Inspection Regulations. January 1977.

The Philippine Recommends for Pork Production. 1999. Philippine Council for Agriculture Forestry and Natural Resources Research and Development. Los Baños, Laguna.

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ANNEXES

1 Scope

This standard specifies the requirements for methods of test for saw in splitting for suspended hog carcass through the backbone. Specifically, it shall be used to:

1.1 verify the mechanism, dimensions, materials, accessories of the splitting saw and the list of specifications submitted by the fabricator;

1.2 determine the performance of the machine;

1.3 evaluate the ease of handling 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 509:2007 Slaughterhouse Equipment - Splitting Saw for Hog Carcass - Specifications

3 Definitions

For the purpose of this standard, the definitions given in PAES 509 and the following shall apply:

3.1
blade speed
linear displacement of the blade's teeth per unit time, expressed in millimeter per second

3.2
bone dust
particles of bone accumulated during cutting

3.3
cutting depth
depth of cut by the splitting saw through the backbone, expressed in millimeter

3.4
cutting speed
speed of cutting through the backbone, expressed in seconds

3.5
dimension
the physical measurement of an object as described by its length, width, height and thickness
3.6
overall length
measurement of the splitting saw in its maximum extended position from both ends parallel to the blade and its handle

3.7
overall width
measurement of the splitting saw from one side to the other side and perpendicular to its blade including the motor case as in the case of an electric motor type

3.8
percent splitting efficiency
amount of energy delivered by the splitting saw relative to the total energy input, expressed in percent

3.9
splitting rate
number of hogs split per unit time, expressed in heads per hour

3.10
splitting time
actual time of splitting a single hog, expressed in seconds

4 General Conditions for Test and Inspection

4.1 Role of fabricator/dealer

The fabricator/dealer shall submit specifications and other relevant information about the splitting saw and shall abide with the terms and conditions set forth by an official testing agency.

4.2 Role of the operator of the fabricator/dealer

An officially designated operator of the fabricator/dealer shall operate, adjust, repair, and shall decide on matters related to the operation of the machine.

4.3 Test site conditions

The splitting saw shall be tested on site for normal operation in a slaughterhouse.

4.4 Test instruments

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

4.5 Test material

Test materials to be used shall be hog carcass with the following characteristics:

4.5.1 Test material characteristics

4.5.1.1 Breed : locally raised hog (as much as possible single breed)

4.5.1.2 Size : market size (80 – 150 kg)

4.5.1.3 Condition : scalded, dehaired, eviscerated and clean

4.5.2 Quantity to be supplied

The number of test material to be supplied shall be at least nine (9) hog trials.

4.6 Running-in and preliminary adjustment

Before the start of the test, the splitting saw should have undergone running-in period wherein various adjustments of the splitting saw shall be made according to the recommendation of the fabricator. (No other adjustments shall be permitted while the test is on-going).

4.7 Termination of test

If during the test run, the machine stops due to 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

5.1.1 This inspection is carried out to verify the mechanism, dimensions, materials and accessories of the splitting saw in comparison with the list of fabricator's technical data and information.

5.1.2 The items to be inspected and verified shall be recorded 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 Initial data of the hog carcass conditions such as breed, size and weight shall be recorded.

5.2.3 Test materials to be used

Test materials to be used for the running-in and for each test trial shall be the same.

5.2.4 Operation of the splitting saw

The splitting saw shall be operated at the recommended settings of the fabricator. After the test run, the area shall be cleaned and then prepared for the next test trial. This procedure shall be repeated for the succeeding test trials.

5.2.5 Test trial

A minimum of nine hog trials shall be adopted.

5.2.6 Data collection

5.2.6.1 Duration of test

The duration of each test trial shall start with the cutting of the carcass from the pelvic bone straight down along the middle of the backbone and ends until completion of splitting (see Figure 1). Time lapsed from the start of operation till separation shall be recorded as splitting time.

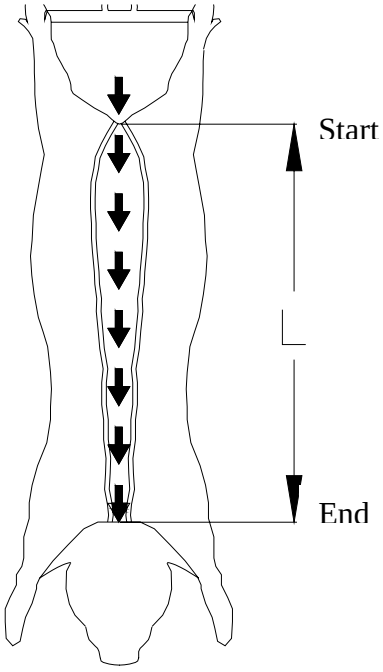

Figure 1. Operation of splitting saw

5.2.6.2 Noise level

The noise emitted by the machine shall be measured using a noise level meter at the location of the operator and collector. The noise level shall be measured approximately 50 mm away from the ear level of the operator and collector.

5.2.6.3 Power consumption

Supply power for electric and pneumatic type shall be maintained and sustained for the entire operation.

Power consumption for splitting saw is measured using a power meter.

5.2.7 Evaluation of test material

The conditions of the test materials such as breed, weight, length or size, and condition of the entire carcass shall be taken. This is done by using a weighing scale, measuring tape and ocular inspection of the carcass.

6 Formula

The formulas to be used during calculations and testing are 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 Machine

Table 1 – Machine Specifications

7.6 Results and Discussions

7.7 Observations (include pictures)

Table 2 –Performance test data

7.8 Names, signatures and designation of test engineers

Annex A
(informative)

Minimum list of
test equipment and materials

A.1	**Equipment**	
		Quantity
A.1.1	**Field**	
A.1.1.1	Tachometer (contact type or photo electric type) Range: 0 rpm to 5,000 rpm	1
A.1.1.2	Digital timers (range: 60 minutes) Accuracy: 0.1 sec	2
A.1.1.3	Tape measure (with maximum length of 5m)	1
A.1.1.4	Noise level meter Range: 30 dB (A) to 130 dB (A)	1
A.1.1.5	Weighing scale (capacity: 1000 kg) Scale divisions: 500 g	1
	Weighing scale (capacity: 1000g) Scale divisions: 0.1 g	1
A.1.1.6	Power meter (for electric motors) 60 Hz, 220 V or Pressure gauge (for pneumatic)	1
A.1.1.7	Camera	1
A.2	**Materials**	
A.2.1	Hog carcass	9
A.2.2	Labeling tags which include	20
A.2.2.1	Date of test	
A.2.2.2	Splitting saw test	
A.2.2.3	Sample source	
A.2.2.4	Breed	
A.2.2.5	Size	
A.2.2.6	Backbone length while suspended	
A.2.2.7	Trial number	
A.2.2.1	Water Bath	
A.2.4	Permanent pentel pen	1

Annex B
(informative)

Specifications of splitting saw

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

GENERAL INFORMATION

Make: _____ Type: _____
Serial No: _____ Brand/Model: _____
Production date of splitting saw 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 Main structure		
B.1.1 Overall dimensions, mm		
B.1.1.1 length		
B.1.1.2 width		
B.1.2 Weight (kg)		
B.1.3 Cover		
B.1.3.1 material		
B.1.3.2 thickness, mm		
B.1.3.3 finish		
B.1.4 Grounding		
B.2 Hanger mounting bracket		
B.2.1 Location (Length from the front end, mm)		
B.2.2 Material used		
B.2.3 Adjustment		
B.3 Power Transmission		
B.3.1 Pulley		
B.3.1.1 Primemover		
B.3.1.1.1 Type		
B.3.1.1.2 Dimension, mm		
B.3.2.2 Cutting blade		
B.3.2.2.1 Diameter, mm		
B.3.2.2.2 No. of teeth		
B.4 Handle		
B.4.1 Material		
B.4.2 Type		
B.4.3 Length, mm		

ITEMS	Fabricator's Specification	Verification by the Testing agency
B.4.4 Diameter, mm		
B.5 Blade		
B.5.1 Make/brand		
B.5.2 Material		
B.5.3 Total Length, mm (if band saw)		
B.5.4 Effective Length, mm		
B.5.5 Diameter, mm (if circular saw)		
B.5.6 No. of teeth		
B.5.7 Blade thickness, mm		
B.5.8 Blade width, mm		
B.6 Blade guard		
B.6.1. Material		
B.6.2. Thickness, mm		
B.6.3. Length of blade uncovered, mm		
B.5 Main Frame		
B.5.1 Material		
B.6 Prime mover		
B.6.1 Pneumatic motor		
B.6.1.1 Brand		
B.6.1.2 Make or fabricator		
B.6.1.3 Serial No.		
B.6.1.4 Type		
B.6.1.5 Rated Power, kW		
B.6.1.6 Rated Speed, rpm		
B.6.1.7 Working pressure, Pa		
B.6.1 Electric motor		
B.6.1.1 Brand		
B.6.1.2 Make or fabricator		
B.6.1.3 Serial No.		
B.6.1.4 Type		
B.6.1.5 Rated Power, kW		
B.6.1.6 Rated Speed, rpm		
B.6.1.7 Frequency, Hz		
B.6.1.8 Voltage		

Annex C
(informative)

Performance Test Data Sheet

Test Trial No. _____ Date: _____
Test Engineer: _____ Location: _____
Assistants: _____ Test Specimen: _____
Test Requested by: _____ Fabricator: _____

C.1 Information on the Test Materials										
ITEMS	**Trial**									**Ave**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
C.1.1. Animal										
C.1.2. Breed										
C.1.3. Weight										
C.1.4. Length										
C.1.5. Condition										
C.2 Result of Performance Test										
ITEMS	**Trial**									**Ave.**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
C.2.1 Noise Level, dB(A)										
C.2.1.1 Without load										
C.2.1.2 With load										
C.2.2 Power Consumption										
C.2.2.1 Power, kW										
C.2.2.1.1 Without load										
C.2.2.1.2 With load										
C.2.2.2 Voltage, V										
C.2.2.2.1 Without load										
C.2.2.2.2 With load										
C.2.2.3 Current, A										
C.2.2.3.1 Without load										
C.2.2.3.2 With load										
C.2.2.3 Pressure, Pa										
C.2.2.3.1 Without load										
C.2.2.3.2 With load										

C.3 Splitting performance

Items	*Trial*									Ave
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	
C.3.1 Before splitting										
C.3.1.1 Length of hog										
C.3.1.2 Time starts										
C.3.1.3 No. of bruises										
C.3.2 After splitting										
C.3.2.1 Time ends										
C.3.2.2 Cutting depth, mm										
C.3.3 Splitting time, sec.										
C.3.4 Splitting rate, hogs/h										
C.3.5 Splitting capacity hogs/# of hrs of operation										
C.3.6 Splitting efficiency, %										

C.4 Rate the following observations:

Items	Rating*				
	1	**2**	**3**	**4**	**5**
C.4.1 Ease of mounting					
C.4.2 Ease of assembly & disassembly					
C.4.3 Ease of cleaning parts					
C.4.4 Ease of adjusting and repair of parts					
C.4.5 Ease of operating					
C.4.6 Safety					
C.4.7 Vibration					
C.4.8 Sharpness of the blade after splitting nine (9) hogs					

*****1 – Very good
2 - Good
3 - Satisfactory
4 - Poor
5 – Very poor

C.5 Other Observations:

_____
_____
_____

Annex D
(informative)

Formula Used During Calculations and Testing

D.1 Splitting saw dust

$$SSD = W_b - W_a$$

Where:

SSD	=	Splitting saw dust, kg
W_a	=	Weight of bone dust collected after splitting, grams
W_b	=	Weight of bone dust collected before splitting, grams

D.2 Splitting rate

$$S_r = \frac{R_L}{t}$$

Where:

S_r	=	Splitting rate, mm/s
R_L	=	Linear rate, mm
t	=	Time, s

D.3 Electrical energy consumption

$$E_c = P_c T_o$$

Where

E_c	=	Electrical energy consumption, kW-h
P_c	=	Power consumed, kW
T_o	=	Time of operation, h

D.4 Splitting efficiency, %

$$Eff = \frac{S_r * SSD * T_s}{3.6x10^{12} E_c * t_s} x100$$

Where

Eff	=	Splitting efficiency, %
T_s	=	Saw blade thickness, mm
t_s	=	Splitting time, s