
PHILIPPINE AGRICULTURAL ENGINEERING STANDARD PAES 522: 2008
Slaughterhouse Equipment – Splitting Saw for Large Ruminants – Methods of Test

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 Large Ruminants” 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 510:2007 Slaughterhouse Equipment – Splitting Saw for Hog Carcass –
Methods of Test

The Cattle Industry of the Region.

[http://home.websprinter.net/~dti10/products/cattle_ind1 .htm](http://home.websprinter.net/~dti10/products/cattle_ind1.htm). <accessed March 2008>.

Wikipedia: The Free Encyclopedia: <http://en.wikipedia.org/wiki>. <accessed March 27, 2008>.

CONTENTS		Page
1	Scope	104
2	References	104
3	Definitions	104
4	General Conditions for Test and Inspection	105
4.1	Role of the manufacturer/dealer	105
4.2	Role of the operator	105
4.3	Test site conditions	105
4.4	Test instruments	105
4.5	Test material	106
4.6	Termination of test	106
5	Test and Inspection	106
5.1	Verification of the manufacturer's technical data and information	106
5.2	Performance test	106
6	Formula	107
7	Test Report	107

ANNEXES

A	Suggested List of Minimum Test Instruments	109
B	Specifications of Splitting Saw	110
C	Performance Test Data Sheet	112
D	Formula Used During Calculation and Testing	114

PHILIPPINE AGRICULTURAL ENGINEERING STANDARD PAES 522: 2008
Slaughterhouse Equipment –Splitting Saw for Large Ruminants– Methods of Test

1 Scope

This standard specifies the requirements for methods of test for splitting saw for large ruminants. 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 manufacturer;
- 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 411:2000** Agricultural Structures – Slaughterhouse for Swine, Small and Large Animals – General Requirements
- PAES 521:2008** Agricultural Machinery – Splitting Saw for Large Ruminants – Specifications

3 Definitions

For the purpose of this standard, the definitions given in PAES 521 and the following shall apply:

3.1

blade speed

linear displacement of the blade 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 through the backbone, expressed in millimeter

3.4

overall length

measurement of the splitting saw in its maximum extended position from both ends parallel to the blade and its handle

3.5

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

3.6

splitting efficiency

ratio of actual work to the energy consumption, expressed in percent

3.7

splitting rate

linear speed of cutting through the backbone, expressed in millimeters per second

3.8

splitting time

actual time of splitting a single carcass, expressed in seconds

4 General Conditions for Test and Inspection

4.1 Role of manufacturer/dealer

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

4.2 Role of the operator of the manufacturer/dealer

An officially designated operator of the manufacturer/dealer shall operate, adjust, repair, and shall decide on matters related to the operation of the machine as the case may be related to the operation of the equipment.

4.3 Test site conditions

The splitting saw shall be tested on site for normal operation in a slaughterhouse. The site should have ample provisions for material handling and workspace and suitable for normal working condition.

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 instrument 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 beef carcass with size of not less than 250 kg. The number of test material to be supplied shall be at least three (3) carcasses.

4.6 Termination of test

If during the test run, the machine 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

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 manufacturer'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 carcass weight and length shall be recorded.

5.2.3 Operation of the splitting saw

The splitting saw shall be operated at the recommended settings of the manufacturer. 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.

5.2.4 Test trial

A maximum of three (3) test trials consisting of one (1) carcass per trial shall be conducted.

5.2.5 Data collection

5.2.5.1 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 (Fig. 1). Time lapsed from the start of operation till separation shall be recorded as splitting time.

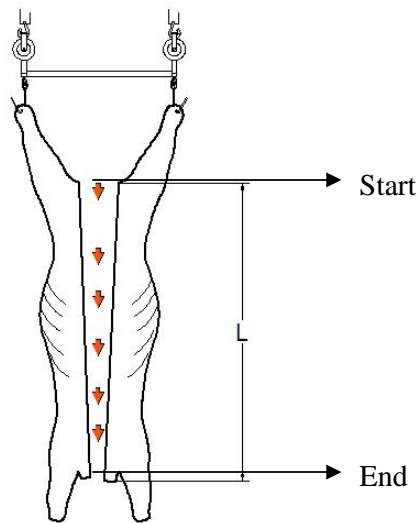


Figure 1. Operation of splitting saw

5.2.5.2 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.

5.2.6 Evaluation of test material

The weight and length of the entire carcass shall be taken using a weighing scale and tape measure.

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 Length of cut carcass, meters

7.7 Results and Discussions

7.8 Observations (include pictures)

Table 2 –Performance test data

7.9 Names, signatures and designation of test engineers

Annex A
(informative)

**Suggested Minimum List of
Test Instruments and Materials**

A.1	Instruments	Quantity
A.1.1	Tachometer (contact type or photo electric type) Range: 0 rpm to 5,000 rpm	1
A.1.2	Digital timers (range: 0 to 60 minutes) Accuracy: 0.1 sec	2
A.1.3	Tape measure (with maximum length of 5m)	1
A.1.4	Noise level meter Range: 0 dB (A) to 130 dB (A)	1
A.1.5	Weighing scale (capacity: 1000 kg) Scale divisions: 500 g	1
	Weighing scale (capacity: 1000g) Scale divisions: 0.1 g	1
A.1.6	Power meter (for electric motors) 60 Hz, 220 V	1
	or Pressure gauge (for pneumatic) (0 to 10 bars)	1
A.1.	Camera	1
A.2	Materials	
A.2.1	Carcass	3
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 Manufacturer: _____
 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	Manufacturer'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.2 Hanger mounting bracket		
B.2.1 Location (Distance from the front end, mm)		
B.2.2 Material used		
B.2.3 Adjustment (Present or Absent)		
B.3 Power Transmission		
B.3.1 Pulley		
B.3.1.1 Primemover		
B.3.1.1.1 Type		
B.3.1.1.2 Dimensions, mm		
B.4 Handle		
B.4.1 Material		
B.4.2 Type		
B.4.3 Dimensions, mm		
B.4.3 Length		
B.4.4 Diameter		
B.5 Cutting Blade		

ITEMS	Manufacturer's Specification	Verification by the Testing agency
B.5.1 Make/brand		
B.5.2 Material		
B.5.3 Dimensions, mm		
B.5.3.1 Total Length (if band saw)		
B.5.3.2 Effective Length		
B.5.3.3 Diameter (if circular saw)		
B.5.3.4 Length of blade uncovered		
B.5.3.5 Thickness		
B.5.3.6 Width		
B.5.4 No. of teeth		
B.5.5 Blade speed, rpm		
B.6 Blade guard		
B.6.1 Material		
B.6.2 Thickness, mm		
B.7 Main Frame		
B.7.1 Material		
B.7.2 Dimensions, mm		
B.7.2.1 Length		
B.7.2.2 Width		
B.7.2.3 Thickness		
B.8 Prime mover		
B.8.1 Electric motor		
B.8.1.1 Brand		
B.8.1.2 Make or manufacturer		
B.8.1.3 Serial No.		
B.8.1.4 Type		
B.8.1.5 Rated Power, kW		
B.8.1.6 Rated Speed, rpm		
B.8.1.7 Frequency, Hz		
B.8.1.8 Voltage		
B.8.2 Pneumatic motor		
B.8.2.1 Brand		
B.8.2.2 Make or manufacturer		
B.8.2.3 Serial No.		
B.8.2.4 Type		
B.8.2.5 Rated Power, kW		
B.8.2.6 Rated Speed, rpm		
B.8.2.7 Working Pressure, Pa		
B.8.3 Hydraulic motor		
B.8.3.1 Brand		
B.8.3.2 Make or manufacturer		
B.8.3.3 Serial No.		
B.8.3.4 Type		
B.8.3.5 Rated Power, kW		
B.8.3.6 Rated Speed, rpm		
B.8.3.7 Working Pressure, Pa		

Annex C
(informative)

Performance Test Data Sheet

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

C.1 Information on the Test Materials				
ITEMS	Trial			Ave
	<i>1</i>	<i>2</i>	<i>3</i>	
C.1.1 Animal				
C.1.2 Breed				
C.1.3 Weight				
C.1.4 Length, mm				
C.1.5 Condition				
C.2 Result of Performance Test				
ITEMS	Trial			Ave
	<i>1</i>	<i>2</i>	<i>3</i>	
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.2.2.4 Pressure, Pa				
C.2.2.4.1 Without load				
C.2.2.4.2 With load				

C.3 Splitting performance

Items	Trial			Ave
	1	2	3	
C.3.1 Before splitting				
C.3.1.1 Length of cattle, mm				
C.3.1.2 Time starts				
C.3.1.3 No. of bruises				
C.3.2 After splitting				
C.3.2.1 Classificatio n/ type of splitting saw				
C.3.2.1 Time ends				
C.3.2.2 Cutting depth, mm				
C.3.2.3 Optimum speed, (tps or m/min)				
C.3.3 Splitting time, s				
C.3.4 Splitting rate, mm/s				
C.3.5 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 Presence of grounding					

- *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 Bone dust

$$BD = W_a - W_b$$

Where:

BD	=	Bone 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	=	Distance, 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, %

$$Eff = \frac{S_r * BD * t_s}{3.6 \times 10^{12} E_c} \times 100$$

Where

Eff	=	Splitting efficiency, %
t_s	=	Splitting time, s