

## **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*. 8<sup>th</sup> ed. McGraw- Hill, Inc.

Food Protection Services. 2005. Abattoirs. BC Centre for Disease Control.

Irish Statute Book, Statutory Instruments, S.I. No. 113/1965 — *PIGS AND BACON ACT, 1935 (PART II) REGULATIONS, 1965*.

PAES 114: 2000 – Agricultural Machinery – Centrifugal, Mixed Flow and Axial Flow Water Pumps – Methods of Test

[www.en.wikipedia.org](http://www.en.wikipedia.org)

[www.engineersedge.com/pipe\\_schedules.htm](http://www.engineersedge.com/pipe_schedules.htm)

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## **1 Scope**

This standard specifies the methods of test and inspection for hog scalder. Specifically, it shall be used to:

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

PAES 505:2007 Slaughterhouse Equipment – Hog Scalder - Specifications

## **3 Definitions**

For the purpose of this standard, the definitions given in PAES 505 and the following shall apply:

### **3.1**

#### **perforation interval**

distance measured from the center of one pipe perforation to the center of the adjacent perforation

### **3.2**

#### **rib interval**

distance between the ribs of the release cradle (Fig. 1)

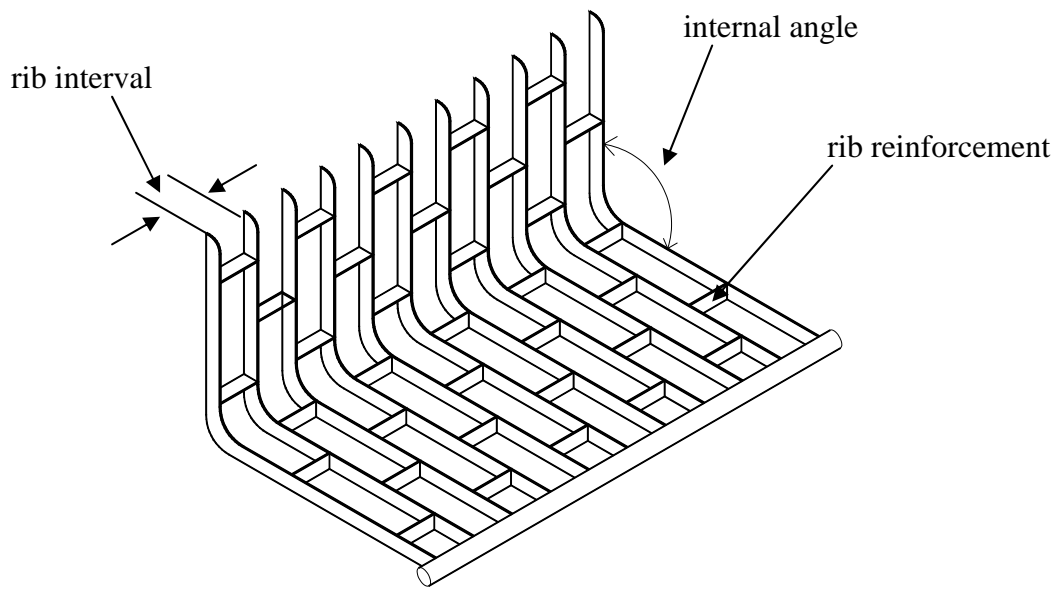


Figure 1. Release cradle

### 3.3

#### release angle

optimum angle that the release cradle can swing (Fig. 2)

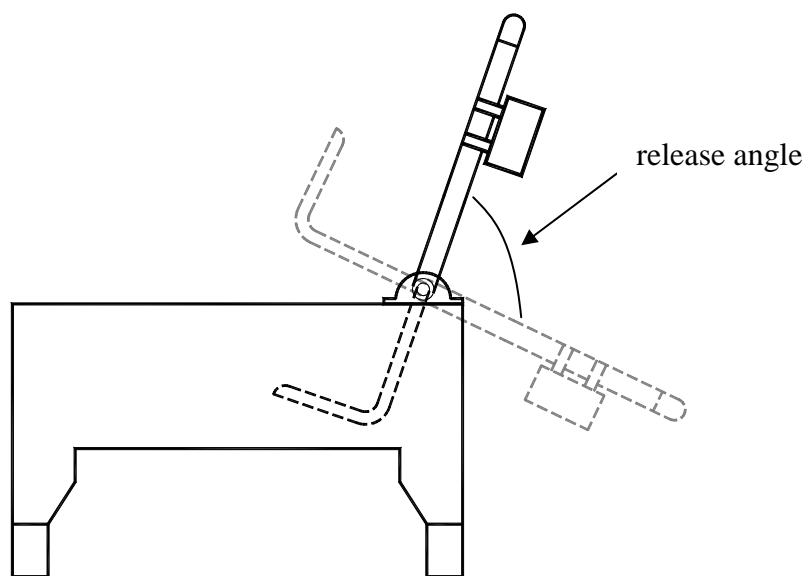


Figure 2. Release angle.

## **4 General Conditions for Test and Inspection**

### **4.1 Role of fabricator/dealer**

The fabricator shall submit the operator's manual for hog scalding conforming to PAES 102 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 matters related to the operation of the equipment.

### **4.3 Test site conditions**

The hog scalding 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 materials needed to carry out the hog scalding test is shown in Annex A.

### **4.5 Test material**

The hogs that shall be used for testing 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 equipment as specified by the fabricator.

### **4.6 Required test material**

There shall be at least 10 hogs with live weights falling within the capacity limit of the scalding as specified by the fabricator.

### **4.7 Termination of test for vertical scalding**

If during the test run, the hog scalding stops due to major component breakdown or malfunction, 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 scalding in comparison with the list of fabricator's technical data and information. All data shall be recorded in Annex B.

## **5.2 Initial heating of water**

Water shall be preheated to 60 – 62 °C (ideal scalding temperature) before the scalding of hogs.

## **5.3 Performance test**

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

### **5.3.2 Measurement of initial data**

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

### **5.3.3 Operation of the hog scalding**

#### **5.3.3.1 Horizontal scalding**

The tank shall be filled with two-thirds water. Water shall be heated to about 60 – 62 °C. The time it took the water to reach the required temperature shall be noted. After preheating the water, the hogs shall be submerged totally into the water for about four (4) to five (5) minutes. The maximum number of hogs that shall be placed into the scalding and the time of submersion shall depend on the fabricator's specified capacity.

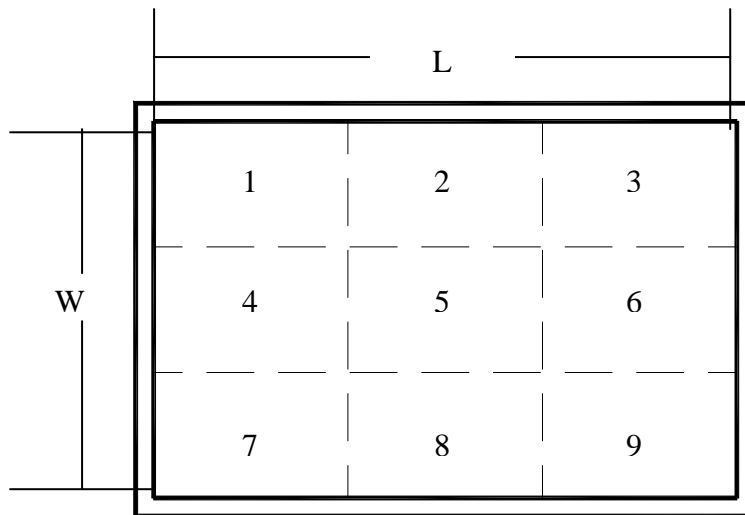
#### **5.3.3.2 Vertical scalding**

Water shall be preheated to about 60 – 62 °C. The hogs shall then be automatically moved into the scalding chamber through the automatic overhead railing. The heated water shall be sprayed evenly throughout the body of the hog while passing through the chamber. The scalded hog shall be automatically released from the scalding chamber for dehairing.

### **5.3.4 Horizontal scalding performance**

**5.3.4.1** The hog scalding shall be tested for uniformity of heat distribution.

**5.3.4.2** The scalding shall be divided into 3 x 3 divisions as shown in Fig.2.



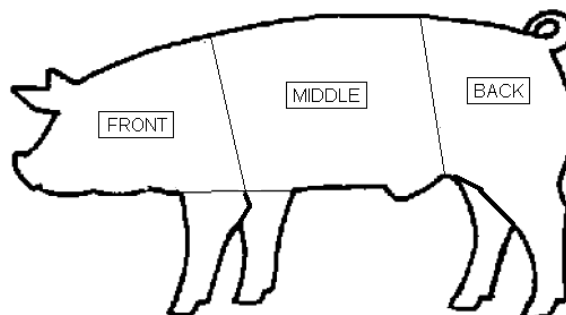
**Figure 2. Scalding 3 x 3 Division.**

**5.3.4.3** Temperature at each section and the time to reach 60 – 62 °C shall be recorded.

**5.3.4.4** The data shall be presented in a histogram and the standard deviation shall be computed using the formula in Annex D.

**5.3.5 Scalding efficiency**

**5.3.5.3** The hog's body shall be divided into three (3) sections: the front section (from hog's snout up to the shoulder part and forelegs), middle section (body which includes the loin and belly part) and back section (includes the ham, hind legs and tail of the hog). Each section of the hog (Fig.3) shall be observed and shall be tested after exposure to the scalding.



**Figure 3. Hog body sections.**

**5.3.5.4** The hog's hair shall be plucked randomly in 10 sites at each section

**5.3.5.5** The scalding efficiency shall be computed using the formula in annex D.

5.3.5.6 All observations shall be recorded in Annex C.

### **5.3.5 Performance After Test**

5.3.5.1 The hog scalding shall be inspected after the scalding operation.

5.3.5.2 Detached welded joints shall be observed.

5.3.5.3 Draining of water and leaks shall be observed.

5.3.5.4 For steam heated scalding, pipelines shall be checked.

5.3.5.5 The perforated pipes and the fittings used shall be checked for loosened connections.

5.3.5.6 For horizontal scalding, release angle (without load) shall be obtained and shall be compared with the initial release angle obtained before loading the hog.

5.3.5.7 Observations shall be recorded in Annex C.

### **5.4 Test trial**

There shall be at least 10 trials of hogs with live weight falling within the specified capacity limit of the scalding.

## **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
<b>A.1 Test hog characteristics</b>	
A.1.1 weighing scale, capacity: 500 kg	1
A.1.2 tape measure, capacity: 5 m	1
<b>A.2 Overall dimension</b>	
A.2.1 steel tape, capacity: 5m	1
A.2.2 caliper	1
<b>A.3 Temperature reading</b>	
A.3.1 thermocouple wires (set)	9
A.3.2 data logger	1
A.3.3 temperature gauge, range: 0-100 °C	
<b>A.4 Pressure reading</b>	
pressure gauge (0-20 kgf/cm <sup>2</sup> )	1
<b>A.5 Preheating time</b>	
timer	1

**Annex B**  
(informative)

**Specifications of Hog Scalders**

Name of Applicant/ Distributor: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Tel No: \_\_\_\_\_  
 Name of Fabricator: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Tel No: \_\_\_\_\_

**GENERAL INFORMATION**

Classification: \_\_\_\_\_ Maximum Weight Capacity: \_\_\_\_\_  
 Serial No: \_\_\_\_\_ Brand/Model: \_\_\_\_\_  
 Production date of Hog scalders 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>B.1</b> Hog scalders		
<b>B.1.1</b> Overall dimensions		
<b>B.1.1.1</b> length, mm		
<b>B.1.1.2</b> width, mm		
<b>B.1.1.3</b> height, mm		
<b>B.1.2</b> Construction material		
<b>B.1.3</b> Inner dimensions		
<b>B.1.4.1</b> length, mm		
<b>B.1.4.2</b> width, mm		
<b>B.1.4.3</b> thickness, mm		
<b>B.1.2</b> Steam pipelines		
<b>B.1.2.1</b> inside diameter, mm		
<b>B.1.2.2</b> construction material		
<b>B.1.2.3</b> pipe schedule		
<b>B.1.3.4</b> perforations		
<b>B.1.3.4.1</b> diameter, mm		
<b>B.1.2.4.2</b> total number of perforations		
<b>B.1.2.4.3</b> perforation interval, mm		
<b>B.1.2.5</b> Fittings		
<b>B.1.2.5.1</b> construction material		
<b>B.1.2.5.2</b> pipe schedule		
<b>B.1.3</b> Release cradle		
<b>B.1.3.1</b> construction material		
<b>B.1.3.2</b> thickness, mm		
<b>B.1.3.3</b> rib interval, mm		
<b>B.1.3.4</b> release angle, deg		

ITEMS	Fabricator's Specification	Verification by the Testing agency
<b>B.1.3.5</b> rib reinforcement		
<b>B.1.3.5.1</b> thickness, mm		
<b>B.1.3.5.2</b> interval, mm		
<b>B.1.3.5.3</b> construction material		
<b>B.1.3.6</b> internal angle, deg		
<b>B.1.4</b> Release lever		
<b>B.1.4.1</b> construction material		
<b>B.1.4.2</b> length of lever arm, mm		
<b>B.1.4.3</b> counterweight		
<b>B.1.4.3.1</b> material		
<b>B.1.4.3.2</b> weight, kg		
<b>B.1.5</b> Operating Pressure at required temperature, Pa		

## ANNEX C

### Performance Test Data Sheet

#### Items to be Measured and Inspected

ITEMS	Trials			Average						
	1	2	3							
<b>C.1 Test Material Condition</b>										
	Trials									
Item	1	2	3	4	5	6	7	8	9	10
live weight, kg										

<b>C.2 Heat distribution for Horizontal Scalders</b>											
ITEMS	section										Average
	1	2	3	4	5	6	7	8	9		
<b>C.2.1</b> temperature reading, °C											
<b>C.2.2</b> time to reach scalding temp, mins											

<b>C.3 Observations</b>	
ITEMS	Rating *
<b>C.3.1 Scalding Tank</b>	
<b>C.3.1.1</b> water leakage	
<b>C.3.1.2</b> ineffective draining	
<b>C.3.1. Performance After Test</b>	
<b>C.3.1.1</b> loosened fittings	
<b>C.3.1.2</b> leaks	
<b>C.3.1.3</b> release angle (deg)	
<b>C.3.1.4</b> other observations:	

\* **1 – none**  
**2 – very low**  
**3 – moderate**

**4 – high**  
**5 – very high**

<b>C.4 Plucking Test</b>										
<b>Trial 1</b>										
<b>Items</b>	<b>Areas *</b>									
Dehairing sections	1	2	3	4	5	6	7	8	9	10
front										
middle										
back										
<b>Trial 2</b>										
<b>Items</b>	<b>Areas *</b>									
Dehairing sections	1	2	3	4	5	6	7	8	9	10
front										
middle										
back										
<b>Trial 3</b>										
<b>Items</b>	<b>Areas *</b>									
Dehairing sections	1	2	3	4	5	6	7	8	9	10
Front										
middle										
Back										
<b>Trial 4</b>										
<b>Items</b>	<b>Areas *</b>									
Dehairing sections	1	2	3	4	5	6	7	8	9	10
Front										
middle										
Back										
<b>Trial 5</b>										
<b>Items</b>	<b>Areas *</b>									
Dehairing sections	1	2	3	4	5	6	7	8	9	10
front										
middle										
back										
<b>Trial 6</b>										
<b>Items</b>	<b>Areas *</b>									
Dehairing sections	1	2	3	4	5	6	7	8	9	10
front										
middle										
back										
<b>Trial 7</b>										
<b>Items</b>	<b>Areas *</b>									
Dehairing sections	1	2	3	4	5	6	7	8	9	10
front										

middle										
back										
<b>Trial 8</b>										
<b>Items</b>	<b>Areas *</b>									
Dehairing sections	1	2	3	4	5	6	7	8	9	10
front										
middle										
back										
<b>Trial 9</b>										
<b>Items</b>	<b>Areas *</b>									
Dehairing sections	1	2	3	4	5	6	7	8	9	10
front										
middle										
back										
<b>Trial 10</b>										
<b>Items</b>	<b>Areas *</b>									
Dehairing sections	1	2	3	4	5	6	7	8	9	10
front										
middle										
back										
<b>C.4.2 Scalding efficiency</b>										

\* y – dehaired properly  
n – not dehaired properly

## ANNEX D

### Formula Used During Calculation and Testing

#### D.1 Capacity

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

where:

$C$	capacity of the hog scalding in hogs per hour
$H$	number of hogs that was held in the scalding
$T$	dumping time, hours

#### D.2 Standard Deviation, STDV

$$STDV = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

where:

$STDV$	standard deviation
$x$	weight of the sample
$\bar{x}$	mean value of the samples
$N$	number of samples

### D.3 Scalding Efficiency

$$Eff = \frac{A_d}{A_T} \times 100$$

where:

$Eff$  scalding efficiency, %

$A_d$  total number of randomly selected areas dehaired properly

$A_T$  total number of randomly selected areas selected for dehairing