

Foreword

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled “Development of Technical Standards for Poultry Dressing/Slaughtering Plant” which was funded by the Department of Agriculture – National Meat Inspection Services (DA-NMIS).

This standard has been technically prepared in accordance with PAES 010-2 – 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 preparation of this standard, the following documents/publications were considered:

PAES 020:2005 General – Metrication Guidelines

PAES 506:2007 Slaughterhouse Equipment – Hog Scalder – Methods of Test

Mead, G.C. 2004. *Poultry meat processing and quality*. Woodhead Publishing in Food Science and Technology. Woodhead Publishing Limited. Cambridge England

Sams, A.R. 2001. *Poultry meat processing*. Department of Poultry Science Texas A&M University. CRC Press. Taylor and Francis Group. Boca Raton, Florida

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1 Scope

This standard specifies the methods of test and inspection for scalding for poultry animals such as chicken, geese, turkeys, ducks, ostriches, and others. Specifically, it shall be used to:

- 1.1** verify the mechanism, dimensions, materials, installation, accessories of the scalding and the list of specifications submitted by the manufacturer;
- 1.2** determine the performance of the device/equipment;
- 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 the references 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 529:2012	Slaughterhouse Equipment – Poultry Scalding – Specifications

3 Definitions

For the purpose of this standard, the definitions given in PAES 529 and the following shall apply:

3.1

coefficient of variation

statistical representation of the precision of distribution of temperature in the scalding tank

3.2**scalding capacity**

total number of poultry animal that can be scalded per unit time, expressed in poultry animal per hour

3.3**scalding efficacy, %**

ratio of total number of sections defeathered properly to the total number of sections randomly selected for defeathering

3.4**scalding efficiency, %**

measures the ability of the scalding tank to maintain consistent and equal temperature at any point in the scalding tank

4 General Conditions for Test and Inspection**4.1 Role of manufacturer/dealer**

The manufacturer shall submit the operator's manual for scalding conforming to PAES 102 and shall abide with the terms and conditions set forth by the 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 scalding tank 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 instruments to be used shall be calibrated and checked by testing agency prior to the conduct of testing. The suggested list of test instruments and materials needed to carry out the scalding test is shown in Annex A.

4.5 Test material

Test materials to be used shall be of the same species. There shall be at least thirty (30) test materials to conduct the test. For ostrich, one (1) or more test materials shall be used.

4.6 Termination of Test

If there is major component breakdown during testing, the test engineer from the official testing agency shall terminate the test.

5 Test and Inspection

5.1 Verification of technical data and information of the manufacturer

5.1.1 This inspection is carried out to verify the mechanisms, dimensions, materials, and accessories of the scalding in comparison with the list of technical data and information of the manufacturer. The items to be inspected and verified shall be recorded in Annex B.

5.2 Condition of test material

Initial data of the poultry animals shall be obtained prior to testing of the scalding. Data shall be recorded in Annex C.

5.3 Performance test

5.3.1 This is carried out to obtain actual data on overall performance of scalding.

5.3.2 Visual inspection shall be made on the welded parts of the scalding and shall be recorded in Annex C.3.

5.3.3 Operation of the Scalding

5.3.3.1 For scalding that uses electric heater, gas and biomass

The tank shall be filled with two-thirds water. Water shall be heated to a temperature depending on the type of poultry animal to be scalded as specified in Table 1 of PAES 527. Agitator (if any) shall be turned on to maintain uniformity of water temperature at any point in the scalding. The time it took the water to reach the required temperature shall be noted. After heating the water, the poultry animal shall be submerged totally into the water at time specified in Table 1 of PAES 527.

5.3.3.2 For scalding that uses boiler and heat exchanger

Water shall be heated using boiler and heat exchanger to a temperature depending on the type of poultry animal to be scalded as specified in Table 1 of PAES 527. For immersed type of scalding, heated water shall be pumped in and out of the scalding tank to maintain the desired temperature throughout the operation. Agitator (if any, for immersed type) shall be turned on to maintain uniformity of water temperature at any point in the scalding. After heating, water shall be sprayed on the poultry animal (for sprayed type) or it shall be submerged totally into the water (for immersion type) at time specified in Table 1 of PAES 527.

5.3.3.3 From the scalding, the poultry animal shall be defeathered.

5.3.4 Scalding Efficiency

5.3.4.1 The scalding shall be tested for uniformity of temperature distribution.

- 5.3.4.2 The bottom and surface of scalding tank shall be divided into 3 x 3 divisions as shown in Figure 1.

1	2	3
4	5	6
7	8	9

Figure 1. Scalding 3 x 3 division

- 5.3.4.3 Temperature at each section shall be measured simultaneously using data logger and thermocouple wires.
- 5.3.4.4 The time to reach the desired temperature for each section shall be recorded.
- 5.3.4.5 The process shall be repeated for scalding tank loaded with poultry animals.
- 5.3.4.6 The coefficient of variance for temperature at different section in the scalding chamber and scalding efficiency before and during scalding shall be computed using formula in Annex D.

5.3.5 Scalding Efficacy

- 5.3.5.1 The poultry animal's body shall be divided into two (2) sections: left and right. Each section shall be observed and shall be tested after exposure to scalding.

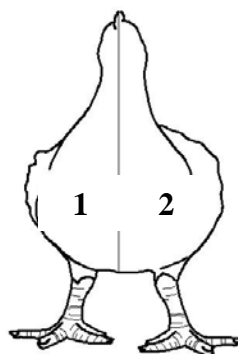


Figure 2. Sectioning of poultry animal's body

- 5.3.5.2 Feathers shall be plucked 10 times randomly at each section of the body of the poultry animal. This shall be done for three (3) trials.

5.3.5.3 The scalding efficiency shall be computed using the formula in Annex D.

5.3.5.4 All observations shall be recorded in Annex C.

5.3.6 Performance After Test

5.3.6.1 The scalding shall be inspected after the scalding operation.

5.3.6.2 Detached welded joints, draining water leaks, pipelines and perforated pipes and fittings used shall be observed and checked.

5.3.6.3 All observations shall be recorded in Annex C.

5.4 Test Trials

There shall be at least three (3) test trials with ten (10) poultry animals per trial. For ostrich, one (1) test trial shall be used.

6 Formula

The formula to be used during calculations and testing shall be 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 Equipment

Table 1 – Equipment Specifications

7.6 Results and Discussions

7.7 Observations (include pictures)

Table 2 – Performance test data

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

Annex A

Suggested List of
Test Instruments and Materials

A.1	Test Poultry Animal Characteristics	Quantity
A.1.1	digital weighing scale, capacity: 20 kg	1
A.1.2	tape measure	1
A.2	Scalder Characteristics	
A.2.1	steel tape	1
A.2.2	weighing scale, capacity: 1000 kg	1
A.2.3	vernier caliper: 0.05 mm accuracy, 200 mm length	1
A.3	Calculations	
	scientific calculator	1
A.4	Current Measurement	
	ammeter	1
A.5	Voltage Measurement	
	voltmeter	1
A. 6	Temperature reading	
A.6.1	thermocouple wires set	9
A.6.2	data logger	1
A.6.3	temperature gauge, range: 1-100 °C	1
A.7	Pressure reading	
	pressure gauge (0-20 kgf/cm ²)	1
A.8	Preheating time	
	digital timer	1

Annex B

Specifications of Scalder

Name of Applicant/Distributor: _____

Address: _____

Tel No: _____

Name of Manufacturer: _____

Address: _____

Tel No: _____

General Information

Classification: _____

Serial No: _____ Type: _____

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 Stunner		
B.1.1 Specie of poultry animal's applicability		
B.1.2 Overall dimensions, mm		
B.1.2.1 length		
B.1.2.2 width		
B.1.2.3 height		
B.1.2.4 thickness		
B.1.2.5 weight, kg		
B.1.3 Materials of constructions		
B.1.4 Pipelines		
B.1.4.1 Dimensions, mm		
B.1.4.1.1 inside diameter		
B.1.4.1.2 thickness		
B.1.4.2 construction material		
B.1.4.3 pipe schedule		
B.1.4.4 perforations		
B.1.4.4.1 diameter, mm		
B.1.4.4.2 total number of perforations		
B.1.4.4.3 perforation interval, mm		
B.1.5 Fittings		
B.1.5.1 construction material		
B.1.5.2 pipe schedule		
B.1.6 Turbulence inducer (if available)		
B.1.6.1 type		
B.1.6.2 material of construction		
B.1.6.3 diameter, mm (if mechanical)		

ITEMS	Manufacturer's Specification	Verification by the Testing Agency
B.1.6.4 speed, rpm (if mechanical)		
B.1.6.5 volumetric flowrate (if air or water induced)		
B.1.7 Frames		
B.1.7.1 length		
B.1.7.2 width		
B.1.7.3 height		
B.1.7.4 thickness		
B.1.8 For electrical heater		
B.1.8.1 Voltmeter		
B.1.8.1.1 range, V		
B.1.8.1.2 sensitivity		
B.1.8.2 Ammeter		
B.1.8.2.1 range, A		
B.1.8.2.2 sensitivity		
B.1.8.3 Materials of constructions		
B.1.8.4 Operating frequency, Hz		
B.1.8.5 Power cord		
B.1.8.5.1 length		
B.1.8.5.2 size		
B.1.9 For heater using burner and liquefied petroleum gas		
B.1.9.1 Burner		
B.1.9.1.1 Construction materials		
B.1.9.1.2 Dimensions, mm		
B.1.9.1.2.1 width		
B.1.9.1.2.2 length		
B.1.9.1.2.3 height		
B.1.9.2 Gas hose		
B.1.9.2.1 Construction materials		
B.1.9.2.1 Dimensions, mm		
B.1.9.2.1.1 diameter		
B.1.9.2.1.2 thickness		
B.1.9.2.1.3 length		
B.1.10 For heater using furnace and biomass materials		
B.1.10.1 Furnace		
B.1.10.1.1 Construction materials		
B.1.10.1.2 Dimensions, mm		
B.1.10.1.2.1 length		
B.1.10.1.2.2 width		
B.1.10.1.2.3 height		
B.1.10.1.2.4 wall thickness		
B.1.10.2 Chimney		

ITEMS	Manufacturer's Specification	Verification by the Testing Agency
B.1.10.2.1 Construction materials		
B.1.10.2.2 Dimensions, mm		
B.1.10.2.2.1 width		
B.1.10.2.2.2 height		
B.1.11 For scalding that uses boiler		
B.1.11.1 Boiler		
B.1.11.1.1 Source of heat		
B.1.11.1.2 Construction materials		
B.1.11.1.3 Dimensions, mm		
B.1.11.1.3.1 length		
B.1.11.1.3.2 width		
B.1.11.1.3.3 height		
B.1.11.4 Heat exchanger/boiler tube		
B.1.11.4.1 Construction materials		
B.1.11.4.2 Dimensions, mm		
B.1.11.4.2.1 length		
B.1.11.4.2.2 diameter		
B.1.11.4.2.3 thickness		
B.1.11.4.3. Number of tubes		
B.1.12 Pump		
B.1.12.1 Type		
B.1.12.2 Rated maximum discharge, L/s		
B.1.12.3 Rated power, kW		
B.2 Other Observations		
B.2.1 Safety features		
B.2.2 Other features, specify:		

B.3 Welding Acceptance test	Remarks
B.3.1 Crack prohibition	
B.3.2 Weld/base-metal fusion	
B.3.3 Crater cross section	
B.3.4 Weld profile	
B.3.5 Time of inspection	
B.3.6 Undersize welds (if any)	
B.3.7 Undercut	
B.3.8 Porosity (presence of air holes on the welded part)	

Annex C

Performance Test Data Sheet

Test Engineer: _____ Date: _____
 Assistants: _____ Location: _____
 Test Location: _____
 Test Requested by: _____
 Manufacturer: _____

	Trial			Average
	1	2	3	
C.1 Information on the Test Materials				
C.1.1 Specie				
C.2 Observation on scalding before and after scalding	Remarks/Observations			
C.2.1 Safety				
C.2.2 Ease of cleaning parts				
C.2.3 Ease of adjusting and repair of parts				
C.2.4 Before testing				
C.2.4.1 water leakage				
C.2.4.2 ineffective draining				
C.2.5 After testing				
C.2.5.1 loosened fittings				
C.2.5.2 leaks				
C.2.6 other observations (descibe):				

C.3 Scalding Efficiency before and during scalding

ITEMS	1	2	3	4	5	6	7	8	9	Average
C.3.1 Before										
C.3.1.1 temperature reading, °C										
C.3.1.2 time to reach scalding temperature, mins										
C.3.2 During										
C.3.2.1 temperature reading, °C										
C.3.2.2 time to reach scalding temperature, mins										

C.4 Scalding Efficacy

Trial 1										
Items	Areas*									
Defeathering sections	1	2	3	4	5	6	7	8	9	10
front										
back										
Trial 2										
Items	Areas*									
Defeathering sections	1	2	3	4	5	6	7	8	9	10
front										
back										
Trial 3										
Items	Areas*									
Defeathering sections	1	2	3	4	5	6	7	8	9	10
front										
back										
Trial 4										
Items	Areas*									
Defeathering sections	1	2	3	4	5	6	7	8	9	10
front										
back										
Trial 5										
Items	Areas*									
Defeathering sections	1	2	3	4	5	6	7	8	9	10
front										
back										
Trial 6										
Items	Areas*									
Defeathering sections	1	2	3	4	5	6	7	8	9	10
front										
back										
Trial 7										
Items	Areas*									
Defeathering sections	1	2	3	4	5	6	7	8	9	10
front										
back										
Trial 8										
Items	Areas*									
Defeathering sections	1	2	3	4	5	6	7	8	9	10
front										
back										
Trial 8										
Items	Areas*									
Defeathering sections	1	2	3	4	5	6	7	8	9	10
front										
back										

Trial 9										
Items	Areas*									
Defeathering sections	1	2	3	4	5	6	7	8	9	10
front										
back										
Trial 9										
Items	Areas*									
Defeathering sections	1	2	3	4	5	6	7	8	9	10
front										
back										
C.4.2 Total number of areas to be defeathered										
C.4.3 Total number of areas defeathered properly										
C.4.4 Scalding efficiency, %										

* y – defeathered properly
 n – not defeathered properly

C.6 Other Observations:

Annex D

Formula Used During Calculations and Testing

D.1 Scalding Capacity

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

where:

C	=	capacity of scalding in poultry animals per hour
P	=	number of poultry animal that was held in the scalding
T	=	dumping time, hours

D.2 Coefficient of Variation for Temperature at Different Point in the Scalding

$$CV = \frac{s}{M}$$

$$\text{Mean of } x = M = \frac{\sum x_j}{n}$$

$$s = \sqrt{s^2}$$

$$s^2 = \frac{\sum x_j^2 - n(M^2)}{n-1}$$

where:

CV	=	coefficient of variation
s	=	standard deviation
s ²	=	variance
x _j	=	individual sample
n	=	total number of samples
M	=	mean of x (temperature)

D.3 Scalding Efficiency (for mechanical) – before and during operation

$$E_{ff} = 100 - CV$$

where:

E_{ff} = efficiency of the scalding, %

CV = coefficient of variation of temperature, %

D.4 Scalding Efficacy

$$Eff = \frac{A_{df}}{A_T} \times 100$$

where:

Eff = scalding efficacy, %

A_{df} = total number of areas defeathered properly

A_T = total number of areas randomly selected for defeathering