

## **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 512:2007 Slaughterhouse Equipment – Overhead Rail System for Hogs – Methods of Test

PAES 518:2008 Slaughterhouse Equipment – Overhead Rail System for Large Ruminants – Methods of Test

Sams, Alan R. *Poultry meat processing*. Department of Poultry Science, Texas A&M University. CRC Press. 2001

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

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## **1 Scope**

This standard specifies the methods of test and inspection for overhead rail system for poultry dressing/slaughtering plant. Specifically, it shall be used to:

- 1.1** verify the mechanism, dimensions, materials, installation, accessories of the overhead rail system and the list of specifications submitted by the manufacturer;
- 1.2** determine the performance of the system;
- 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:

<b>PAES 102:2000</b>	Agricultural Machinery – Operator’s Manual – Content and Presentation
<b>PAES 411:2000</b>	Agricultural Structures – Slaughterhouse for Swine, Small and Large Animals – General Requirements
<b>PAES 525:2012</b>	Slaughterhouse Equipment – Overhead Rail System for Poultry Dressing/Slaughtering Plant – Specifications

## **3 Definitions**

For the purpose of this standard, the definitions given in PAES 525 and the following shall apply:

### **3.1**

#### **bending**

#### **flexural stress**

stress caused by bending moment at a given point in the beam supporting the overhead rail system

### **3.2**

#### **fracture**

deformation caused by excessive stress applied to the overhead rail system

### **3.3**

#### **live weight**

weight of poultry animal prior to slaughter

### **3.4**

#### **load capacity**

maximum load capacity of a rail track in a 1000 mm distance, expressed in kg per linear meter

### **3.5**

#### **overall length**

measurement from both ends of the entire track/rail

### **3.6**

#### **radius of curvature**

##### **radius**

distance from the circumference of a circle to its center

### **3.7**

#### **sagging**

failure due to elastic instability of the overhead rail system

### **3.8**

#### **shackle spacing**

horizontal distance between two shackles

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

### **4.1 Role of manufacturer/dealer**

The manufacturer shall submit the operator's manual for overhead rail system 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 overhead rail system 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 overhead rail system test is shown in Annex A.

## **4.5 Test materials**

### **4.5.1 Linear speed Reduction Test**

Test materials to be used shall be of the same species. There shall be at least thirty (30) test materials to conduct the test.

### **4.5.2 Structural Test**

Test materials to be used shall be test weights or fabricated weight materials such as solid metals; wood; bagged sand, stone/gravel, etc.; or its combination, may be used during the performance test of the overhead rail system.

Nine 5 kg (11 lb.) test weights shall be used to conduct the test.

## **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**

This inspection is carried out to verify the mechanisms, dimensions, materials, accessories, and linear speed of the overhead rail system 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 test materials shall be obtained prior to testing of the overhead rail system. 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 overhead rail system.

**5.3.2** Weight of the test materials shall be taken and recorded.

**5.3.3** Evaluation on the capacity of the overhead rail system statically and dynamically shall be verified

**5.3.4** Visual inspection shall be made on the welded parts of the overhead rail system and shall be recorded in Annex C.

### **5.3.5 Operation of the Overhead Rail System**

**5.3.5.1** Acceleration transducer shall be attached to the rail of the overhead rail system to record the vibration during operation (with and without load). During operation without load, the alignment, slope and fabrication finish of the whole overhead rail system shall be checked.

#### **5.3.5.2 Linear speed reduction test**

**5.3.5.2.1** The linear speed of the overhead rail system without load shall be taken and recorded.

**5.3.5.2.2** Poultry animals shall be suspended manually using shackles.

**5.3.5.2.3** Once the test materials are suspended, it is conveyed mechanically along the rail track to check for the alignment, slope and fabrication finish of the whole overhead rail system.

**5.3.5.2.4** Linear speed of the rail system with load shall be taken and recorded.

**5.3.5.2.5** Linear speed reduction shall be computed using the formula in Annex D.

#### **5.3.5.3 Structural test**

**5.3.5.3.1** Test materials (test weights) shall be suspended manually using shackles. For every linear meter, a total of 15 kg (33 lb.) test weights evenly distributed shall be suspended.

**5.3.5.3.2** Once the test materials are suspended, it is conveyed mechanically along the rail track to check for the alignment, slope and fabrication finish of the whole overhead rail system.

**5.3.5.3.3** Any for sign of failure in any part of the overhead rail system, such as sagging, bending, and fracture shall be taken and recorded in Annex C.

**5.3.5.3.4** Visual inspection on the welded parts of the rail system and other observations not stated shall be recorded.

### **5.3.6 Data Collection**

#### **5.3.6.1 Power Consumption**

In case of electric powered overhead rail system, power meter shall be used to measure the electric energy consumption with and without load.

**5.3.6.2** The data obtained shall be recorded in Annex C.

#### **5.4 Test trials**

There shall be at least three (3) test trials. For speed reduction test 30 poultry animals shall be used per trial. For structural test, 45 kg (99 lb.) of test weights per 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

<b>A.1</b>	<b>Test Weight Characteristics</b>	<b>Quantity</b>
<b>A.1.1</b>	digital weighing scale, capacity: 20 kg	1
<b>A.1.2</b>	tape measure	1
<b>A.2</b>	<b>Overhead Rail System Characteristics</b>	
<b>A.2.1</b>	steel tape	1
<b>A.2.2</b>	vernier caliper: 0.05 mm accuracy, 200 mm length	1
<b>A.3</b>	<b>Speed</b>	
	tachometer (contact type or photo electric type) range: 0 rpm to 5000 rpm	1
<b>A.4</b>	<b>Power</b>	
	power meter (for electric motor) 60 Hz, 220V	1
<b>A.5</b>	<b>Calculations</b>	
	scientific calculator	1
<b>A.6</b>	<b>Time</b>	
	digital timer (range: 60 minutes) Accuracy: 0.1 second	1
<b>A.7</b>	<b>Labelling</b>	
	permanent marker	1
<b>A.8</b>	<b>Vibration Level</b>	
<b>A.8.1</b>	Acceleration transducer (capacity: 1G; frequency response: up to 40Hz)	1
<b>A.8.2</b>	Strain amplifier (bridge resistance: 60 to 100 ohms)	1



## Annex B

### Specifications of Overhead Rail System

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>B.1 Main structures</b>		
<b>B.1.1</b> Material of construction		
<b>B.1.2</b> Overall length, m		
<b>B.2 Main frame railing</b>		
<b>B.2.1</b> Material of construction		
<b>B.2.2</b> Dimensions, mm		
<b>B.2.2.1</b> Width		
<b>B.2.2.2</b> Thickness		
<b>B.2.4</b> Maximum load capacity (static), kg/m		
<b>B.3 Rail track</b>		
<b>B.3.1</b> Material of construction		
<b>B.3.2</b> Shape		
<b>B.3.3</b> Dimensions, mm		
<b>B.3.3.1</b> Diameter or width		
<b>B.3.3.2</b> Height (if rectangular)		
<b>B.3.3.3</b> Thickness		
<b>B.3.4</b> Number of rails		
<b>B.3.5</b> Maximum moving load capacity, kg/m		
<b>B.3.6</b> Speed, m/s		
<b>B.4 Chains</b>		
<b>B.4.1</b> Material of construction		
<b>B.4.2</b> Size		
<b>B.4.3</b> Thickness, mm		
<b>B.5 Sprocket</b>		
<b>B.5.1</b> Material of construction		
<b>B.5.2</b> Dimensions, mm		

ITEMS	Manufacturer's Specification	Verification by the Testing Agency
<b>B.5.2.1</b> Diameter		
<b>B.5.2.2</b> Thickness		
<b>B.5.3</b> Number of teeth		
<b>B.6 Main frame of the whole overhead rail system</b>		
<b>B.6.1</b> Material of construction		
<b>B.6.2</b> Dimensions, mm		
<b>B.6.2.1</b> Length		
<b>B.6.2.2</b> Width		
<b>B.6.2.3</b> Height		
<b>B.7 Steel Support</b>		
<b>B.7.1</b> Material of construction		
<b>B.7.2</b> Dimensions, mm		
<b>B.7.2.1</b> Height		
<b>B.7.2.2</b> Width		
<b>B.7.2.3</b> Thickness		
<b>B.7.3</b> Maximum tensile strength, kg		
<b>B.8 Shackle</b>		
<b>B.8.1</b> Material of construction		
<b>B.8.2</b> Dimensions, mm		
<b>B.8.2.1</b> Length		
<b>B.8.2.2</b> Width		
<b>B.8.2.3</b> Height		
<b>B.8.2.4</b> Thickness		
<b>B.9 Track scale (if available)</b>		
<b>B.9.1</b> Material of construction		
<b>B.9.2</b> Brand		
<b>B.9.3</b> Type		
<b>B.9.4</b> Capacity, kg		
<b>B.9.5</b> Accuracy, kg		
<b>B.9.6</b> Location		
<b>B.9.7</b> Length, mm		
<b>B.10 Prime mover</b>		
<b>B.10.1 Electric motor</b>		
<b>B.10.1.1</b> Brand		
<b>B.10.1.2</b> Make or manufacturer		
<b>B.10.1.3</b> Serial Number		
<b>B.10.1.4</b> Type		
<b>B.10.1.5</b> Rated Power, kW		
<b>B.10.1.6</b> Rated speed, rpm		
<b>B.10.1.7</b> Frequency, Hz		
<b>B.10.1.8</b> Voltage, V		
<b>B.10.2</b> Internal Combustion Engine		
<b>B.10.2.1</b> Brand		
<b>B.10.2.2</b> Model		

ITEMS	Manufacturer's Specification	Verification by the Testing Agency
<b>B.10.2.3</b> Make or manufacturer		
<b>B.10.2.4</b> Serial Number		
<b>B.10.2.5</b> Type		
<b>B.10.2.6</b> Rated power, kW		
<b>B.10.2.7</b> Rated speed, rpm		
<b>B.10.2.8</b> Cooling system		
<b>B.10.2.9</b> Starting system		
<b>B.10.2.10</b> Weight, kg		
<b>B.11 Other Observations</b>		
<b>B.11.1</b> Safety features:		
<b>B.11.2</b> Others, specify:		

<b>B.12 Welding Acceptance test</b>				
<b>B.12.1</b> Crack prohibition				
<b>B.12.2</b> Weld/base-metal fusion				
<b>B.12.3</b> Crater cross section				
<b>B.12.4</b> Weld profile				
<b>B.12.5</b> Time of inspection				
<b>B.12.6</b> Undersize welds (if any)				
<b>B.12.7</b> Undercut				
<b>B.12.8</b> 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	
<b>C.1 Information on the Test Materials</b>				
<b>C.1.1</b> Weight, kg				
<b>C.1.2</b> Materials used				
<b>C.1.3</b> Dimensions, mm				
<b>C.1.3.1</b> Length				
<b>C.1.3.2</b> Width				
<b>C.1.3.3</b> Thickness				
<b>C.1.3.4</b> Diameter (if cylindrical)				
<b>C.2</b> Speed of Components				
<b>C.2.1</b> Prime mover, rpm				
<b>C.2.1.1</b> without load				
<b>C.2.1.2</b> with load				
<b>C.2.2</b> Conveyor, m/s				
<b>C.2.2.1</b> without load				
<b>C.2.2.2</b> with load				
<b>C.3</b> Power Consumption, kW				
<b>C.3.1</b> without load				
<b>C.3.2</b> with load				
<b>C.4</b> Voltage, V				
<b>C.4.1</b> without load				
<b>C.4.2</b> with load				
<b>C.5</b> Current, A				
<b>C.5.1</b> without load				
<b>C.5.2</b> with load				
<b>C.6</b> Fuel Consumption, L/h				
<b>C.6.1</b> Engine operating time, h				
<b>C.6.2</b> Fuel consumed, L				

<b>C.7 Observation before and after conduct of test</b>	<b>Remarks/Observations</b>
<b>C.7.1</b> Ease of loading	
<b>C.7.2</b> Ease of unloading	
<b>C.7.3</b> Ease of cleaning parts	
<b>C.7.4</b> Ease of adjusting, repair and replacement of parts	
<b>C.7.5</b> Ease of collecting output	
<b>C.7.6</b> Uniform travel of trolley along the rail	
<b>C.7.7</b> Safety	
<b>C.7.8</b> Vibration	
<b>C.7.9</b> Failure	
<b>C.7.9.1</b> Sagging	
<b>C.7.9.2</b> Fracture	
<b>C.7.10</b> Other observations (describe):	

	<b>Observations/Data Obtained</b>
<b>C.8.1</b> Load capacity, kg	
<b>C.8.1.1</b> Trolley	
<b>C.8.1.2</b> Rail track	
<b>C.8.2</b> Vibration, G	
<b>C.8.3</b> Percent Speed Reduction, %	
<b>C.8.4</b> Time of operation, h	
<b>C.8.5</b> Electric Energy Consumption, kW-h	
<b>C.8.6</b> Rail Slope, %	

**C.9 Other Observations:**

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## Annex D

### Formula Used During Calculations and Testing

#### D.1 Percent Speed Reduction

$$R_s = \left[ 1 - \frac{S_2}{S_1} \right] \times 100$$

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

#### D.2 Electric Energy Consumption

$$E_c = P_c T_o$$

where:

$E_c$	=	electric energy consumption, kW-h
$P_c$	=	power consumed, kW
$T_o$	=	time of operation, h

#### D.3 Rail Slope

$$S = \frac{\text{Rise}}{\text{Run}} \times 100$$

where:

$S$	=	rail slope
Rise	=	vertical distance between ends of the rail, expressed in meter
Run	=	distance between ends of the rail measured horizontally, expressed in meter

**D.4 Linear Speed**

$$\text{Linear Speed} = \pi DN$$

where:

Linear speed = in m/s

D = diameter of drum, m

N = rotational speed, rpm