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:

Baumeister, T., E.A. Avallone and T. Baumeister III. 1978. *Marks' Standard Handbook for Mechanical Engineers.* 8th ed. McGraw- Hill, Inc.

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

Wikipedia: The Free Encyclopedia. http://en.wikipedia.org/wiki. June 27, 2007.

Slaughterhouse Equipment – Overhead Rail System for Hogs – Methods of Test

1 Scope

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

1.1 verify the mechanism, dimensions, materials, installation, accessories of the overhead railings and the list of specifications submitted by the fabricator;

1.2 determine the performance of the equipment;

1.3 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 407: 2001 Agricultural Structures – Slaughterhouse for Swine, Small and Large Animals – General Requirements

PAES 511:2007 Slaughterhouse Equipment – Overhead Rail System for Hogs - Specifications

3 Definitions

For the purpose of this standard, the definitions given in PAES 511 and the following shall apply:

3.1
breed
species of hog used as test material

3.2
hanger/bracket spacing
horizontal distance between rail hangers

3.3
live weight
weight of hog prior to slaughter

3.4
moving load capacity
maximum load capacity of a rail track in a 1000 mm distance, expressed in kg

3.5
overall length
measurement from both ends of the entire track/rail

3.6
radius of curvature
radius
distance of a circle or curve to its center

3.7
rail slope
measurement of upward or downward inclination of the rail track from a reference horizontal plane

3.8
rail track spacing
center to center distance or spacing between railings measured horizontally

4 General Conditions for Test and Inspection

4.1 Role of fabricator/dealer

The fabricator shall submit specifications and other relevant information about the overhead railing and shall abide with the terms and conditions set forth by an official testing agency.

4.2 Test site conditions

The overhead railing shall be tested as installed in the slaughterhouse.

4.3 Test instruments

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

4.4 Test material

Test materials to be used shall be test weights with the following characteristics:

4.4.1 Test material characteristics

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.

4.5 Quantity to be supplied

Ten (10) pieces of test weights or fabricated weight materials of at least 100 kg each shall be used for manual type of rail system while for automatic type twenty (20) pieces of test weights or fabricated weight materials at 100 kg each shall be used.

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 mechanisms, dimensions, materials, fabrication and accessories of the overhead railings 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 system performance.

5.2.2 Initial data of the test weights shall be recorded.

5.2.3 Evaluation on the capacity of the rail system statically and dynamically shall be verified.

5.2.3.1 Manually operated

5.2.3.1.1 Test weight shall be suspended at gambrelling point.

5.2.3.1.2 Once test weight is suspended, a slight push shall be made to check for the alignment, slope and fabrication finish.

5.2.3.1.3 Observations for any sign of failure in any part of the overhead rail system, such as buckling and breakage shall be recorded in Annex C.

5.2.3.1.4 Visual inspection acceptance test shall be made on welded parts of the rail system and shall be recorded in Annex C.2.1.2.

5.2.3.2 Semi-mechanized

5.2.3.2.1 Test weight shall be suspended at gambrelling point.

5.2.3.2.2 Once test weight is suspended, a slight push shall be made to check for the alignment, slope and fabrication finish.

5.2.3.2.3 Observations for any sign of failure in any part of the overhead rail system, such as buckling and breakage shall be recorded in Annex C.

5.2.3.2.4 Visual inspection acceptance test shall be made on welded parts of the rail system and shall be recorded in Annex C.2.1.2.

5.2.3.3 Mechanized

5.2.3.3.1 Test weight is suspended at the shackling point.

5.2.3.3.2 Once the test weight is suspended, it is conveyed mechanically along the rail track to check for the alignment, slope and fabrication finish.

5.2.3.3.3 Speed of the conveyor shall be noted and shall be compared with the indicated speed by the fabricator.

5.2.3.3.4 Percent speed reduction shall be computed.

5.2.3.3.5 Observations for any sign of failure in any part of the overhead rail system, such as buckling and breakage shall be recorded in Annex C.

5.2.3.3.6 Visual inspection acceptance test shall be made on welded parts of the rail system and shall be recorded in Annex C.2.2.2.

5.2.3.3.7 For other observations not stated, an additional sheet may be provided.

5.2.4 Test trial

There shall at least ten (10) trials.

5.2.5 Data collection

5.2.5.1 Power consumption

In case of automatic system where electric motor is used as the primemover, a power meter shall be used to measure electric energy consumption.

5.2.5.2 Data recording and observations

Record sheet for all data and information during the test is given in Annex C.

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 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
(informative)

Minimum List
Test Equipment and Materials

A.1	**Equipment**	
		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: 60 minutes) Accuracy: 0.1 sec	2
A.1.3	Caliper	
A.1.4	Weighing scale (capacity: 1000 kg) Scale divisions: 0.1 kg	1
A.1.5	Power meter (for electric motors) 60 Hz, 220 V	
A.1.6	Camera	1
A.1.7	Dumping Level	1
A.1.8	Tape measure	1
A.1.9	Handheld vibration meter	1
A.2	**Materials**	
A.2.1	Labeling tags which include	20
A.2.2	Date of test	
A.2.3	Overhead railing, test	
A.2.4	Test weights	
	100 kg each (Manual type of rail system)	(10)
	(Automatic type of rail system)	(20)
A.2.5	Trial number	
A.2.6	Permanent marking pen	1

Annex B
(informative)

Specifications of Overhead Railing

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

GENERAL INFORMATION
Classification: _____
Serial No: _____ Type: _____
Installation date of overhead railing 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 length, m		
B.2 Main frame railing		
B.2.1 Material		
B.2.2 Rail spacing, mm		
B.2.3 Dimensions, mm		
B.2.3.1 Width		
B.2.3.2 Thickness		
B.2.4 Maximum load capacity (static), kg		
B.3 Rail track		
B.3.1 Material		
B.3.2 Slope		
B.3.2.1 %		
B.3.2.2 Direction		
B.3.3 Shape		
B.3.4 Number of rails		
B.3.5 Maximum moving load capacity, kg		
B.3.6 Dimensions, mm		
B.3.6.1 width, mm		
B.3.6.2 thickness, mm		
B.3.6.3 diameter, mm (if tubular)		
B.4 Rail hangers		
B.4.1 Material		
B.4.2 Hanger spacing, mm		
B.4.3 Dimensions, mm		

ITEMS	Fabricator's Specification	Verification by the Testing agency
B.4.3.1 width, mm		
B.4.3.2 thickness, mm		
B.4.3.3 diameter, mm (if rod)		
B.4.4 Maximum tensile strength, kg		
B.4. Rail scale (if applicable)		
B.4.1. Material		
B.4.2. Brand		
B.4.3. Type		
B.4.4. Capacity, kg		
B.4.5. Sensitivity, gm/mm		
B.4.6. Location		
B.5. Prime mover (if applicable)		
B.5.1. Electric motor		
B.5.1.1. Brand		
B.5.1.2. Fabricator		
B.5.1.3. Serial No.		
B.5.1.4. Type		
B.5.1.5. Rated Power, kW		
B.5.1.6. Rated Speed, rpm		
B.5.1.7. Frequency, Hz		
B.5.1.8. 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	**Trial**										**Ave**
	1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	
C.1.1. Weight, kg											
C.1.2. Material											
C.1.3. Dimensions, mm											
C.1.3.1. Weight, kg											
C.1.3.2. Length, mm											
C.1.3.3. Width, mm											
C.1.3.4. Thickness, mm											
C.1.3.5. Diameter, mm (if circular)											
C.2 Result of Performance Test											
ITEMS	**Trial**										**Ave**
C.2.1 Manual/gravity operated	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	
C.2.1.1 Noise Level, dB(A)											
C.2.1.1.1 Without load											
C.2.1.1.2 With load											
C.2.1.2 Welding acceptance test											
C.2.1.2.1 Crack prohibition											
C.2.1.2.2 Weld/base-metal fusion											
C.2.1.2.3 Crater cross section											
C.2.1.2.4 Weld profile											
C.2.1.2.5 Time of inspection											
C.2.1.2.6 Undersize welds (if any)											
C.2.1.2.7 Undercut											
C.2.1.2.8 Porosity											
ITEMS	**Trial**										**Ave**
C.2.2 Automatic operated	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8 …19***		***20***	
C.2.2.1 Speed of Components, rpm											
C.2.2.1.1 Electric Motor											
C.2.2.1.2 Without load											
C.2.2.1.3 With load											
C.2.1.2 Reducer Shaft											
C.2.1.2.1 Without load											
C.2.1.2.2 With load											
C.2.1.3 Trolley speed											
C.2.1.3.1 Without load											

C.2.1.3.2 With load											
C.2.2 Noise Level, dB(A)											
C.2.2.1 Without load											
C.2.2.2 With load											
C.2.3 Power Consumption											
C.2.3.1 Power, kW											
C.2.3.1.1 Without load											
C.2.3.1.2 With load											
C.2.3.2 Voltage, V											
C.2.3.2.1 Without load											
C.2.3.2.2 With load											
C.2.3.3 Current, A											
C.2.3.3.1 Without load											
C.2.3.3.2 With load											
C.2.2.2 Welding acceptance test											
C.2.2.2.1 Crack prohibition											
C.2.2.2.2 Weld/base-metal fusion											
C.2.2.2.3 Crater cross section											
C.2.2.2.4 Weld profile											
C.2.2.2.5 Time of inspection											
C.2.2.2.6 Undersize welds (if any)											
C.2.2.2.7 Undercut											
C.2.2.2.8 Porosity											

C.3 Overhead railing performance

	Static	**Dynamic**
C.3.1 Load capacity, kg		
C.3.1.1 Rail hanger		
C.3.1.2 Rail track		
C.3.1.3 Trolley		
C.3.1.4 Chain		
C.3.1.5 Vibration, Hz		
C.3.2 Traveling time, s		
C.3.3 Failure		
C.3.3.1 Buckling*		
C.3.3.2 Fracture*		

*****Yes/No

C.4 Rate the following observations:

Items	Rating**
C.4.1 Ease of loading	
C.4.2 Ease of unloading	
C.4.3 Ease of cleaning parts	
C.4.4 Ease of adjusting and repair of parts	
C.4.5 Ease of collecting output	
C.4.6 Uniform travel of trolley along the rail	
C.4.7 Safety	
C.4.8 Vibration	

****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 Percent Speed Reduction

$$R_S = \left(1 - \frac{S_1}{S_2} \right) \text{ x } 100$$

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 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.3 Slope

$$S = \frac{Rise}{Run} x100$$

where:

Rise = Vertical distance between ends of the rail, expressed in m.
Run = Distance between ends of the rail measured horizontally, expressed in m.

C.3.4 Tensile Stress

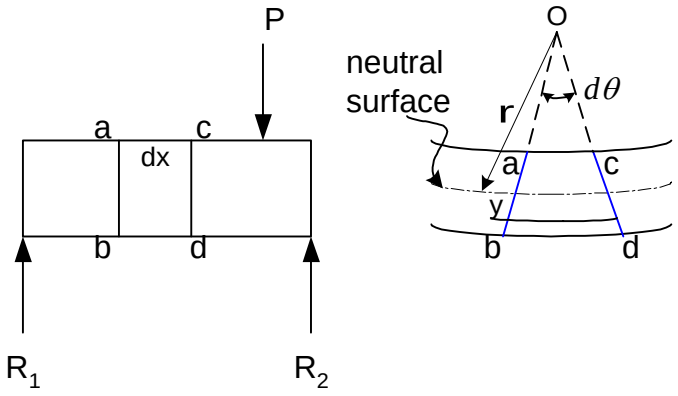
$$\sigma = \frac{P}{A}$$

where:

σ = average normal stress at any point on the cross-sectional area.

P = internal resultant normal force, which is applied through the centroid of the cross-sectional area.
A = cross-sectional area of the bar.

C.3.5 Flexure Stress – stress caused by the bending moment



$\sigma = \frac{My}{I}$ the Flexure formula that relates the flexure stress with the bending moment

where:
σ = Flexure stress
M = bending moment at a given point in the beam
y = distance of fiber from the neutral axis
I = moment of inertia of the cross-sectional area of the beam with respect to the neutral axis

$$\max \sigma = \frac{Mc}{I} \quad \text{or} \quad \max \sigma = \frac{M}{S} \qquad S = \frac{I}{c}$$

where:
c = distance of the farmost fiber from the neutral axis
S = section modulus of the cross-section