

# PHILIPPINE NATIONAL STANDARD

PNS/PAES 258:2011  
(PAES published 2011)  
ICS 65.060.01

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## Agricultural machinery – Feed Mixer – Specifications



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**National Foreword**

This Philippine Agricultural Engineering Standards PAES 258:2011, Agricultural machinery – Feed Mixer – Specifications was approved for adoption as Philippine National Standard by the Bureau of Product Standards upon the recommendation of the Agricultural Machinery Testing and Evaluation Center (AMTEC) and the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development of the Department of Science and Technology (PCARRD-DOST).

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**PHILIPPINE AGRICULTURAL ENGINEERING STANDARD PAES 258:2011**  
**Agricultural Machinery – Feed Mixer – Specifications**

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**Foreword**

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) through the project “Development of Standards for Agricultural Production and Postharvest Machinery” funded by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development – Department of Science and Technology (PCARRD – DOST)

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 the preparation of this standard, the following documents/publications were considered:

W. H. Hasting and D. Higgs. Feed Milling Processes  
<http://www.fao.org/docrep/x5738e/x5738e0j.htm#3.1%20horizontal%20mixers>  
<accessed on September, 2010>

Kammel, David W. Design, Selection and Use of TMR Mixers. Biological Systems Engineering Department. UW-Madison, 460 Henry Mall, Madison, WI 53706.  
November 25, 1998.

Marshall, Tim. Feed processing.  
<http://www.animal.ufl.edu/ANS4245C/documents/FeedProcessing.pdf>.<accessed on June 02, 2009>

Herrman, Tim and Keith Behnke .Testing mixer performance. Department of Grain Science and Industry. Kansas State University. October 1994  
<http://www.oznet.ksu.edu/library/grsci2/MF1172.PDF>.<accessed on June 02, 2009>

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## **1 Scope**

This standard specifies the manufacturing and performance requirements for feed mixer for agri-fisheries.

## **2 References**

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this National Standard:

<b>AWS D1.6:2000</b>	Structural Welding Code – Stainless Steel
<b>PAES 102:2000</b>	Agricultural Machinery – Operator’s Manual – Content and Presentation
<b>PAES 103:2000</b>	Agricultural Machinery – Method of Sampling
<b>PAES 311:2001</b>	Engineering Materials - Screws for Agricultural Machines – Specifications and Applications
<b>PAES 313:2001</b>	Engineering Materials – Bolts and Nuts for Agricultural Machines – Specifications and Applications
<b>PAES 259:2010</b>	Agricultural Machinery – Feed Mixer – Methods of Test

## **3 Definitions**

For the purpose of this standard the following definitions shall apply:

### **3.1**

#### **feeds**

meal type, pellets or crumble type of food that are mixed from various raw materials and additive

### **3.2**

#### **feed mixer**

machine used to mix uniformly the feed ingredients

### **3.3**

#### **coefficient of variation**

statistical representation of the precision of distribution of feed ingredients

### **3.4**

#### **mixing rate**

weight of the feed ingredients fed to the machine per unit time, expressed in kilogram per hour

## **4 Classification**

The classification of feed mixer shall be the following:

### **4.1 Mixing Drum Position**

#### **4.1.1 Horizontal feed mixer**

Type of mixer that have horizontal feed mixing device(s). This mixer moves the feed ingredients from one end to the other.

Classification of horizontal feed mixer shall be according to types of mixing device:

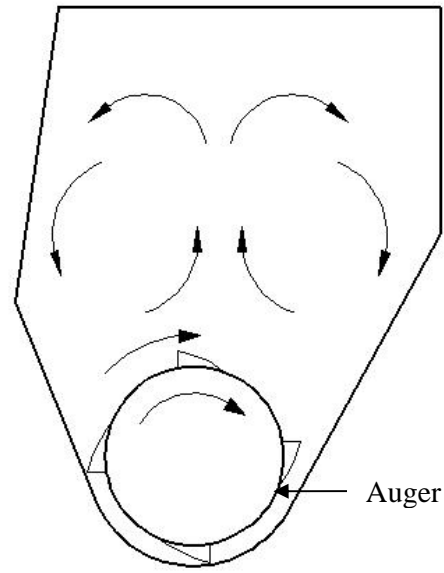
##### **4.1.1.1 Auger mixer**

Feed mixer that uses augers to mix the feed ingredients.

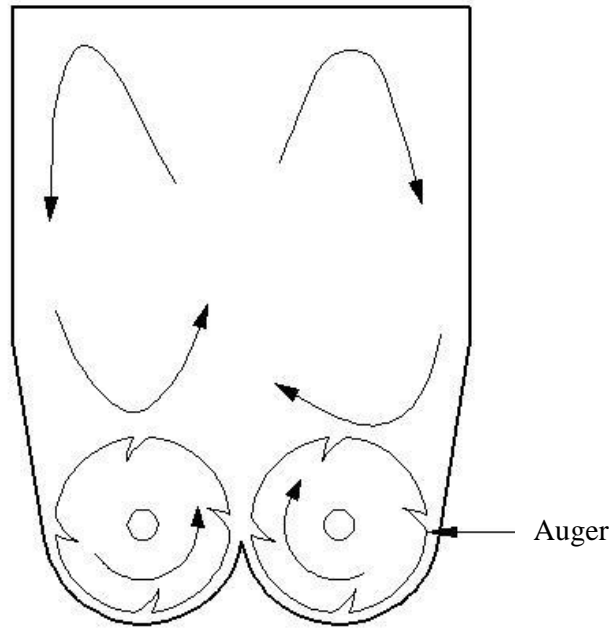
Auger mixer shall be classified according to the following:

###### **4.1.1.1.1 One and two augers**

Feed mixer that moves the feed ingredients towards the middle, to the top, towards the sides and back down to the auger. (Fig. 1)



A



B

Figure 1. Horizontal mixer with one (A) and two (B) augers

#### 4.1.1.1.2 Three and four augers

Feed mixer that moves the feed ingredients towards the side and from bottom to top of the mixer. (Fig. 2)

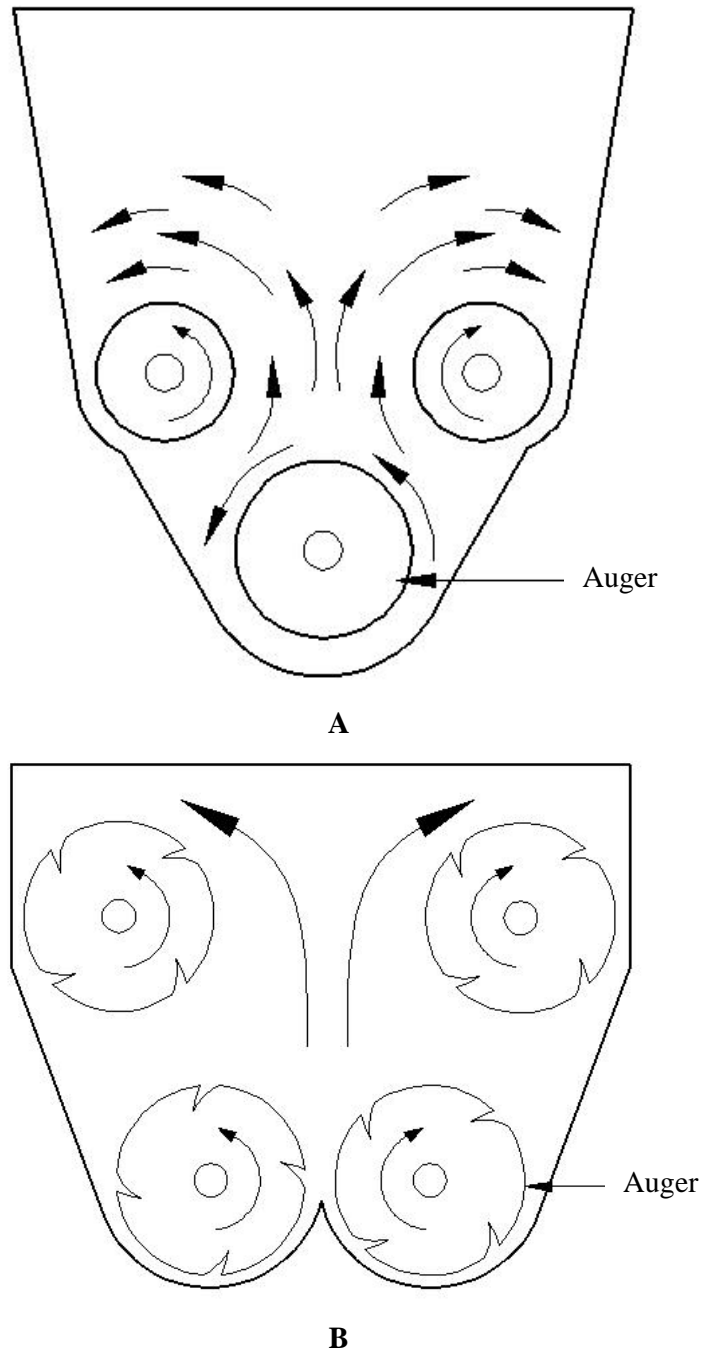
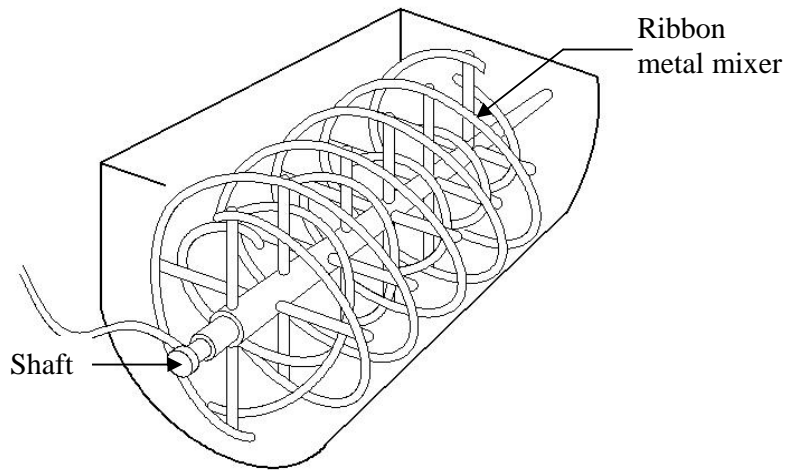


Figure 2. Horizontal mixer with three (A) and four (B) augers

#### 4.1.1.2 Ribbon mixer

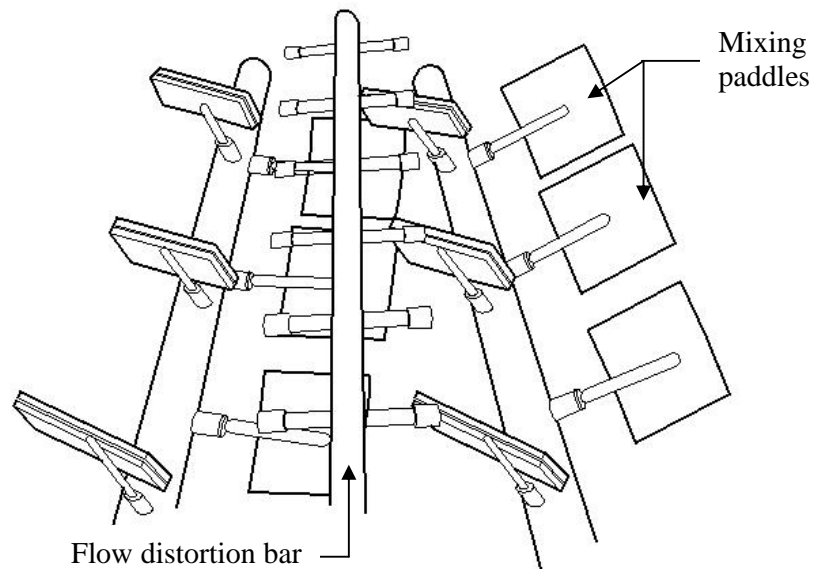
Feed mixer that uses helical ribbons to mix the feed ingredients.  
(Fig. 3)



**Figure 3. Horizontal mixer with helical ribbon metal mixing device**

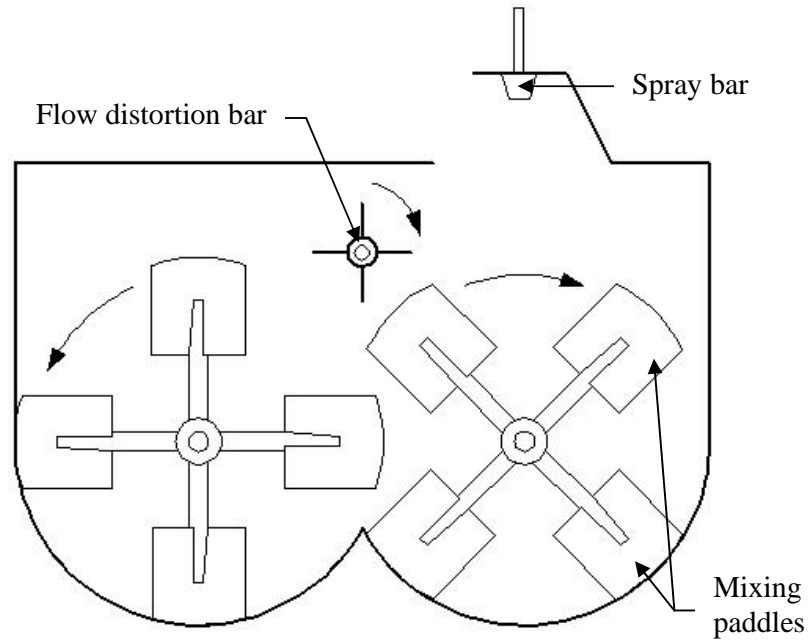
#### 4.1.1.3 Paddles

Feed mixer that uses paddles (arranged radially around the shaft) to mix the feed ingredients. (Fig. 4)



**Figure 4a. Horizontal mixer with paddle mixing device**

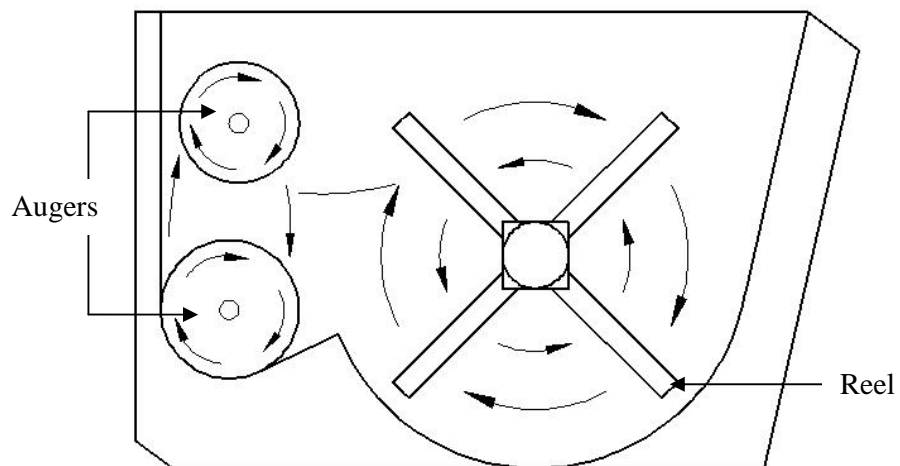




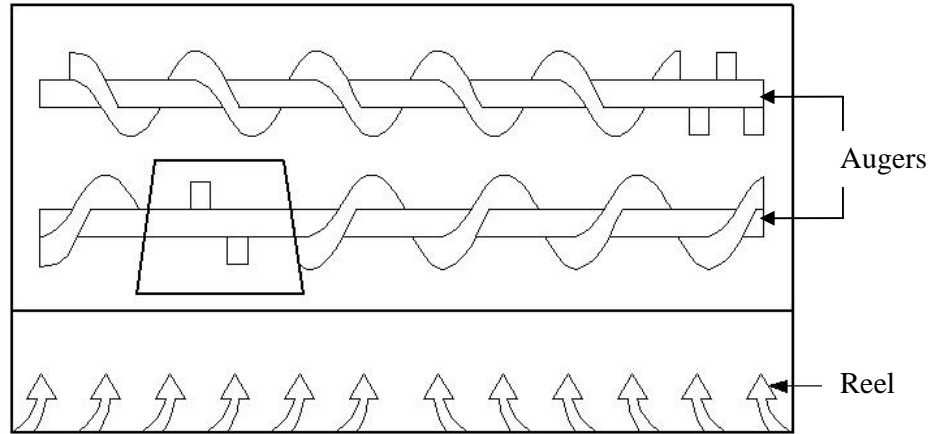
**Figure 4b. Horizontal mixer with paddle mixing device**

#### 4.1.1.4 Reel and augers

Feed mixer that uses a reel (lifts and tumbles the feed ingredients) and a set of augers (mix the feed ingredients and move the feed to the discharge area). (Fig. 5a and 5b)



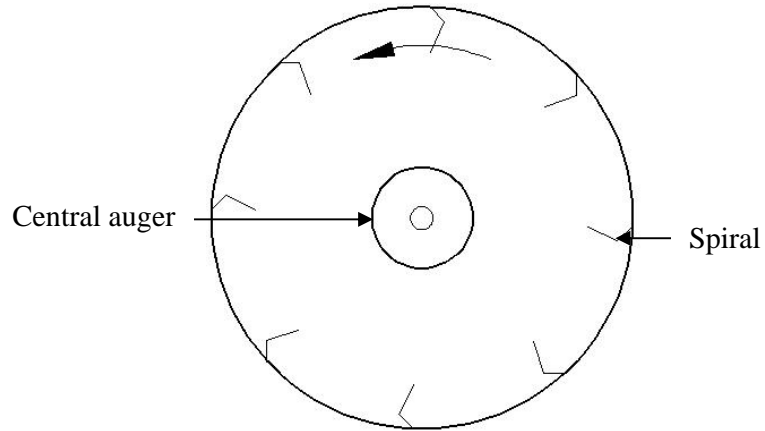
**Figure 5a. Horizontal feed mixer with reel and augers**



**Figure 5b. Horizontal feed mixer with reel and augers**

**4.1.1.5 Tumble mixer**

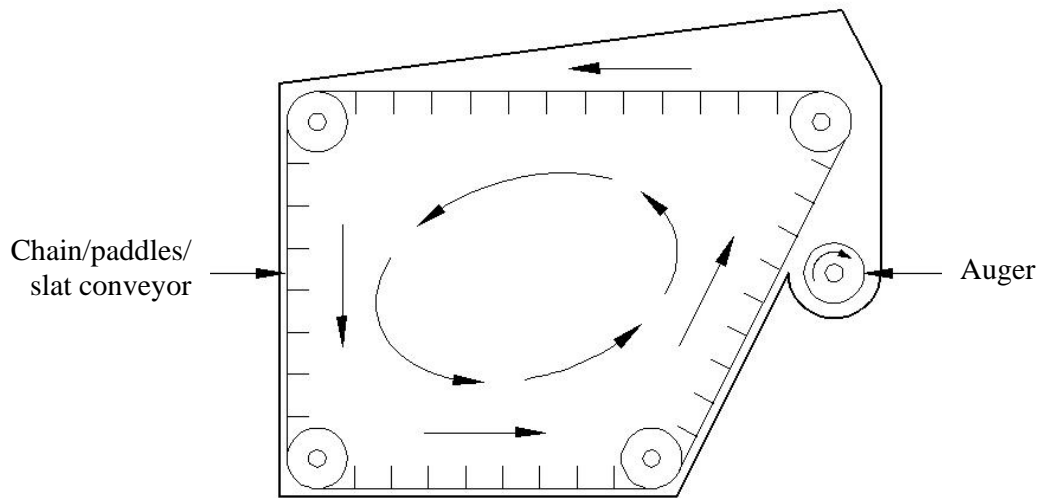
Feed mixer that have spirals and/or pans on the interior surface of the drum and a central auger to lift, tumble and mix the feed ingredients. (Fig. 6)



**Figure 6. Tumble horizontal mixer**

#### 4.1.1.6 Chain, paddle and auger

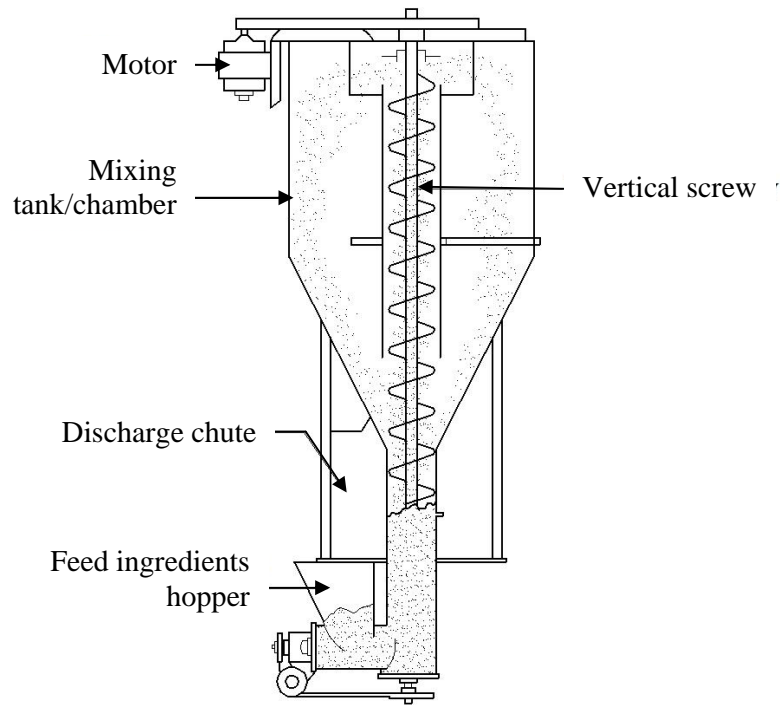
Feed mixer that uses a tub or a box containing a chain, paddles or slat conveyor and auger to tumble and mix the feed ingredients. (Fig. 7)



**Figure 7. Horizontal feed mixer with chain, paddle and auger**

#### 4.1.2 Vertical feed mixer

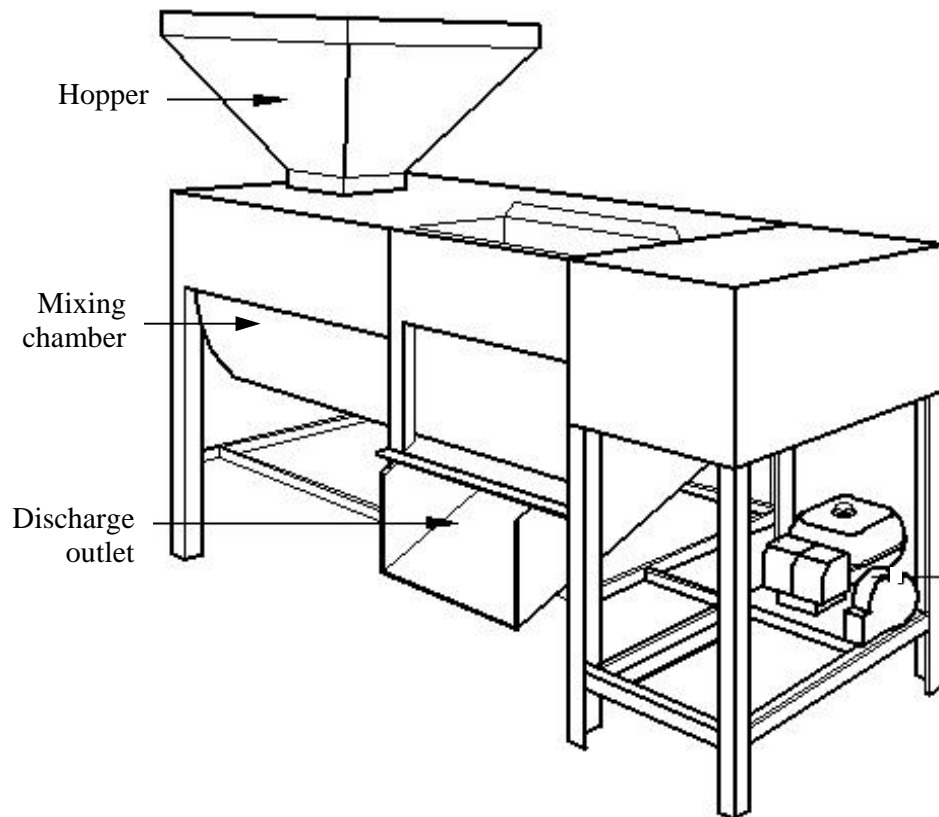
Type of feed mixer that have vertical feed mixing device. This type of feed mixer takes the ingredients to the top of mixing device where it falls and repeat this procedure until the feed ingredients are well mixed. (Fig. 8)



**Figure 8. Vertical feed mixer**

## 4.2 Mode of Installation

### 4.2.1 Stationary type

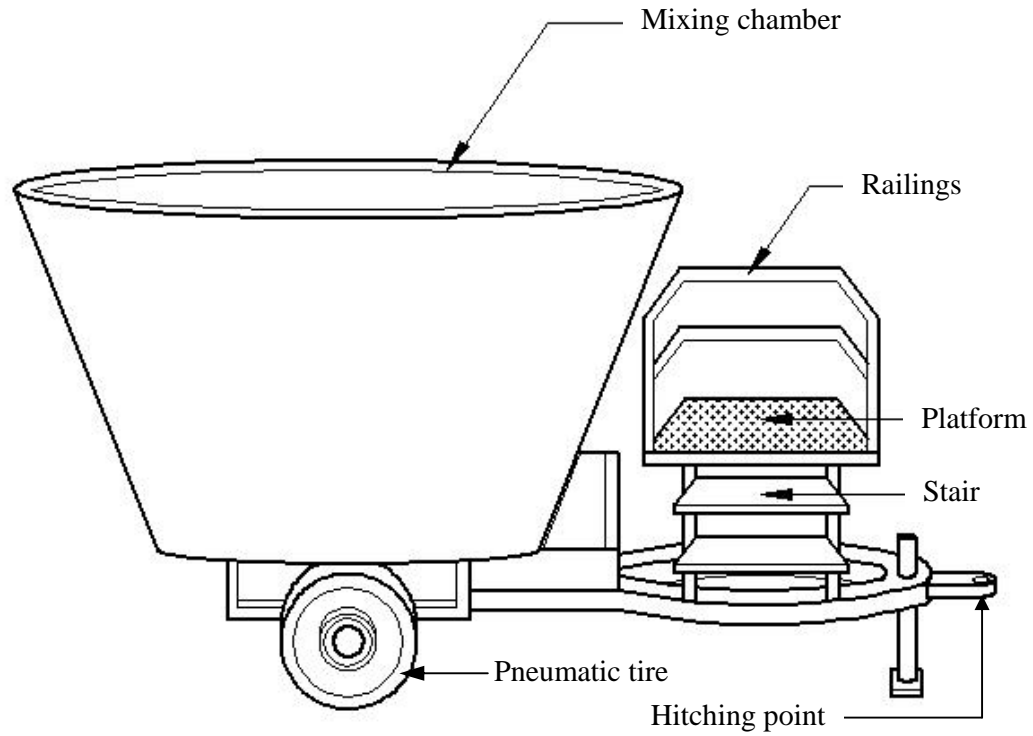


**Figure 9. Stationary type feed mixer**

#### 4.2.2 Mobile type

##### 4.2.2.1 Trailer type

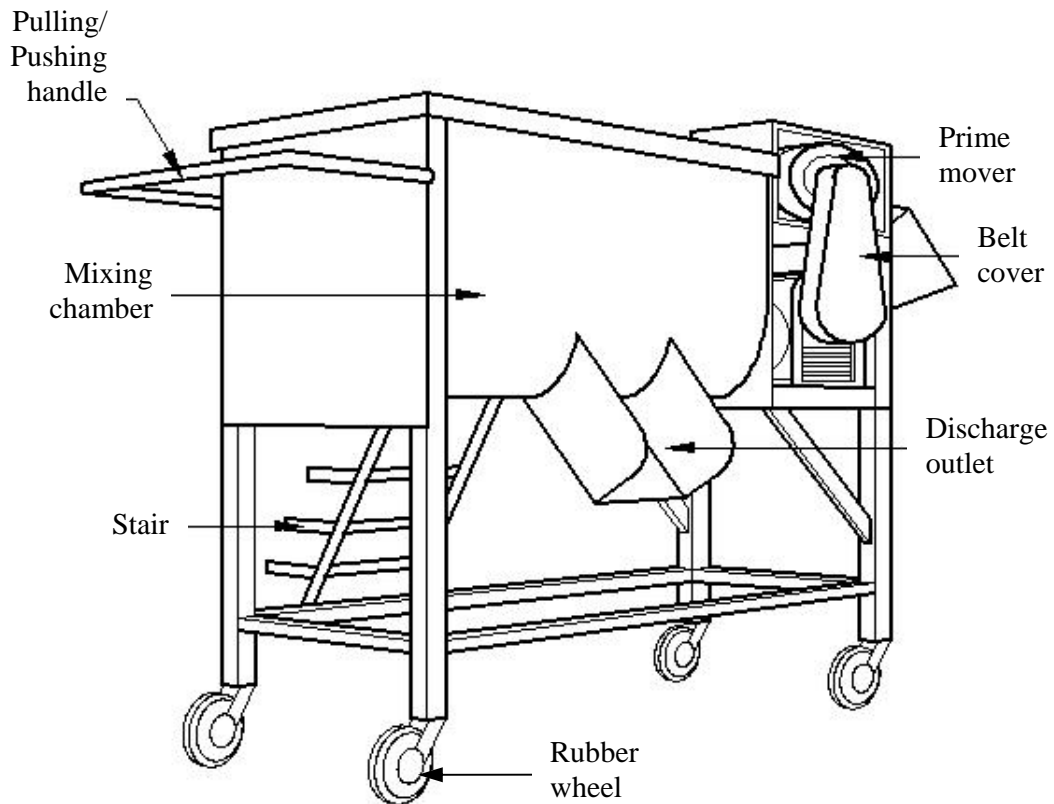
Feed mixer that is commonly hitched to transport vehicle to facilitate mobility.  
(Fig. 10)



**Figure 10. Trailer type feed mixer**

#### 4.2.2.2 Cart type

Low capacity mixer that can be manually moved. (Fig. 11)



**Figure 11. Cart type feed mixer**

## **5 Manufacturing Requirements**

- 5.1** Feed mixer shall compose of mixing tank/chamber, mixing device, discharge chute, prime mover and hopper.
- 5.2** Steel bars (angle bars, flat bars and round bars), metal sheet or plate, high elasticity carbon steel and heavy-duty mild steel shall be generally used for the manufacture of the different components of the feed mixer.
- 5.3** Mixing tank/chamber, mixing device and all parts of feed mixer that are in contact with the feed ingredients shall be made of food grade non-corrosive materials (e.g. stainless steel grade 304).
- 5.4** For ribbon feed mixer, linear speed shall range from 75 m/min to 100 m/min. The speed shall vary inversely with the circumference of the outer ribbon.
- 5.5** For paddle feed mixer, linear speed shall range from 100 m/min to 120 m/min.
- 5.6** For vertical feed mixer, the screw shall have rotating speed ranging from 100 to 200 rpm.
- 5.7** Bolts and screws to be used shall conform to the requirements of PAES 311 and 313.
- 5.8** Sizes of the parts of the feed mixer shall conform to the specifications of the manufacturer.

## **6 Performance Requirements**

The feed mixer when tested in accordance with PAES 259 shall conform to the following requirements:

- 6.1** The noise emitted by the feed mixer shall not be more than 96 dB(A).
- 6.2** Coefficient of variation of the salt and chemical/nutritional content of the feed from the feed mixer and corresponding corrective action are shown in Table 1.



Table 1. Corrective action on various coefficient of variation obtained from mixer tests. (Testing Mixer Performance by Tim Herrman and Keith Behnke)

<b>Percent Coefficient of Variation, %</b>	<b>Rating</b>	<b>Corrective Action</b>
< 10%	Excellent	None
10% to 15%	Good	Increase mixing time by 25% to 35%
>15% to 20%	Fair	Increase mixing time 50%, look for worn equipment, overfilling, or sequence of ingredient addition
> 20%	Poor	Possible combination of all of the above

NOTE: < - less than  
> - greater than

**6.3** There shall be no clogging in the mixing chamber during the operation.

## **7 Safety, Workmanship and Finish**

**7.1** The base of feed mixer shall be rigid and its rotating components shall be statically and dynamically balanced.

**7.2** The feed mixer shall be free from manufacturing defects.

**7.3** Mixing device shall be accessible, adjustable and replaceable and shall be easy to clean.

**7.4** All surfaces shall be free from rust and shall be coated with a suitable paint material.

**7.5** The external parts of the feed mixer shall be free from sharp edges and rough surfaces.

**7.6** Cover shall be provided for belt, prime mover and other moving parts.

**7.7** There shall be provision for belt tightening and adjustments.

**7.8** There shall be provision for the safety of the operators in the feeding port and other moving parts.

**7.9** Mechanism for immediate disengagement between prime mover and feed mixer shall be provided.

- 7.10** All welded parts shall be water-tight and smoothly polished and it shall pass visual inspection criteria (AWS D1.1:2000) for discontinuity of materials.
- 7.11** Welded joints shall not be less than 4 mm (1/8 in.) side fillet welded. Undercut shall not exceed 2 mm (1/16 in.) for any length of weld.

## **8 Warranty for Manufacturing and Durability**

- 8.1** Warranty against defective materials and workmanship shall be provided for parts and services except for normal wear and tear of consumable maintenance parts such as belts within six months from the date of purchase.
- 8.2** The construction shall be rigid and durable without breakdown of its major components for at least six months from the date of purchase.

## **9 Maintenance and Operation**

- 9.1** Each feed mixer unit shall be provided with a set of standard tools prescribed by the manufacturer.
- 9.2** An operator's manual which conform to PAES 102, shall be provided.
- 9.3** The feed mixer shall be easy to clean and operate.

## **10 Testing**

Feed mixer shall be tested in accordance with PAES 259.

## **11 Marking**

- 11.1** Each feed mixer shall be marked in English with the following information using a stencil or by directly punching it on a plate and shall be positioned at a most conspicuous place:
  - 11.1.1** Registered trademark of the manufacturer
  - 11.1.2** Brand
  - 11.1.3** Model
  - 11.1.4** Serial number

- 11.1.5** Mixing rate, kg/h
- 11.1.6** Recommended mixing speed, rpm
- 11.1.7** Power requirement, kW
- 11.1.8** Name and address of the supplier
- 11.1.9** Name and address of the distributor, if imported
- 11.1.10** Country of manufacture (if imported) / “Made in the Philippines” (if manufactured in the Philippines)
- 11.2** Appropriate safety precautions shall be provided. Marking shall be stated in English and Filipino and shall be printed in red color with a white background.
- 11.3** The markings shall have a durable bond with the base surface material.
- 11.4** The markings shall be all weather resistant and under normal cleaning procedures, it shall not fade, discolor, crack or blister and shall remain legible.

# Philippine Agricultural Engineering Standards

AMTEC-UPLB – PCARRD Project: “Development of Standards for Agricultural Production and Postharvest Machinery”

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