

# PHILIPPINE NATIONAL STANDARD

PNS/PAES 224:2015  
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## Agricultural machinery – Rice combine harvester - Specifications



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**National Foreword**

The Philippine Agricultural Engineering Standards PAES 224:2015, Agricultural machinery – Rice combine harvester - Specifications was approved for adoption as Philippine National Standard by the Bureau of Philippine Standards upon the recommendation of the Agricultural Machinery Testing and Evaluation Center (AMTEC) and the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development of the Department of Science and Technology (PCAARRD-DOST).

This standard cancels and replaces PNS/PAES 224:2005 (PAES published 2004).

## **Foreword**

The revision of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled “Development of Standards for Rice Production and Postproduction Machinery” which was funded by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) of the Department of Science and Technology (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 preparation of this standard, the following documents/publications were considered:

Regional Network for Agricultural Machinery (RNAM) Test Codes and Procedures for Harvesting Machine, Technical Series No. 12:1983.

Specification for Knife Sections for Grain Harvesting Machines. Indian Standards Institution, India.

## **1      Scope**

This standard specifies the requirements for the manufacture and performance of ricecombine harvester.

## **2      References**

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

**ISO 4254-7:1992**      Tractors and Machinery for Agriculture and Forestry – Technical means for ensuring Safety – Part 7: Combine Harvesters, Forage and Cotton Harvesters

**ISO 4253:1993**      Agricultural Tractors – Operator’s Seating Accommodation – Dimensions

**PNS/PAES 102:2000** Agricultural Machinery – Operator’s Manual – Content and Presentation

**PNS/PAES 139:2004** Agricultural Machinery – Roll-Over Protective Structure (ROPS) – Specifications

**PNS/PAES 311:2001** Engineering Materials – Bolts and Nuts for Agricultural Machines – Specifications and Applications

**PNS/PAES 313:2001** Engineering Materials – Screws for Agricultural Machines – Specifications and Applications

**PNS/PAES 225:2015** Agricultural Machinery – Rice Combine Harvester – Methods of Test

## **3      Definitions**

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

### **3.1**

#### **actual field capacity**

ratio of the area covered per unit of time

### **3.2**

#### **blower**

cleaning fan

rotary device which produces a flow of air across the chaffer and cleaning sieve(s) to blow away the materials or impurities lighter than grains

### **3.3**

#### **concave**

concave-shaped, stationary element adjacent to the threshing cylinder or threshing rotor, fitted primarily to enhance threshing

**NOTE** In the case of a concave that is permeable to grain flow, either in whole or in part, it has the important secondary function of primary separation.

### **3.4**

#### **crop elevator**

auxiliary conveyor to assist in feeding the crop to the threshing cylinder

### **3.5**

#### **field efficiency**

ratio of the actual field capacity and theoretical field capacity, expressed in percent (%)

### **3.6**

#### **grain elevator**

device which carries the grains from grain auger to grain tank or bin

### **3.7**

#### **grain loss**

loss classified according to source, including all field losses attributable to the machine

### **3.8**

#### **grain pan**

pan for collecting the clean grains after being passed through cleaning sieve(s) for conveying to grain auger

### **3.9**

#### **grain tank**

bin

tank used to hold the threshed grain

### **3.10**

#### **header**

feed table

portion of the rice combine harvester comprising the mechanism for gathering, cutting, and picking the crop

### **3.11**

#### **header loss**

grains that have fallen to the ground due to the machine's cutting operation

### **3.12**

#### **impurities**

all matters other than grains such as paddy stalks and leaves, and weeds

### **3.13**

#### **oscillating screen**

cleaning mechanism that oscillates at 300 to 400 times per minute in a plane that is parallel to the screen

### **3.14**

#### **reel**

revolving slats or arms with battens arranged parallel to the cutter bar to hold the crop being cut by the knife and to push and guide it to a conveyor platform or feeder conveyor auger

### **3.15**

#### **rice combine harvester**

mobile grain-harvesting machine for cutting, picking, stripping or picking up crop, threshing, separating, cleaning and conveying grain into a grain hopper or bag and depositing harvest residue onto the ground

### **3.16**

#### **shaker shoe**

shoe

oscillating structure which supports the cleaning sieve(s) and which may also support the chaffer and the chaffer extension

### **3.17**

#### **straw walker**

assembly of two or more racks which agitates the straw and separates the remaining grains from straw

### **3.18**

#### **stripper beater**

rear beater

element placed on the rear side of the cylinder and above to rear ward of concave or concave grate extension or transition grate to assist the deflection of straw on straw walker

### **3.19**

#### **threshing cylinder**

threshing drum

balanced rotating assembly, comprising rasp bars, beater bars or spikes on its periphery and their supports, for threshing the crop, which, in conjunction with a stationary element adjacent to it, is

fitted primarily to enhance threshing, where the crop being threshed is contained between rotating and stationary elements for less than 360°

### 3.20

#### **theoretical field capacity**

computed rate of harvesting in a given area per unit of time

## 4 Classification

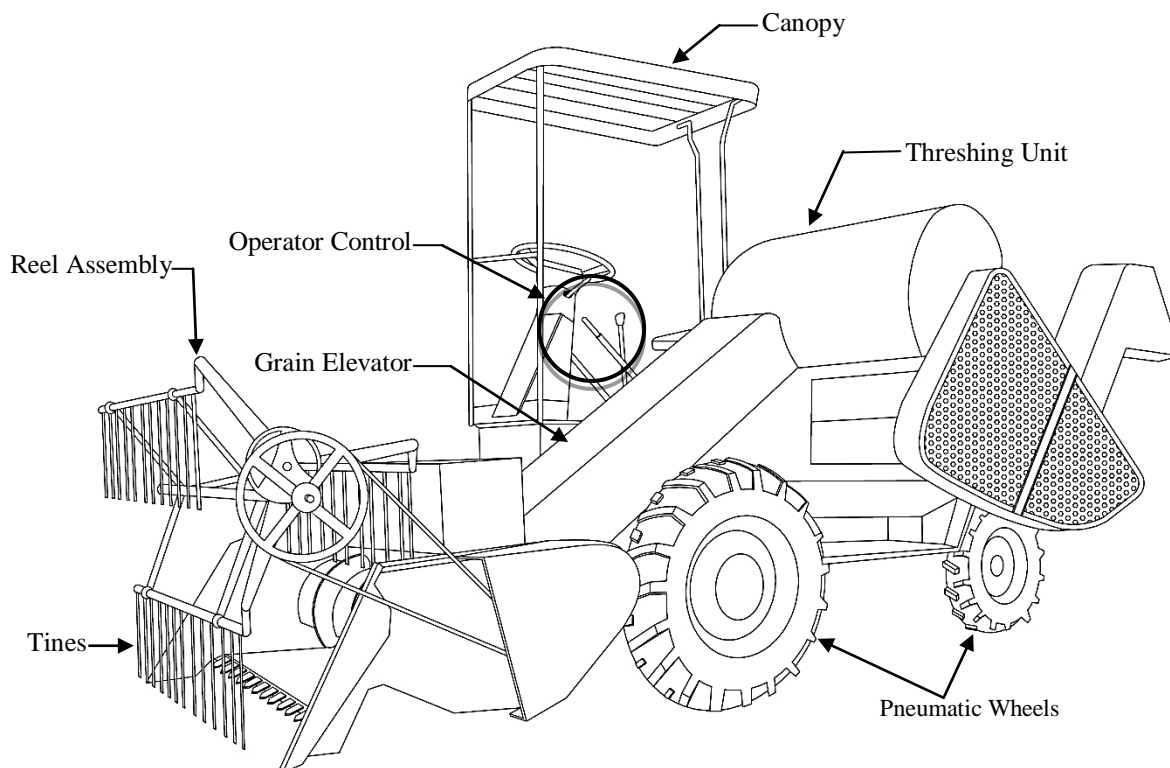
The classification of rice combine harvester shall be the following:

### 4.1 Ride-on

Type of rice combine harvester where the engine is integral with the machine and provides power for all processes and movement.

#### 4.1.1 Wheeled type

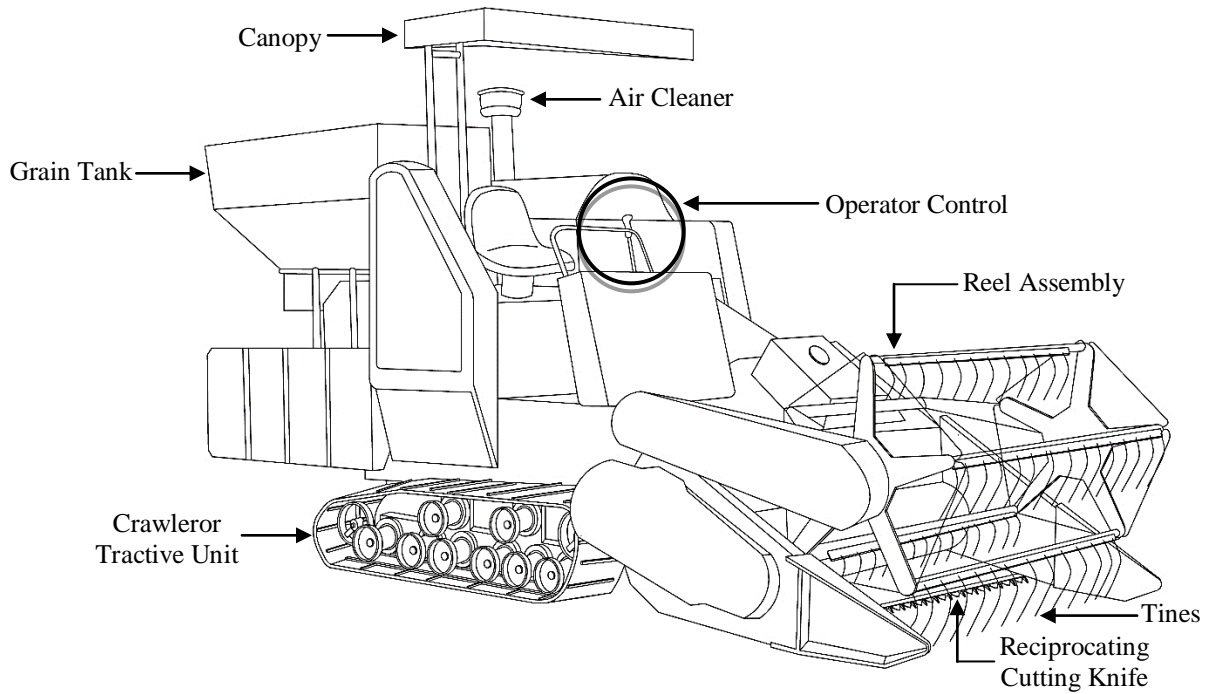
Rice combine harvester in which the pneumatic wheels or steel cage wheels are used (Figure 1).



**Figure 1 -Wheeled type**

#### 4.1.2 Track type (Crawler type)

Rice combine harvester fitted with full or half tracks instead of pneumatic wheels (Figure 2)

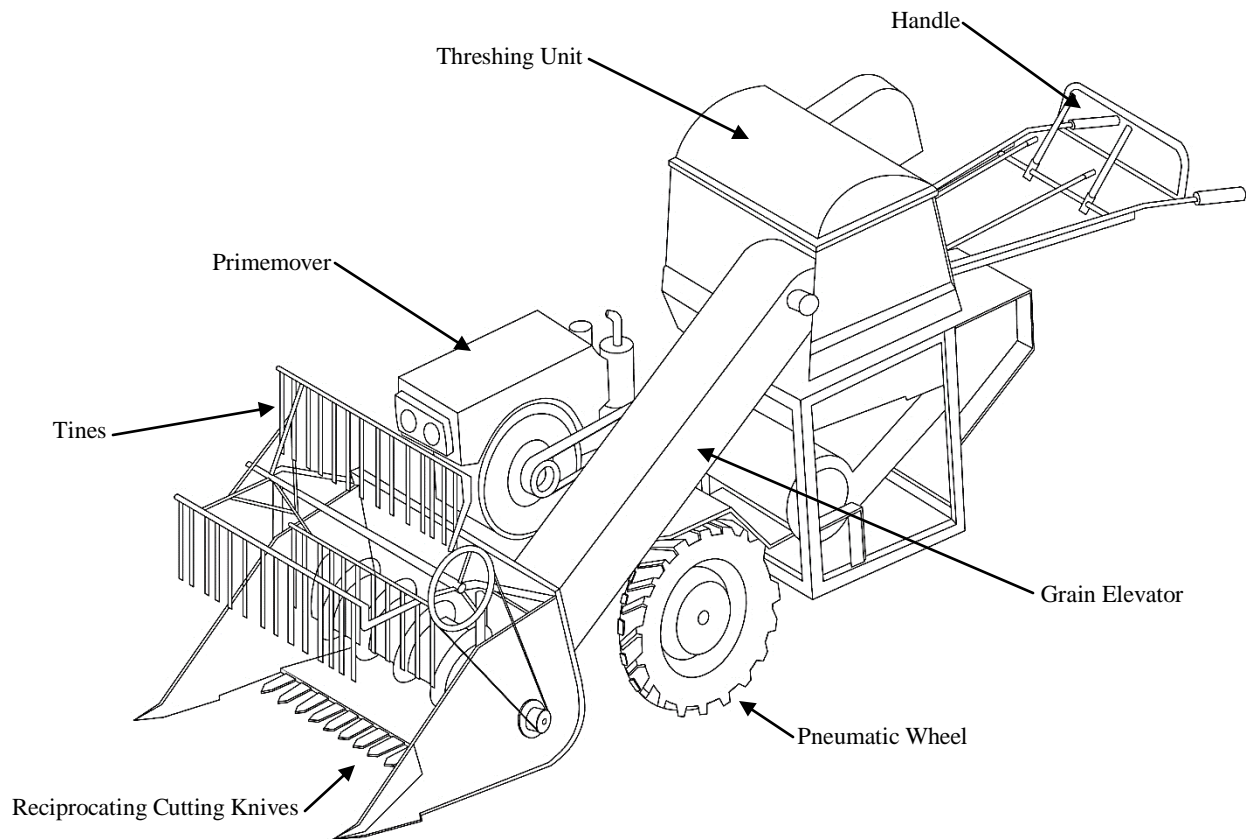


**Figure 2- Track type rice combine harvester**

#### 4.2 Walk-behind

Smaller rice combine harvester wherein the engine is integral within the machine and is operated solely by one operator (Figure 3).





**Figure 3 – Walk-behind rice combine harvester**

**4.3 Attachment**

Type of rice combine harvester which requires a tractor to serve as a source of power.

**4.3.1 Trailing type**

Rice combine harvester mounted at the rear of the tractor.

**4.3.2 Front-mounted**

Rice combine harvester mounted at the front of the tractor

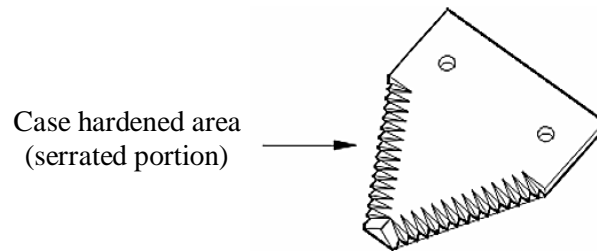
## 5 Materials of Construction

**5.1** Steel bars and metal sheet shall be generally used for the manufacture of the different components of the rice combine harvester.

**5.2** Stainless steel, steel alloys or abrasion-resistant coated metals shall be generally used for the manufacture of the primary components (e.g. reel assembly and pick-up tines) of the rice combine harvester.

**5.3** Cutting elements (i.e. knife) should be made of either American Iron and Steel Institute (AISI) 1080 to AISI 1085 or AISI 5160 or its equivalent.

**5.4** The serrated edge of the cutting knife should be case hardened at Rockwell C Scale (RC) 46 to RC 52 for AISI 1080 to AISI 1085 (Figure 4). The non-hardened portion of the cutting knife shall have hardness within the range of RC 25 to RC 27.



**Figure 4 - Cutting knife**

**5.5** Threshing elements shall be made of alloy steel, or heat-treated carbon steel with carbon content of 0.40 % - 0.45 % (i.e. AISI 1040 to AISI 1045 or its equivalent).

**5.6** Bolts and screws to be used shall conform with the requirements of PNS/PAES 311:2001 Engineering Materials – Bolts and Nuts for Agricultural Machines – Specifications and Applications and PNS/PAES 313:2001 Engineering Materials – Screws for Agricultural Machines – Specifications and Applications.

## 6 Performance Requirements

The rice combine harvester when tested, in accordance with PNS/PAES 225:2015 Agricultural Machinery: Rice Combine Harvester – Methods of Test, shall conform with the following requirements:

**6.1** The performance criteria for rice combine harvester shall be as specified in Table 1.

**6.2** Sealed type bearings should be used as protection against dust. If non-sealed type bearings and bushings are used, lubricating mechanism or equipment shall be provided.

**6.3** Belt cover or guard and provisions for belt tightening and adjustments shall be provided.

**Table 1 - Performance criteria for rice combine harvester**

<b>Criteria</b>	<b>Performance Data</b>
Field efficiency (%), minimum	75.0
Header loss (%), maximum	0.5
Separation loss, (%), maximum	1.3
Blower loss, (%), maximum	1.2
Unthreshed loss, (%), maximum	0.2
Scattering loss, (%), maximum	0.3
Purity (%), minimum	
a. with fan	97
b. without fan	95
Broken grains (%), maximum	2.0
Net cracked grain (%), maximum	5.0
Noise level, db(A), maximum	95.0*

\*Allowable noise level for four (4) hours of continuous exposure based on Occupational Safety and Health Standards, Department of Labor and Employment, Philippines. 2013.

## **7 Design Requirements**

### **7.1 Cutting unit**

**7.1.1** Cutting unit should be composed of reel assembly and cutter bar.

**7.1.1.1** The reel shall be adjustable horizontally and vertically to suit different crop conditions such as height and density. The recommended reel speed should be 25 % to 50 % faster than the ground speed.

**7.1.1.2** Cutter bar shall be adjustable to fit various height of cut.

### **7.2 Feeding unit**

Feeding unit should be composed of feeder or conveyor and front beater or feed chain.

### **7.3 Threshing unit**

**7.3.1** Threshing unit should be composed of threshing drum, concaves, open grates and beaters or stripper drum.

**7.3.2** The recommended peripheral speed of the threshing drum is 20 m/s to 30 m/s.

**7.3.3** Concaves should be adjustable at the front and rear to change the clearance between the concave and the cylinder.

#### **7.4 Separating unit**

Separating unit shall be provided with deflectors, rotary beaters or retarders to regulate the movement of the straw and to deflect flying grains.

#### **7.5 Cleaning unit**

**7.5.1** Cleaning operation should be either mechanical (i.e. screening out larger particles with the chaffer and sieves) or aerodynamics (i.e. blowing out the lighter particles with an airblast) or combination of both.

**7.5.2** Cleaning unit should consist of grain pan, chaffer with adjustable openings, tailings auger, shoe sieve with adjustable position and inclination, and fan. Fan speed should be adjustable.

#### **7.6 Straw handling unit**

Straw handling unit should be composed of either straw spreader or chopper spreader or binder or plain straw ejector.

#### **7.7 Grain handling unit**

**7.7.1** Grain handling unit should be composed of grain auger, grain elevator and grain collector. Grain collector can either be grain tank or grain bag.

**7.7.2** If grain tank is used, it shall be designed to minimize the bridging of grains. Steps and handrails outside the grain tank shall be provided.

**7.7.3** If grain bag is used, two-spout bag attachment and a platform or collector's seat shall be provided.

#### **7.8 Cab or frame**

**7.8.1** If cab or frame is installed on rice combine harvester, it shall conform with the requirements of PNS/PAES 139:2004 Agricultural Machinery – Roll-Over Protective Structure (ROPS) – Specifications.

**7.8.2** Operator's seat and the location of specific controls relative to the Seat Index Point (SIP) within the seating accommodation shall conform with ISO 4253:1993.

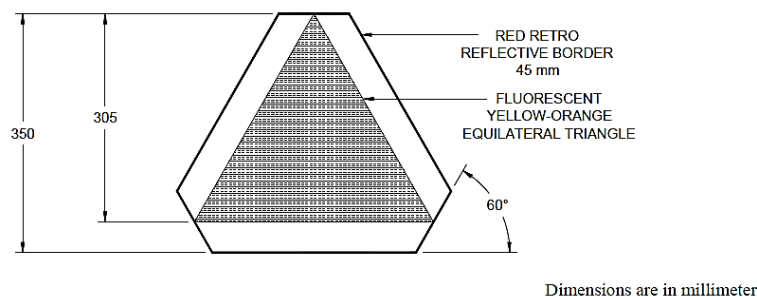
## 7.9 Traction type

Traction should be made of pneumatic tires, steel cage wheels, halftracks or full crawler grounddrive.

## 8 Safety Requirements

8.1 Safety requirements shall conform with ISO 4254-7:1993.

8.2 Rice combine harvester shall be fitted with slow-moving vehicle (SMV) emblem. The emblem shall be located at the rear of the rice combine harvester with dimensional requirement (Figure 5).



**Figure 5 - Slow-moving vehicle emblem**

8.3 Head and tail lights shall be provided.

## 9 Workmanship and Finish

9.1 The rice combine harvester shall be free from manufacturing defects that may be detrimental to its operation.

9.2 Any uncoated metallic surfaces shall be free from rust and shall be painted properly. Cutting section shall be coated with anti-corrosive varnish.

9.3 The rice combine harvester shall be free from sharp edges and surfaces that may injure the operator except for cutting blades.

9.4 Rotating parts shall be dynamically balanced.

## **10 Warranty for Construction and Services**

**10.1** A one (1) year warranty on parts and services, in accordance with the manufacturer's warranty policy, shall be provided. This shall start upon acceptance of the rice combine harvester and shall not include normal wear and tear and consumable parts.

**10.2** There shall be no breakdown of its major components under normal use (e.g. transmission systems, cutting and gathering mechanism, etc) within one (1) year from acceptance of the rice combine harvester, in accordance to the manufacturer's warranty policy.

## **11 Maintenance and Operation**

**11.1** An operator's manual, which conforms to PNS/PAES 102:2000 Agricultural Machinery – Operator's Manual – Content and Presentation shall be provided.

**11.2** Each rice combine harvester unit shall be provided with a set of manufacturer's standard tools required for maintenance.

## **12 Testing**

Rice combine harvester shall be tested in accordance with PNS/PAES 225:2015-Agricultural Machinery: Rice Combine Harvester – Methods of Test.

## **13 Marking and Labeling**

**13.1** Each rice combine harvester shall be provided with one (1) or several nameplates containing the following information in English using stencil or by directly punching it in the plate and shall be positioned at the most conspicuous place:

**13.1.1** Registered trademark of the manufacturer

**13.1.2** Brand

**13.1.3** Model

**13.1.4** Serial number

**13.1.5** Rated field capacity, ha/h

**13.1.6** Power requirement, kW

**13.1.7** Name, address and contact number of the distributor

**13.1.8** Country of manufacture

**13.2** Safety/precautionary markings shall be provided when appropriate. Marking shall be stated in English and Filipino that can be understood by the operator and shall be printed in red color with a white background.

**13.3** The markings shall have a durable bond with the base surface material.

**13.4** The markings shall be weather resistant and under normal cleaning procedures, it shall not fade, discolor, crack, peel and shall remain legible.

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