

Foreword

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) with support from the Department of Agriculture.

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:

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.

Agricultural Machinery – Rice Combine – Specifications

1 Scope

This standard specifies the requirements for the construction and performance of rice combine.

2 References

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

PAES 102: 2000	Agricultural Machinery – Operator’s Manual – Content and Presentation
PAES 103:2000	Agricultural Machinery – Method of Sampling
PAES 225:2005	Agricultural Machinery – Rice Combine – Methods of Test
PAES 311:2001	Engineering Materials – Bolts and Nuts for Agricultural Machines – Specifications and Applications
PAES 313:2001	Engineering Materials – Screws for Agricultural Machines – Specifications and Applications
PAES 139: 2004	Agricultural Machinery – Roll-Over Protective Structure (ROPS) – Specifications
ISO 4253:1993	Agricultural Tractors – Operator’s Seating Accommodation – Dimensions
ISO 4254-7:1992	Tractors and Machinery for Agriculture and Forestry – Technical means for ensuring Safety – Part 7: Combine Harvesters, Forage and Cotton Harvesters

3 Definitions

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

3.1**blower**

cleaning fan

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

3.2

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.

3.3

crop elevator

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

3.4

field efficiency

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

3.5

grain elevator

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

3.6

grain loss

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

3.7

grain pan

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

3.8

grain tank

bin

tank used to hold the threshed grain

3.9

header

feed table

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

3.10

header loss

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

3.11

impurities

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

3.12

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

3.13

rice combine

mobile grain-harvesting machine (see Figure 1) for cutting, picking, stripping or picking up crop, threshing, separating, cleaning and conveying grain into a grain hopper and depositing harvest residue onto the ground

3.14

shaker shoe

shoe

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

3.15

straw walker

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

3.16

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

3.17

threshing cylinder

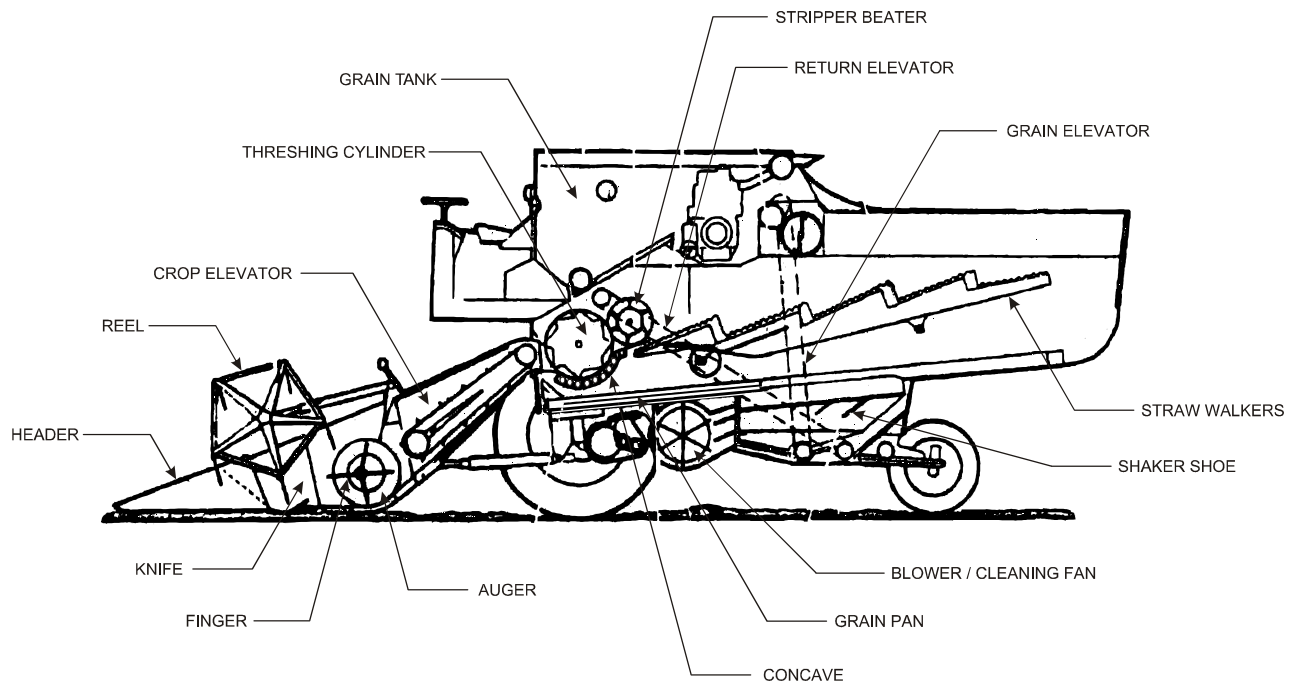
threshing drum

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°

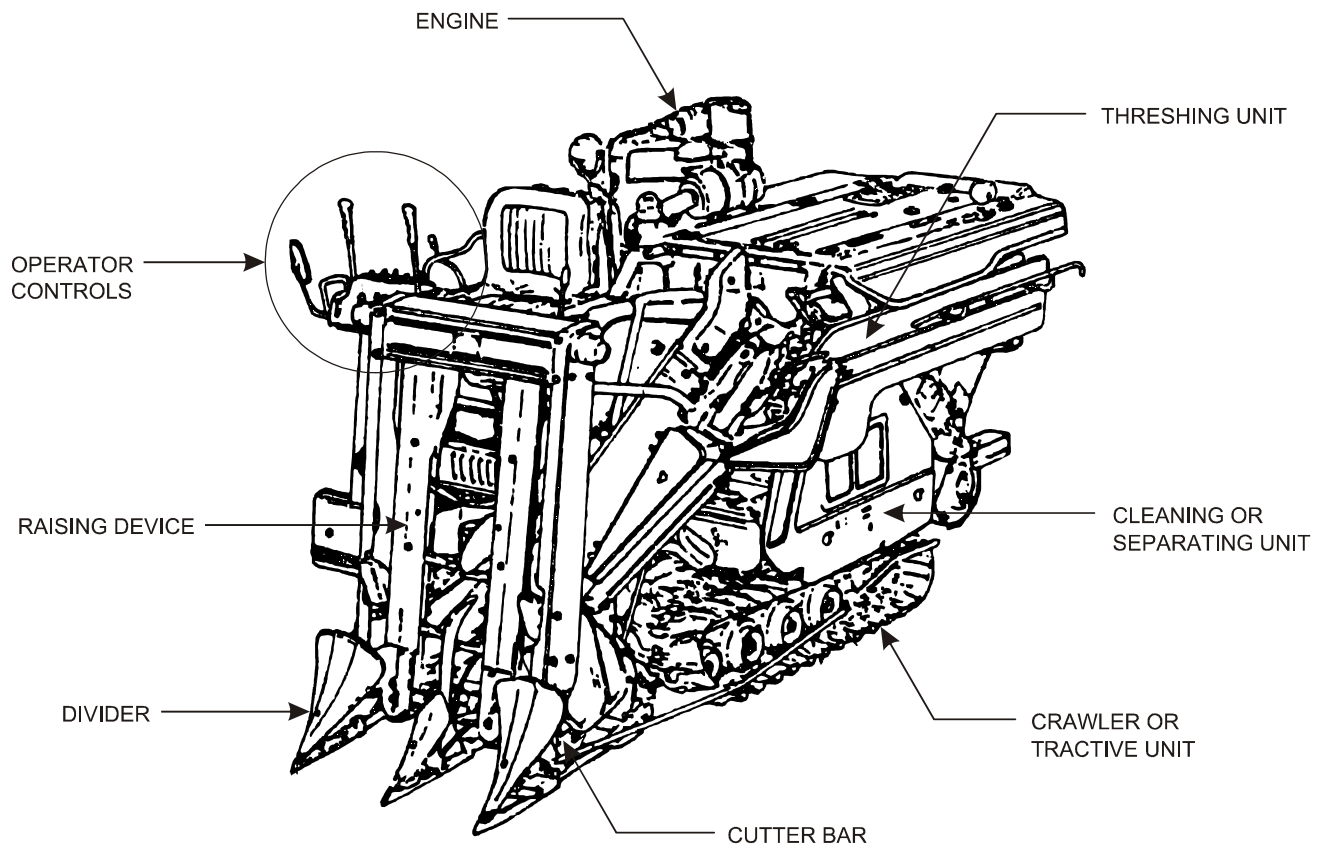
3.18

theoretical field capacity

computed rate of being able to reap palay in a given area per unit of time



a. Wheeled type



b. Track type

Figure 1 – Typical design of rice combine

4 Classification

The classification of rice combine shall be the following:

4.1 Self-propelled

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

4.1.1 Wheeled type

Rice combine in which the pneumatic wheels or steel cage wheels are used.

4.1.2 Track type

Rice combine fitted with full or half tracks instead of pneumatic wheels.

4.2 Tractor-operated

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

4.2.1 Trailed

Rice combine mounted at the rear of the tractor.

4.2.2 Side-mounted

Rice combine mounted at the side of the tractor

5 Materials of Construction

5.1 Stainless steel, alloys or abrasion-resistant coated metals shall be generally used for the manufacture of the primary components of the rice combine.

5.2 Cutting elements (i.e. knife) should be made of either AISI 1080 to AISI 1085 or AISI 5160 or its ISO equivalent.

5.3 The serrated portion of the cutting knife should be case hardened at RC 46 to RC 52 for AISI 1080 to AISI 1085 (see Figure 2). The non-hardened portion of the cutting knife shall have hardness within the range of RC 25 to RC 27.

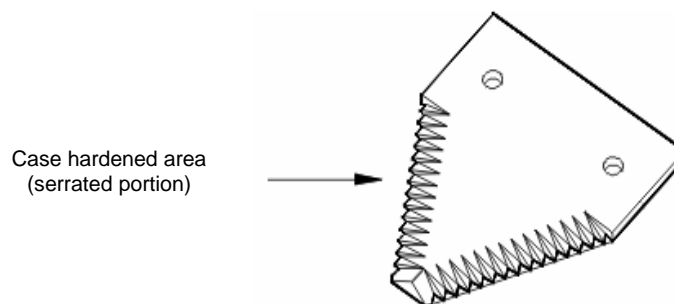


Figure 2 - Cutting knife

5.4 Threshing elements shall be made of alloy steel, or heat-treated carbon steel with carbon content of 40 % - 45 % (i.e. AISI 1040 to AISI 1055 or its ISO equivalent).

5.5 Bolts and screws to be used shall conform with the requirements of PAES 311 and PAES 313.

6 Performance Requirements

The rice combine when tested in accordance with PAES 225 shall conform to the following requirements:

6.1 The performance criteria for rice combine 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

Criteria	Performance Data
Field efficiency (%), minimum	75
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
Total machine loss (%), maximum	3.5
Purity (%), minimum	
a. with sifter and fan	97
b. without sifter and fan	95
c. without cleaning devices	80
Mechanically damaged grain (%), 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, Ministry of Labor, Philippines. 1983.

7 Design Requirements

7.1 Cutting unit

7.1.1 Cutting unit should be composed of reel or pick-up tines, dividers and cutter bar.

7.1.2 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.

7.1.3 Dividers shall be able to separate the standing grain crop along the side of the machine and shall be able to assist in picking up partially lodged or entangled crop, gathering and guiding them to the cutting unit.

7.1.4 Cutterbar 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 air blast) or combination of both.

7.5.2 Cleaning unit should consist of grain pan, chaffer with adjustable openings, tailing 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 grain bag attachment and a platform or bagger's seat shall be provided.

7.8 Cab or frame

7.8.1 If cab or frame is installed on rice combine, it shall conform to the requirements of PAES 139:2004.

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.

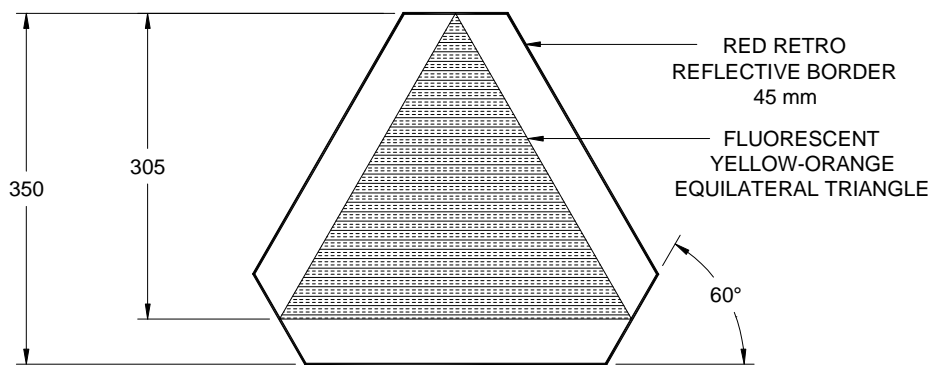
7.9 Traction aid

Traction aid should be pneumatic tires, steel cage wheels, halftracks or full crawler ground drive.

8 Safety Requirements

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

8.2 Rice combine shall be fitted with slow-moving vehicle (SMV) emblem. The emblem shall be located at the rear of the rice combine with dimensional requirement as shown in Figure 3.



Dimensions are in millimeter

Figure 3 - Slow-moving vehicle emblem

8.3 Head lamps and tail lights shall be provided.

9 Workmanship and Finish

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

9.4 Rotating parts should be dynamically balanced.

10 Warranty for Construction and Durability

10.1 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 purchase of the rice combine.

10.2 The construction shall be rigid and durable without breakdown of its major components (i.e. transmission systems, cutting, gathering, threshing and cleaning mechanisms, etc.) within six months from original purchase.

11 Maintenance and Operation

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

11.2 Rice combine shall also be provided with four pieces each of spare cutting blades and ledger.

11.3 An operator's manual which conforms to PAES 102, shall be provided.

12 Sampling

The rice combine shall be sampled for testing in accordance with PAES 103.

13 Testing

Sampled rice combine shall be tested in accordance with PAES 225.

14 Marking and Labeling

14.1 Each rice combine shall be marked in English with the following information using a stencil or by directly punching it in a plate and shall be positioned at the most conspicuous place:

14.1.1 Registered trademark of the manufacturer

14.1.2 Brand

14.1.3 Model

14.1.4 Serial number

14.1.5 Rated field capacity, ha/h

14.1.6 Power requirement, kW

14.1.7 Name and address of the manufacturer

14.1.8 Name and address of the importer, if imported

14.1.9 Country of manufacture (if imported) / “Made in the Philippines” (if manufactured in the Philippines)

14.2 Safety/precautionary markings shall be provided when appropriate. Marking shall be stated in English and Filipino and shall be printed in red color with a white background.

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

14.4 The markings shall be weather resistant and under normal cleaning procedures, it shall not fade, discolor, crack or blister and shall remain legible.