PHILIPPINE NATIONAL STANDARD

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Postharvest Machinery – Rice Mill – Specifications

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Foreword

The Philippine National Standard (PNS) for Agricultural Machinery – Rice Mill – Specifications (PNS/BAFS PABES 303:2020) was developed by the Bureau of Agriculture and Fisheries Standards (BAFS) as per request of the AgriComponent Corporation. It has been prepared by the Technical Working Group (TWG) for Rice Mill per approved Department of Agriculture Special Order (SO) No. 1092 Series of 2018.

This edition includes the following significant changes compared to the previous edition:

- Deletion of the terms “broken grains”, “milling degree”, “cone type rice mill”, and “polisher” in Clause 3
- Inclusion of the terms “destoner”, “paddy separator”, and “pre-cleaner” in Clause 3
- Revision on the definition of the terms “input capacity”, “milling capacity”, “rubber roll huller”, and “single-pass rice mill” in Clause 3
- Renaming of “multi-pass rice mill” to “multi-stage rice mill” and revision on its definition in Clause 3
- Renaming of “centrifugal type” to “impeller type” and revision on its definition in Clause 3
- Inclusion of figure for parts of the rice grain in Clause 3
- Inclusion of figures for typical process flow diagram for single-pass rice mill and multi-stage rice mill in Clause 4
- Deletion of “under-runner stone disc” as type of huller in Clause 4
- Inclusion of figures for “rubber roll huller” and “impeller type huller” in Clause 4
- Inclusion of provisions for fabrication requirements as Clause 5
- Transfer of performance and other requirements to Clause 6 and revision on the provisions under it
- Renaming of “Workmanship and Finish” to “Safety, Workmanship, and Finish” and revision of the provisions under it
- Renaming of “Warranty for Construction and Services” to “Warranty for Fabrication and Services” and revision of the provision under it
- Revision on the provisions under “Maintenance and Operation”, “Sampling”, and “Marking and Labeling”,
- Inclusion of “Other Terms and Definitions Relevant to Rice Milling” as Annex A

This Standard cancels and replaces the provisions recommended by PAES 206:2015 Agricultural Machinery – Rice Mill – Specifications.

This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2.

1 Scope

This standard specifies the minimum requirements for rice mill.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

PAES 101:2000, *Agricultural Machinery – Technical Means for Ensuring Safety – General*

PAES 102:2000, *Agricultural Machinery – Operator's Manual – Content and Presentation*

PAES 103:2000, *Agricultural Machinery – Method of Sampling*

PNS/BAFS/PAES 192:2016, *Agricultural Machinery – Guidelines on After-Sales Service*

PNS/BAFS PABES 304:2020, *Postharvest Machinery – Rice Mill – Methods of Test*

PNS/PAES 214:2004, *Agricultural Machinery – Rubber Roll for Rice Mill – Specifications.*

3 Terms and Definitions

For the purpose of this standard, the following terms and definitions shall apply.

3.1
bran
outer layer of the brown rice consisting of the aleurone cells covering the endosperm of the rice grain

3.2
brown rice
pinawa
dehulled rice
cargo rice
dehusked rice
rice grains from which only the hull has been removed leaving the bran layer still intact

3.3
coefficient of hulling
ratio of the dehulled grains to the total amount of grain input

3.4
coefficient of wholeness
ratio of the whole brown rice to the total amount of dehulled grains

3.5
destoner
ancillary device used to separate stones from the paddy and/or brown rice

3.6
head rice
grain or a piece of a grain with its length equal to or greater than 75% of the average length of the whole grains

3.7
huller
husker
component of a rice mill that removes the hull (palea and lemma) from the grains

3.8
hulling efficiency
product of the coefficient of hulling and the coefficient of wholeness of grains, expressed in percent (%)

3.9
input capacity
weight of paddy per unit loading time into the dumping pit/receiving hopper, expressed in metric tons per hour (MT/hr)

3.10
milled rice
grains obtained after the removal of hull, bran, and germ

3.11
milling capacity
weight of paddy that the rice mill can process per total milling time, expressed in metric tons per hour (MT/hr)

3.12
milling recovery
ratio of the weight of milled rice to the total weight of paddy, expressed in percent (%)

3.13
milling recovery index
ratio of the milling recovery obtained from the actual testing, to the milling recovery obtained from the laboratory test mill

3.14
multi- stage rice mill
rice passes through a series of different processes and machines from paddy to desired output

3.15
paddy
rough rice
palay
unhulled grain of *Oryza sativa*, which means grain with the glumes enclosing the kernel

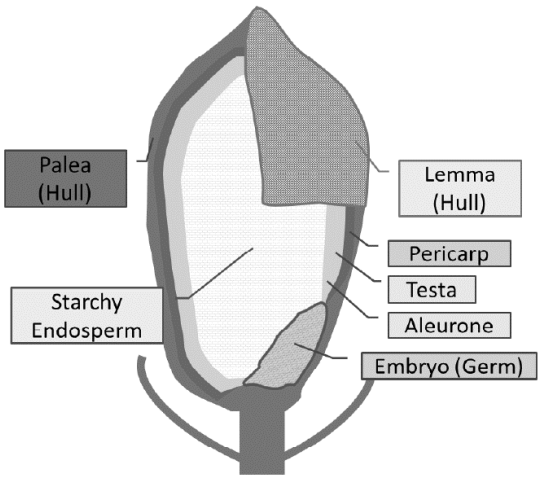

Figure 1 – Parts of the rice grain

3.16
paddy separator
ancillary device used to separate brown rice from a paddy mixture

3.17
percent head rice
ratio of the weight of grains with a size of 75% or more of the whole grain to the total weight of milled rice, expressed in percent (%)

3.18
percent head rice index
ratio of the percent head rice obtained from the actual testing, to the percent head rice obtained from the laboratory test mill

3.19
pre-cleaner
ancillary device used to remove foreign matter/impurities from the paddy before milling

3.20
rice hull
rice husk
outer most rough covering of the paddy grain (palea and lemma) consisting of the empty glumes, floral glumes, and awn

3.21
rice mill
machine used to remove the hull and bran of the paddy to produce milled rice and consists mainly of hulling and whitening assembly

3.21.1
rubber roll huller
type of rice mill made of rubber bonded to an inner metal drum core use for hulling

3.21.2
impeller-type huller
type of huller with rotating blades and utilizes pressure such as Coriolis' force, frictional force from the blades, or impact force at collision with the blades and the peripheral surface

3.22
single- pass rice mill
removes the husk and bran in one pass and produces white rice directly from the paddy

3.23
well milled rice
rice grain from which the hull, germ, outer bran layer, and greater part of the inner bran layer have been removed, but part of the lengthwise streaks of the bran layer may still be present on more than 40% of the sample grains

3.24
whitener
component of a rice mill that removes the bran in the brown rice

3.24.1
abrasive whitener
type of whitening machine consisting of a cylinder or cone coated with abrasive material such as emery stone or any similar materials and enclosed in a perforated steel housing

3.24.2
friction type whitener
type of whitening machine consisting of a ridged cylinder enclosed in a perforated steel housing

4 Classification

The classification of rice mill should be based on the following.

4.1 Method of operation

4.1.1 Single- pass rice mill

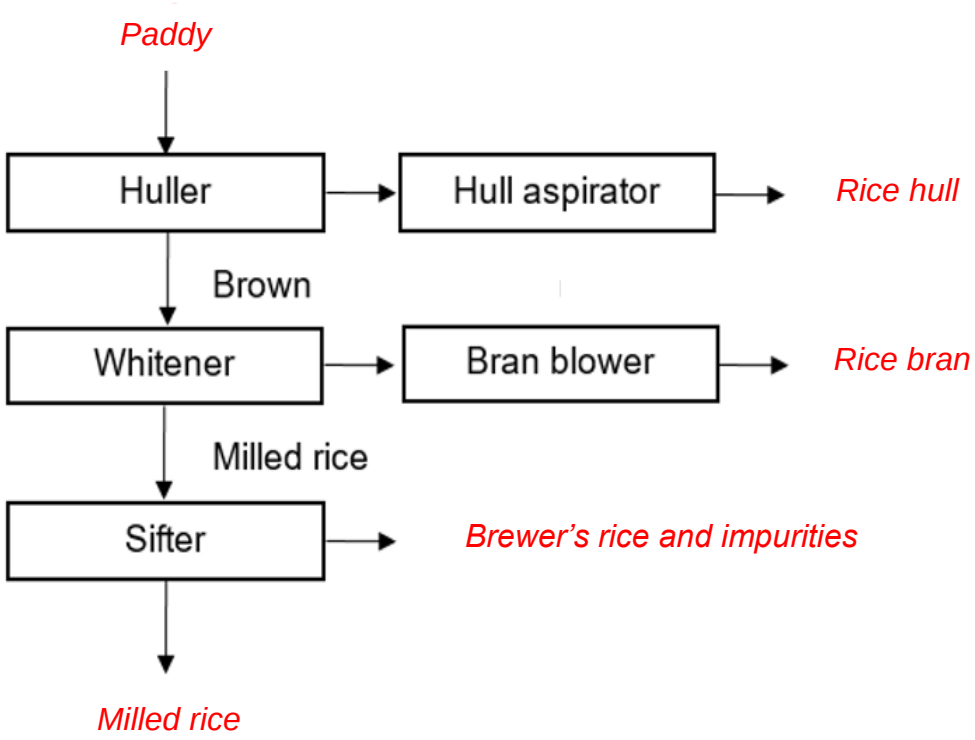

Figure 1 – Typical process flow diagram of a Single- pass Rice Mill

4.1.3 Multi-stage rice mill

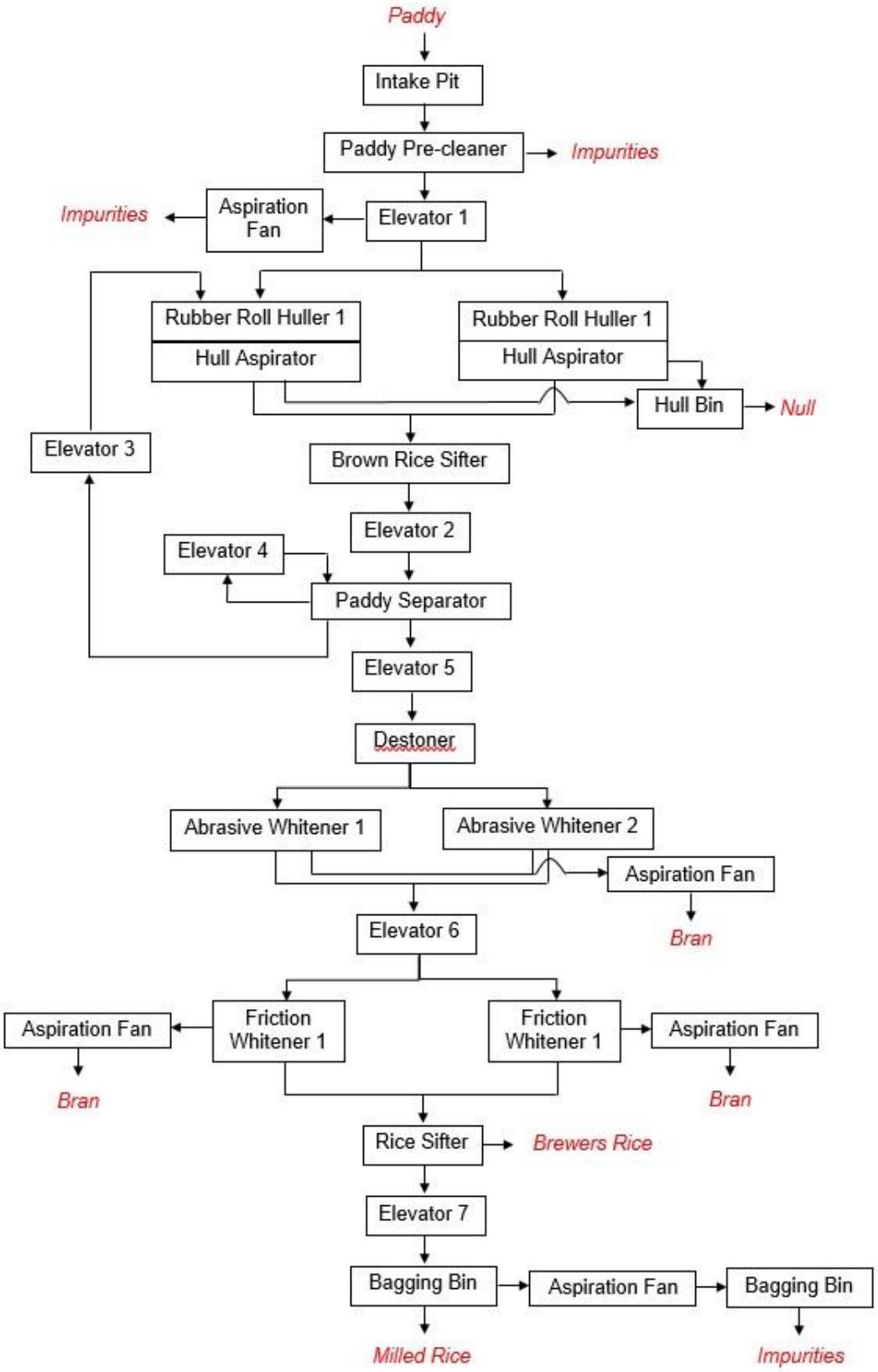

Figure 2 – Typical process flow diagram of a multi-stage rice mill

4.2 Type of huller

4.2.1 Rubber roll huller

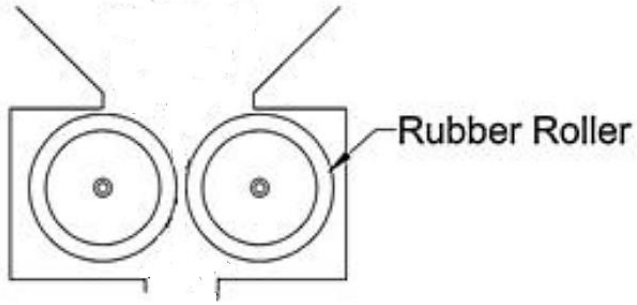

Figure 3 – Rubber roll huller

4.2.2 Impeller type

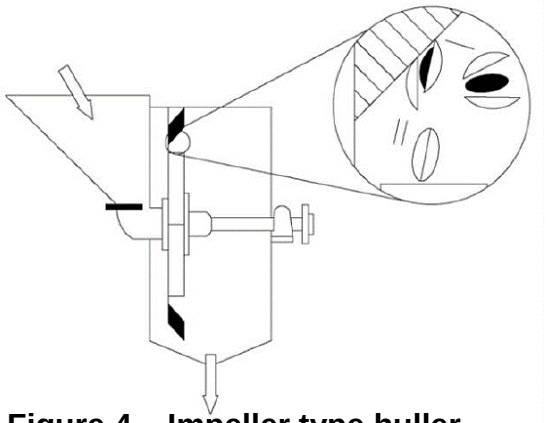

Figure 4 – Impeller type huller

5 Fabrication Requirements

5.1 Steel bars, metal sheet or plate, or any appropriate materials should be used for the manufacture of the different components of rice mill. Parts that are in direct contact with the milled rice should be made of non- corrosive materials.

5.2 Frame and stand shall be able to support the whole rice mill assembly during operation. Means to minimize vibration shall be provided.

5.3 Bolts and nuts, screws, bearings, bushing and seals to be used for the fabrication of rice mill shall conform to the requirements of applicable Philippine Agricultural Engineering Standards (PAES) for engineering materials or other applicable international standards.

5.4 Rice mill that uses rubber rolls as its hulling unit shall conform to the requirements of PNS/PAES 214: 2004.

5.5 There shall be provisions for lubrication of non-sealed type bearings.

6 Performance and other Requirements

6.1 The specified capacity of the machine shall be attained.

6.2 The rubber roll shall be able to process the input capacity as stated in PNS/PAES 214:2004.

6.3 The performance criteria for rice mill for milled rice and brown rice shall be as specified in Table 1 and 2, respectively.

Table 1 – Performance Criteria of Rice Mill for Milled Rice

Criteria	Performance Data		
	Rubber Roll		Impeller Type
	Single Pass	Multi-stage	
Hulling efficiency, % minimum	75	79	68
Milling recovery index, minimum	0.90	0.95	0.95
Percent head rice index, minimum	0.85	0.90	0.81
Milling degree	Well milled	Well milled	Well milled
No. of paddy per kilogram milled rice	15	15	15

Table 2 – Performance Criteria of Rice Mill for Brown Rice

Criteria	Performance Data
Hulling efficiency, % minimum	75
No. of paddy per kilogram, maximum	20

7 Safety, Workmanship and Finish

7.1 The maximum allowable noise level shall be 92 dB(A).

7.2 There shall be provision for ear protection.

7.3 Rice mill and other components/appurtenances shall be free from any manufacturing defects that may be detrimental to its operation.

7.4 The construction of rice mill and other components/appurtenances shall be rigid and durable without noticeable cracks and weak joints.

7.5 The rotating components of rice mill shall be statically and dynamically balanced.

7.6 Any uncoated metallic surfaces of the rice mill and other components/appurtenances shall be free from rust and shall be painted properly.

7.7 The external part of the rice mill and other components/appurtenances shall be free from sharp edges and rough surfaces that may injure the operator. The warning notice shall be in accordance with PAES 101:2000.

7.8 Mechanism for immediate disengagement of power transmission shall be provided.

7.9 There shall be provisions for belt cover or guard, belt tightening, and adjustments.

7.9 There shall be provision for the safety of the operators in the feeding port.

7.10 There shall be provision for dust collection system.

8 Warranty for Fabrication and Services

Warranty shall be provided for parts and services, except for normal wear and tear of expendable or consumable maintenance part, for at least one year (1) upon the acceptance of the procuring entity of the rice mill. General requirements for warranty and after- sales service shall conform with PNS/BAFS/PAES 192: 2016.

9 Maintenance and Operation

9.1 Each rice mill shall be provided with at least three (3) pieces of dust masks and the basic tools as specified in the operator's manual.

9.2 Operator's manual based on the PAES 102:2000, maintenance schedule and a list of warrantable parts of the rice mill shall be provided.

9.3 The rice mill shall be easy to maintain and operate.

10 Sampling

Rice mill shall be sampled for testing in accordance with PAES 103:2000 or any other suitable method of selection.

11 Testing

Rice mill shall be tested in accordance with PNS/BAFS PABES 304:2020.

12 Marking and Labeling

12.1 Each rice mill and other components/ appurtenances shall be marked at noticeable place with the following information.

12.1.1 Registered trademark of the manufacturer

12.1.2 Brand

12.1.3 Model

12.1.4 Year of manufacture

12.1.5 Serial number

12.1.6 Name and address of the manufacturer/importer/distributor

12.1.7 Country of manufacture/origin (if imported) / “Made in the Philippines” (if manufactured in the country)

12.1.8 Input capacity, MT/hr

12.1.9 Power requirement, kW

12.2 Safety/Precautionary markings shall be provided. It shall be stated in English and Filipino and printed in red font color with a white background.

12.3 The markings shall be durably bonded to the base surface material. The markings shall be all weather resistant and under normal cleaning procedures. It shall not fade, discolor, peel, crack or blister at all cost. It shall remain legible.

Annex A
(informative)

Other Terms and Definitions Relevant to Rice Milling

Broken grains
pieces of grains smaller than 75% of the average length of the whole grain

Degree of milling
extent to which the bran layers have been removed in hulled rice

Over milled rice
OMR
rice grain from which the hull, the germ, and the bran layers have been removed

Regular milled rice
RMR
rice grain from which the hull, germ, outer bran layers and greater part of the inner bran layers have been removed but part of the lengthwise streaks of the bran layers may still be present on 21% to 40% of the sample grains

Undermilled rice
UMR
rice grain from which the hull, germ, outer bran layer, and greater part of the inner bran layer have been removed, but part of the lengthwise streaks of the bran layer may still be present on more than 40 % of the sample grains

Polished rice
white rice that pass through a polisher

Special rice
rice variety (traditional or modern) with any special quality such as glutinous, aromatic, pigmented, japonica, and micronutrient-dense rice and includes those varieties with excellent eating and nutritive quality.

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