

PHILIPPINE NATIONAL

STANDARD

PNS/BAFS PAES 190:2018
ICS 65.060.01

**Agricultural machinery - Cacao grinder -
Specification**



BUREAU OF PHILIPPINE STANDARDS (BPS)

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- International Organization for Standardization (ISO)
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Foreword

The implementation of Republic Act 10601 also known as the Agricultural and Fisheries Mechanization (AFMech) Law of 2013 mandated the Bureau of Agriculture and Fisheries Standards (BAFS) to develop standard specifications and test procedures for agricultural and fisheries machinery and equipment.

The Bureau, in collaboration with the Bureau of Agricultural and Fisheries Engineering (BAFE), concerned Department of Agriculture (DA) Bureaus, and attached agencies, Philippine Regulatory Board of Agricultural and Biosystems Engineering (PRB-ABE) and University of the Philippines Los Baños – Agricultural Machinery Testing and Evaluation Center (UPLB-AMTEC), embarked on a project entitled “**Development of Philippine National Standard/ Philippine Agricultural Engineering Standard for Cacao Grinder**”.

The production of Philippine Tablea starts by sorting the cacao beans to ensure uniformity in roasting. The selected beans undergo roasting to develop the color and flavor of the beans and to make the shells of the cacao brittle thus allowing the cacao bean to break into smaller pieces. Shelling and winnowing come next to remove the shells and other impurities to produce cacao nibs. Cacao nibs will then be subjected to grinding to produce cocoa liquor to be molded.

Grinding the cacao nibs to produce the cocoa liquor can result to minimum product recovery and affects the fineness of the grind. In view of this, the development of standard specifications and test procedures for this machine is essential for the advancement of the Philippine cacao industry.

This standard will serve as reference for Agricultural and Biosystems Engineers (ABEs) in the preparation and evaluation of specifications and test reports for cacao grinders pursuant to Republic Act No. 10915 otherwise known as the Philippine Agricultural and Biosystems Engineering Act of 2016.

This standard has been technically prepared in accordance with Bureau of Philippine Standards (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.

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Agricultural machinery - Cacao grinder - Specification

1 Scope

This standard shall cover the use of the cacao grinder for the production of cocoa liquor for Philippine Tablea. It shall specify the material, fabrication and performance requirements for cacao grinder particularly those run by an electric motor.

2 References

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

BAFS/PAES 191:2016, Agricultural Machinery – Cacao Grinder – Methods of Test

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

PAES 138:2004, Agricultural Machinery – Guidelines on After-Sales Service

OSHS Rule 1074:01, Threshold Limit Values for Noise - Occupational Safety and Health Center, Department of Labor and Employment (2013)

3 Definitions

For the purpose of this standard, the following definitions apply.

3.1**cacao grinder**

machine that grinds the cacao nib into cocoa liquor

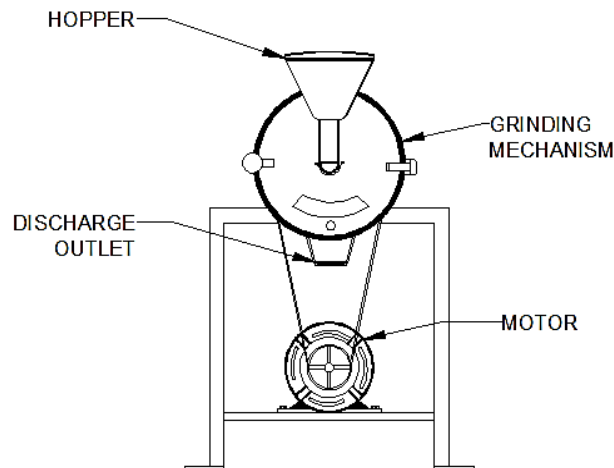


Figure 1- . Cacao grinder and its essential components

3.2

cacao nibs

refers to the dried, roasted and shelled cacao beans

3.3

cocoa liquor

cocoa paste

product obtained from grinding the cacao nibs

3.4

discharge outlet

part of machine where cocoa liquor is discharged

3.5

grinding

process of size reduction to convert cacao nibs into cocoa liquor

3.6

grinding mechanism

refers to flat burr, conical burr, hammer type, screw type or blade type grinder that converts cacao nibs into cocoa liquor

3.7

grinding recovery

ratio between the total weight of cocoa liquor collected at the discharge outlet to the total weight of cacao nibs loaded in the hopper of the machine, expressed in percent

3.8

hopper

part of the cacao grinder where cacao nibs are loaded

3.9

input capacity

weight of cacao nibs fed into the grinder per unit of time, expressed in kilogram per hour

3.10

output capacity

weight of cocoa liquor collected at the outlet per unit time, expressed in kilogram per hour

4 Classification

The classification of cacao grinder should be according to the following:

4.1 Grinding Mechanism

4.1.1 Flat burr grinder

It is a type of grinder that uses a pair of flat disks with a series of grooves on the disk face. One disk rotates while the other disk remains stationary. Nibs are ground into liquor mainly by shearing action.

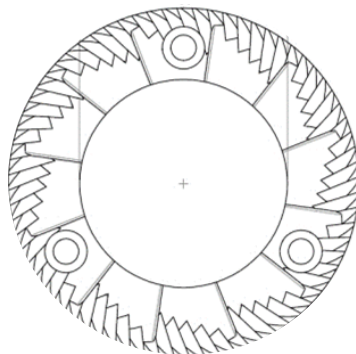


Figure 2 - Flat burr grinder

4.1.2 Hammer-type grinder

Hammer-type grinder crushes cacao nibs by impact. It has a number of hammer bars (fixed or swinging) mounted radially on a shaft rotating along the horizontal axis.

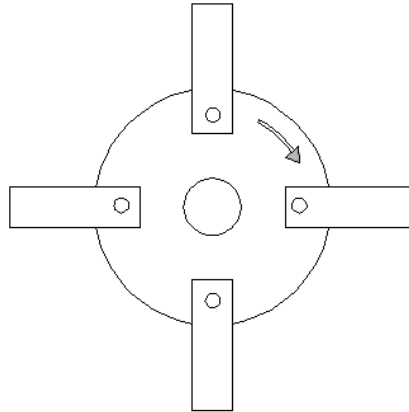


Figure 3 - Hammer type grinder

4.1.3 Conical burr grinder

Conical burr grinder has a conical shaped grinding surface capable of grinding cacao nibs at a slower and quieter rate than flat burr grinder. This is usually found on low speed and gear reduction grinders.

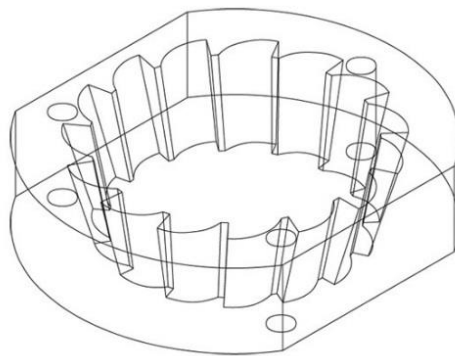


Figure 5 - Conical burr grinder

4.1.4 Blade grinder

It is a type of grinder that uses a metal blade that whirls to chop up the cacao nib.

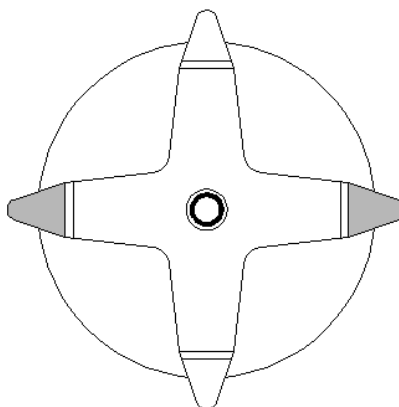


Figure 6 - Blade type grinder

4.1.5 Screw-type or auger-type grinder

This type of grinder consist feeding auger and stationary perforated discs or the grinding plate.

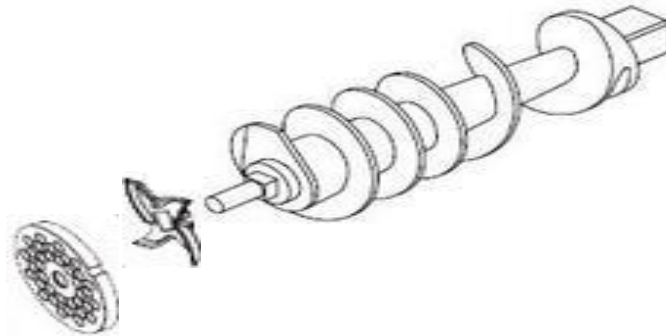


Figure 6 - Screw-type or auger-type grinder

4.2 Grinding unit orientation

4.2.1 Vertical

The shaft axis of grinding unit is vertical.

4.2.2 Horizontal

The shaft axis of grinding unit is horizontal.

5 Fabrication Requirements

5.1 Steel bars, metal sheet or plate and mild steel shall be generally used for the manufacture of the different components of the cacao grinder. Parts that are in direct contact to the cocoa liquor such as the grinding mechanism and the grinding chamber shall be made of corrosion resistant and food grade materials (e.g. stainless steel grade 304, 316) in compliance to the food safety standards.

5.2 Cacao grinder shall use electric motor as prime mover.

5.3 Frame and stand shall be able to support the whole cacao grinder assembly during operation with low noise levels.

5.4 Cacao grinder should have a mechanism for adjustment of the fineness of the output.

5.5 There should be provision of magnets to prevent metallic materials from entering the grinding chamber.

5.6 Bolts and nuts, screws, bearings, bushing and seals to be used shall conform to the requirements of PAES or other international standards.

6 Performance and Other Requirements

The cacao grinder, when tested, shall conform to the following requirements:

6.1 Input and output capacity specified by the manufacturer shall be attained.

6.2 The performance criteria for cacao grinder shall be specified in Table 1.

Table 1. Performance Criteria for Cacao Grinder

CRITERIA	PERFORMANCE DATA
Grinding Recovery, percent, minimum	95
Average Particle Size, microns, maximum	50

6.3 The noise level shall comply with the requirements of Occupational Safety and Health Center, Department of Labor and Employment depending on the daily duration of operation. (Table 2)

Table 2 - Permissible Noise Exposure

DURATION PER DAY, HOURS	SOUND LEVELS [dB(A)], SLOW RESPONSE
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
1/2	110
1/4	115

7 Safety, Workmanship and Finish

7.1 Cacao grinder shall be free from any manufacturing defects that may be detrimental to its operation.

7.2 The rotating components of cacao grinder shall be statically and dynamically balanced.

7.3 Grinding mechanism shall be adjustable and replaceable when needed.

7.4 All metal surfaces shall be free from rust.

7.5 The external part of the cacao grinder shall be free from sharp edges and rough surfaces that may injure the operator. Warning notices shall be provided in accordance with PAES 101:2000 – Agricultural Machinery – Technical Means for Ensuring Safety – General

7.6 Mechanism for immediate disengagement of power shall be provided.

7.7 All moving parts shall be provided with cover or guard.

7.8 Grinding chamber shall be totally enclosed to avoid contamination.

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 parts for at least one (1) year upon the acceptance of procuring entity of the cacao grinder. General requirements of the warranty shall conform to BAFS/PAES 192:2016, Agricultural Machinery – Guidelines on After-Sales Service.

9 Maintenance and Operation

9.1 Each unit of cacao grinder shall be provided with a set of manufacturer's standard tools required for maintenance.

9.2 Operator's manual shall be provided (PAES 102:2000 - Agricultural Machinery – Operator's Manual – Content and Presentation) and the manual should state the parts of the cacao grinder that are covered by warranty.

9.3 The cacao grinder shall be easy to clean and operate.

10 Sampling

Cacao grinder shall be sampled for testing in accordance with PAES 103:2000 – Agricultural Machinery – Methods of Sampling.

11 Testing

Cacao grinder shall be tested in accordance with PNS/BAFS/PAES 191:2016 Agricultural Machinery – Cacao Grinder – Methods of Test.

12 Marking and Labeling

12.1 Each unit of cacao grinder shall be marked at the most visible place with the following information:

12.1.1 Registered trademark of the manufacturer

12.1.2 Brand

12.1.3 Model

12.1.4 Serial Number

12.1.5 Name and address of the manufacturer/importer/distributor

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

12.1.7 Input capacity, kg/h

12.1.8 Recommended grinding speed, rpm

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 color with a white background.

12.3 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 and shall remain legible.

- (1) PNS/BAFPS 88:2012 Code of Practice for Philippine Tablea
- (2) David Pugh (September 2014), Microtrac Total Solutions in Particle Characterization – Savings to be Made in the Chocolate Production Process Through Close Fineness Monitoring



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BUREAU OF PHILIPPINE STANDARDS (BPS)

**Department of Agriculture
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