

PHILIPPINE NATIONAL STANDARD

PNS/BAFS xxx:2026
ICS 65.060.01

Chipping Machine — Specifications



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1 Scope

This Standard specifies the requirements for the manufacture and performance of chipping machines for multi-crop commodities in food and feed processing.

2 Normative References

The following documents are referred to in the text in such a way that some or all their contents constitute the requirement of this document. The latest edition of the referenced documents (including any amendments) applies.

Agricultural Machine and Testing Evaluation Center (AMTEC) - University of the Philippines Los Baños (UPLB). (2005). Chipping machine — Specifications (PAES 222: 2005)
<https://amtec.uplb.edu.ph/wp-content/uploads/2019/07/paes-222-chipper-specs-1.pdf>

AMTEC-UPLB. (2004). Chipping machine — Methods of Test (PAES 223: 2004). <https://amtec.uplb.edu.ph/wp-content/uploads/2019/07/paes-223.pdf>

Bureau of Agriculture and Fisheries Standards (BAFS)-Department of Agriculture (DA). (2022). Technical means for ensuring safety — Guidelines (PNS/BAFS 330:2022).
https://drive.google.com/file/d/1PCAFvluBpDKi3KJ_E7PLIS8yScCvfRGM/view

BAFS-DA. (2024). After-sales service — Guidelines (PNS/BAFS 192:2024).
<https://drive.google.com/file/d/1PoWKiUC7T6S2uOmsFOVZCebZI3hPnVJV/view>

BAFS-DA. (2024). Methods of sampling for agricultural and biosystems power and machinery — Guidelines (PNS/BAFS 391:2024).
https://drive.google.com/file/d/1U942cHfs_mHJuqUu7BFk-58Zm3sySnnS/view

BAFS-DA. (2024). Operator’s manual for agricultural and biosystems power and machinery — Guidelines (PNS/BAFS 390:2024).
<https://drive.google.com/file/d/1V0j10815Yy-o9qvcGLIiBOWMDHYgitb/view>

BAFS-DA. (2026). Chipping machine — Methods of test (PNS/BAFS xxx:2026).

Occupational Safety and Health Center (OSHC)-Department of Labor and Employment (DOLE). (2020). Occupational safety and health standards. <https://oshc.dole.gov.ph/wp-content/uploads/2020/02/OSH-Standards-2020-Edition.pdf>

3 Terms and Definitions

For the purpose of this Standard, the following definitions below apply. The preferred terms are written in bold type after the Clause number while admitted terms are listed in italicized type after the definition, which could be interchangeably used in interpreting the provisions of this Standard:

3.1 chip

thin slice of material with desired thickness that varies depending on the material type or user preference [Agricultural Machinery Testing and Evaluation Center (AMTEC)-University of the Philippines Los Baños (UPLB), 2005, *modified*]

3.2 chipping capacity

amount of input material that can be processed per unit time, expressed in kilogram per hour, kg/h (AMTEC-UPLB, 2005)

3.3 chipping machine

size reduction machine either power or manually operated which is used to cut or slice multi-crop commodities into small thin pieces called chips (AMTEC-UPLB, 2005, *modified*)
admitted term: chipper

NOTE See Figure 1.

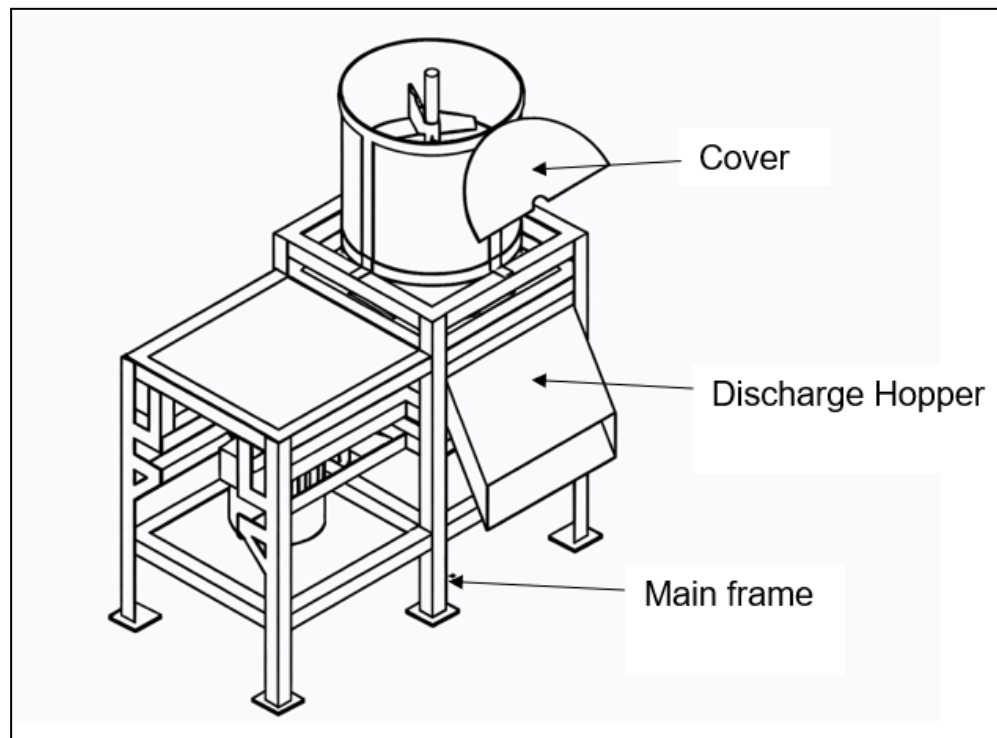


Figure 1. Typical design of a chipping machine (AMTEC-UPLB, 2005)

3.4

chipping recovery

ratio of the weight of the chips collected at the main outlet, to the total weight of the input of the chipper, expressed in percentage, %

3.5

coefficient of variation (CoV)

a percentage of deviation from the average chip thickness, %
(AMTEC-UPLB, 2025, *modified*)

admitted term : variation of cut

3.6

cutterhead

devices intended to slice the crop into chips with reasonable consistency within a range of optional settings (AMTEC-UPLB, 2005)

admitted term: cutting rotor

NOTE See Figure 2.

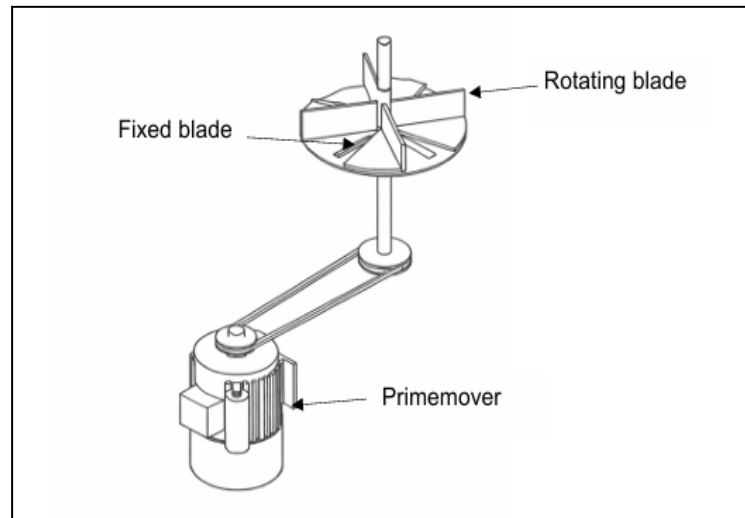


Figure 2. Cutterhead sample (AMTEC-UPLB, 2005)

3.7

discharge chute

opening through where chips are thrown out (AMTEC-UPLB, 2005)

3.8

drum type

blades on cylindrical mountings such that the cutting edges of the blades are essentially parallel to the axis of rotation (AMTEC-UPLB, 2005)

NOTE See Figure 3 and Figure 4.

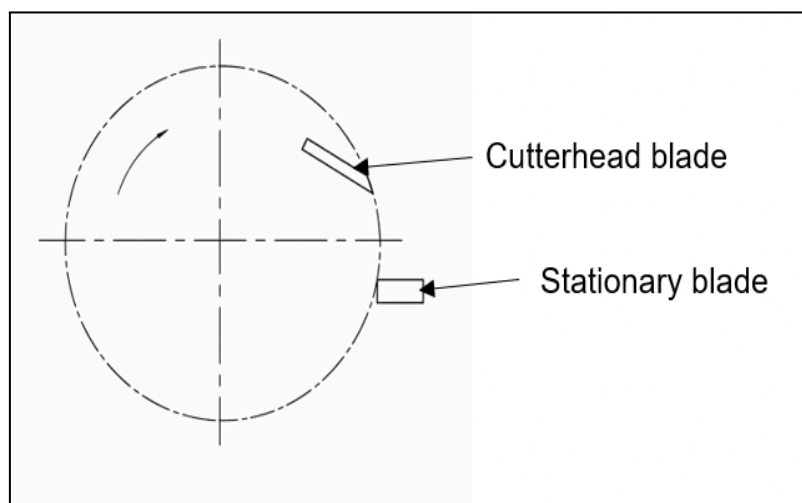


Figure 3. Drum type cutterhead (AMTEC-UPLB, 2005)

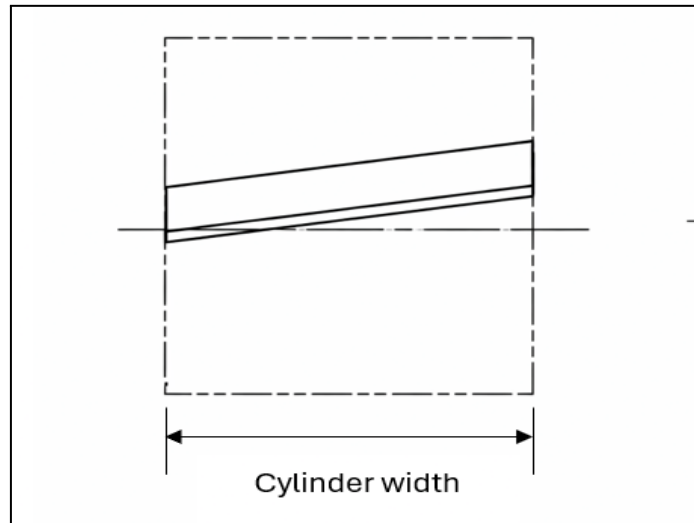


Figure 4. Cylinder width

3.9

flywheel type

type of a chipping machine with blades mounted radially with the cutting edges describing a plane perpendicular to the axis of rotation

NOTE See Figure 5.

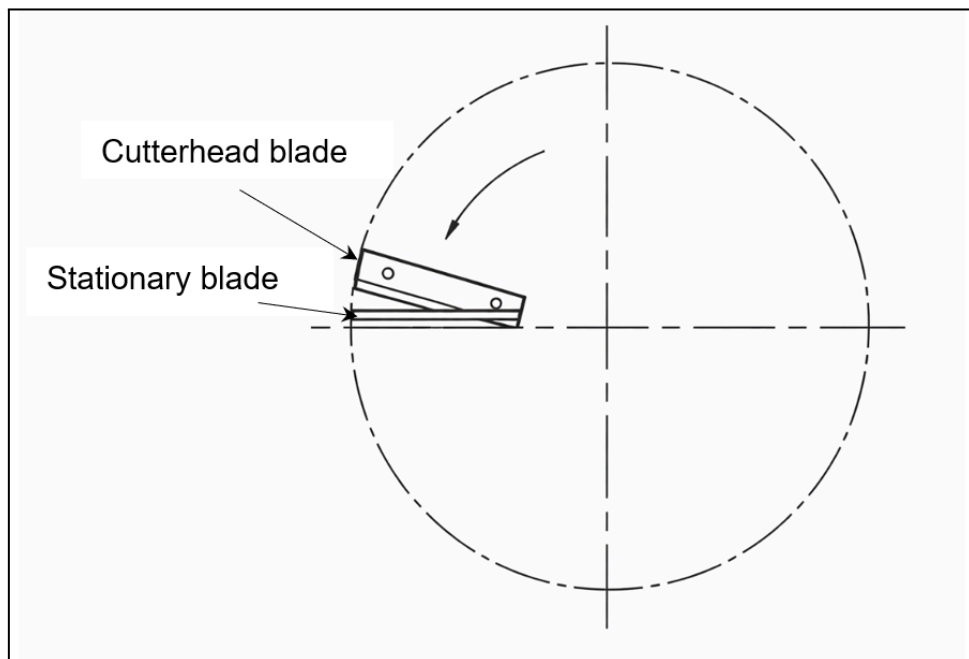


Figure 5. Flywheel type cutterhead (AMTEC-UPLB, 2005)

3.10

guard

device or structure designed to prevent contact with the moving parts by a person and/or clothing (BAFS-DA, 2022)

3.11

prime mover

refers to the internal combustion engine (ICE) (e.g., gasoline or diesel), electric motor, and other integral power sources used to run the chipping machine (AMTEC-UPLB, 2004, *modified*)

3.12

stationary blade

fixed plate providing a stationary cutting edge against which the cutterhead blades shear the crop (AMTEC-UPLB, 2025, *modified*)
admitted term: shear bar

4 Classifications

The classification of chipping machine shall be based according to the following:

4.1 Based on the primemover

4.1.1 Power-operated

The chipping operation is primarily powered by a prime mover that provides the required mechanical power application for the process. The power-operated chipping machine is shown in Figure 1.

4.1.2 Manually-operated

The chipping operation is powered primarily by human strength through sustained and repetitive manual force applied by the operator. The manually-operated chipping machine is shown in Figure 6.

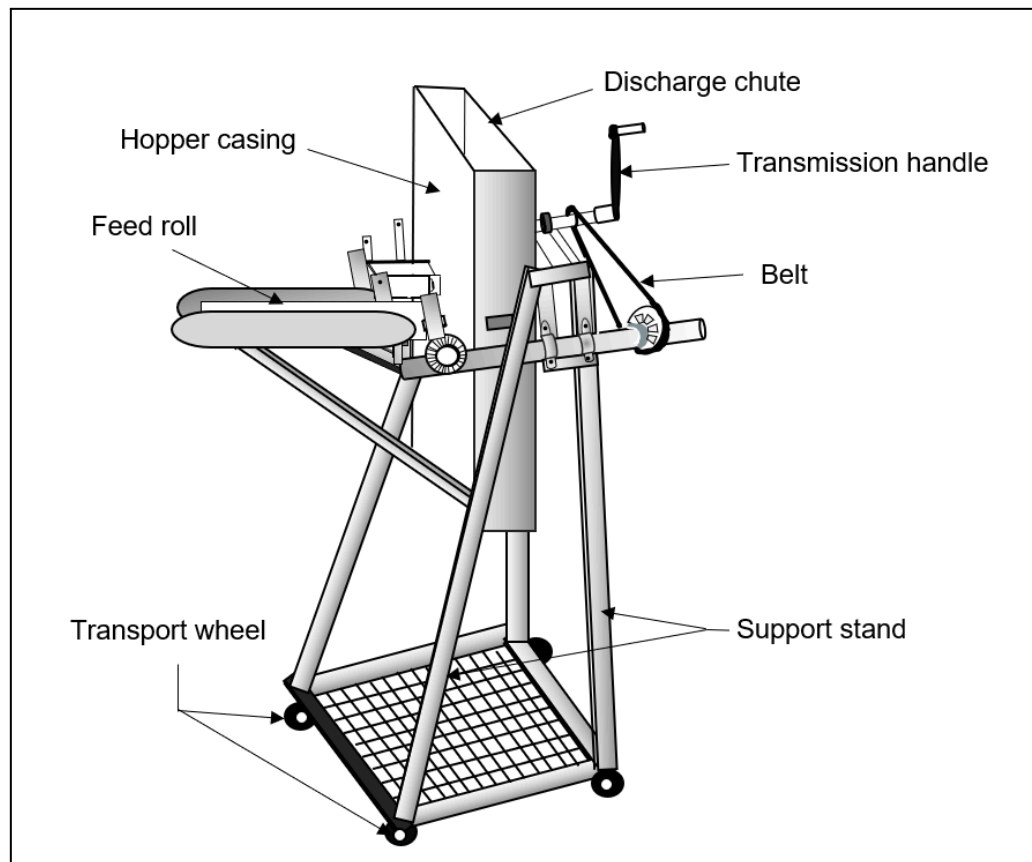


Figure 6. Manually-operated chipping machine (adapted from Capiz State University (CAPSU), 2019)

4.2 Based on the chipping mechanism

4.2.1 Drum type

The drum type chipping mechanism is shown in Figure 3.

4.2.2 Flywheel type

The flywheel type chipping mechanism is shown in Figure 5.

5 Manufacturing Requirements

5.1 Steel bars and metal sheets or plates shall be generally used in the manufacture of the different components of a chipping machine. However, for parts which are in direct contact with the materials to be chipped, food grade materials shall be used.

- 5.2** Components in direct contact with food shall be made of stainless steel (e.g., AISI 304 for general use, AISI 312 for high thermal property, AISI 316 for acidic products). For the feed table, AISI 1040 to AISI 1045 steel or their ISO equivalents shall be used.
- 5.3** Blades used for feed processing should be made of at least 0.80% carbon content (e.g., AISI 1080 or its ISO equivalent) and other better materials.
- 5.4** The intake, discharge chutes, and all parts in contact with the materials except for blades used for feed processing and other relevant materials shall be coated with paint and or any equivalent corrosion resistant materials.
- 5.5** Bolts, nuts, fasteners and screws to be used should conform with the requirements of Engineering materials — Bolts and nuts — Specifications (PAES 311:2001) and Engineering materials — Screws for agricultural machines — Specifications and Applications (PAES 313: 2001)
- 5.6** High speed tool steel with equivalent alloy steel shall be used in the manufacture of the chipping blades. It shall have a minimum hardness of 61 Hardness Rockwell C (HRC). Materials shall be provided with a certificate from a recognized material testing agency.

6 Performance Requirements

- 6.1** There shall be a provision for the adjustment of thickness setting.
- 6.2** The chipping machine shall produce a clear-cut chip.
- 6.3** The chipping capacity shall meet the specifications of the manufacturer.
- 6.4** The chipping machine shall obtain a minimum material recovery of 95%.

7 Safety, Workmanship, and Finish

- 7.1** The safety distance for feeding input materials shall be greater than 230 mm to prevent contact with the cutting mechanism based on PNS/BAFS 330:2022 (Technical means for ensuring safety — Guidelines). The safety distances from feed opening are shown in Table 1 and 2.

Table 1. Safety distance from feed opening less than 250 mm (AMTEC-UPLB, 2005)

Feed opening size ^a	Feed opening shape, mm		
	slot	square	round
≤ 40	≥ 200	≥ 200	≥ 120
> 40 ≤ 50	≥ 850 ^{b,c}	≥ 200	≥ 200
> 50 ≤ 250	≥ 850 ^c	≥ 850 ^c	≥ 850 ^c

^a Measured across the narrowest point.
^b If the length of the slot opening measured along the side of the slot is < 65 mm, the safety distance can be reduced to 200 mm.
^c Where the height of the lowest outer of any barrier or the feed opening itself is > 1,200 mm above the ground, the safety distance is measured as a chain measurement from the outer edge. Openings < 1,200 mm above the ground are measured as the shortest distance from the plane of the opening. If the opening is more than 1,200 mm above the ground, this safety distance to the cutting means can be reduced by L/2 where L = h – 1,200 and h is the height above the ground of the lowest point of the feed opening.

Table 2. Safety distance from feed opening greater than 250 mm (AMTEC-UPLB, 2005)

Height above the ground at the lowest edge of the feed opening	Distance to the cutting means from the edge of the feed opening
≤ 1200	≥ 1200 ^a
≥ 1200	≥ 850 ^b

^a Where the height of the lowest edge of the opening is below 1,200 mm, the chute shall be restricted to not more than 400 mm x 400 mm at the distance of at least 850 mm from the cutting means and the actual opening shall measure no more than 1,000 mm in any direction.
^b Where the height of the lowest outer edge of any barrier or the feed opening itself is > 1,200 mm above the ground, the safety distance is measured as a chain measurement from the outer edge. Openings < 1,200 mm above the ground are measured as the

Height above the ground at the lowest edge of the feed opening	Distance to the cutting means from the edge of the feed opening
shortest distance from the plane of opening. If the opening is more than 1,200 mm above the ground, this safety distance to the cutting means can be reduced by $L/2$ where $L = h - 1200$ and h is the height above the ground of the lowest point of the feed opening.	

- 7.2** The discharge chute shall be designed to prevent direct access to, and accidental contact, with the cutting elements.
- 7.3** The chipping machine shall be free from manufacturing defects that may be detrimental to its operation.
- 7.4** The chipping machine shall be free from sharp edges and surfaces (except for the cutting edge) that may injure the operator.
- 7.5** The guards such as belt cover shall be permanently attached to the machine and shall not be detachable without the use of tools. A provision for locking pins should be provided to prevent loosening of components and ensure stability.
- 7.6** Rotating parts should be dynamically balanced.
- 7.7** Mechanism for immediate disengagement of power transmission shall be provided.
- 7.8** Sealed type bearings should be used as protection against dust. There shall be provision for lubrication of non-sealed type bearings and bushings.
- 7.9** Belt tightening and adjustments shall be provided.
- 7.10** For feed processing applications, all uncoated metallic surfaces shall be free from rust and shall be coated with paint. Recognized protective systems, such as epoxy, polyurethane, or zinc-rich primers, are recommended. Stainless steel components shall remain unpainted due to their inherent corrosion resistance and suitability for food contact.
- 7.11** Safety signs and warning notices shall be provided in conformance with PNS/BAFS 330:2022 (Technical means for ensuring safety — Guidelines).
- 7.12** The use of a chipping machine in terms of operator's exposure on permissible noise level shall conform to Annex A (Occupational safety and health standard [Rule 1074.01– 1074.03]).

- 7.13** If the machine exceeds the noise level of 92 dB(A), an ear protective device shall be provided by the manufacturer.
- 7.14** The cutting mechanism shall be accessible and blades shall be individually replaceable and can be sharpened.
- 7.15** The base of the chipping machine shall be stable during operation.
- 7.16** For a power-operated chipping machine, an electrical switch shall be installed. The use of light indicators in the electrical switch is recommended to indicate its operational (green light) and non-operational state (red light).
- 7.17** A mechanism for emergency shutdown, proper grounding, and circuit overload protection (e.g. inline fuse, contactor electrical switch) of the machine shall be provided to ensure operational safety. It shall be installed in a location that is easily accessible and within the reach of the operator during normal operation.

Alternate Text:

- 7.17** The mechanism for emergency shutdown, proper grounding, and circuit overload protection (e.g. inline fuse, contactor electrical switch) of the machine shall be provided **and these shall** be installed in a location that is easily accessible and within the reach of the operator during normal operation. **The electrical components should be based on the Philippine Electrical Code through Article 3.10 (Conductors for general wiring) and Article 4.30 (Motors, motor circuits and controller) to ensure operational safety.**

8 Warranty for Construction and Durability

Requirements for after-sales services shall be in conformance with PNS/BAFS 192:2024 (After-sales service — Guidelines).

9 Maintenance and Operation

- 9.1** Each unit of the chipping machine shall be provided with a set of standard tools for operation and basic maintenance as prescribed by the manufacturer.
- 9.2** An operator's manual for the chipping machine shall be provided in conformance with PNS/BAFS 390:2024 (Operator's manual for agricultural and biosystems power and machinery — Guidelines). The operator's manual shall include emphasis on the safety and health hazards especially the use of basic personal protective equipment.

10 Sampling

The chipping machine shall be sampled for testing in conformance with PNS/BAFS 391:2024 (Methods of sampling for agricultural and biosystems power and machinery — Guidelines) or other suitable method of selection validated by the testing authority.

11 Testing

The sampled chipping machine shall be tested in conformance with PNS/BAFS xxx:2026 (Chipping Machine — Methods of test).

12 Markings and Labeling

12.1 Each unit of chipping machine shall be engraved or embossed with the following information, either on the body or on a metal nameplate/s permanently attached at the most conspicuous place:

- a) Registered trademark of the manufacturer;
- b) Brand;
- c) Model;
- d) Serial Number;
- e) Date of manufacture; and
- f) Country of manufacture/origin (if imported) / “Made in the Philippines” (if manufactured in the country)

12.2 Other markings and labeling shall comply with the applicable regulations set by the competent authority.

Annex A
(Informative)

Occupational safety and health standards (Rule 1074.01–1074.03)

A.1 Threshold limit values for noise

A.1.1 The threshold limit values refer to sound pressure that represents conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effect on their ability to hear and understand normal speech.

A.1.2 Feasible administrative or engineering controls shall be utilized when workers are exposed to sound levels exceeding those specified in Table A.1 hereof when measured on a scale of a standard sound level meter at slow response. If such controls fail to reduce sound within the specified levels, ear protective devices capable of bringing the sound level to permissible noise exposure shall be provided by the employer and used by the worker.

Table A.1. Permissible noise exposure (OSHC-DOLE, 2020)

Duration per day, h	Sound levels (slow response), dB(A)
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼	115

A.2 Permissible noise exposure

A.2.1 The values specified in Table A.1 apply to total time of exposure per working day regardless of whether this is one continuous exposure or a number of short-term exposures but does not apply to impact or impulsive type of noise.

A.2.2 If the variation in noise level involves maximum intervals of one second or less, it shall be considered as continuous. If the interval is over one second, it becomes impulse or impact noise.

A.2.3 When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered rather than the effect of each.

A.2.4 If the sum of the fractions in Equation 1 exceeds one, then the mixed exposure should be considered to exceed the threshold limit value. C indicates the total time exposure at a specified noise level, and T indicates the total time of exposure permitted at the level. However, the permissible levels indicated in Table A.1 shall not be exceeded for the corresponding number of hours per day allowed. Noise exposures of less than 90 dB(A) are not covered by Equation 1.

$$X = \frac{C_1}{T_1} + \frac{C_2}{T_2} + \frac{C_3}{T_3} + \dots + \frac{C_n}{T_n}$$

where:

- X is the sum of the ratios of C and T
- C is the total time of exposure at a specified noise level
- T is the total time of exposure permitted at the level

A.2.5 Exposures to impulsive or impact noise shall not exceed 140 dB(A) peak sound pressure level (ceiling value).

References

- Agricultural Machine and Testing Evaluation Center (AMTEC) - University of the Philippines Los Baños (UPLB). (2005). Chipping machine — Specifications (PAES 222: 2005)
<https://amtec.uplb.edu.ph/wp-content/uploads/2019/07/paes-222-chipper-specs-1.pdf>
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