

PHILIPPINE NATIONAL STANDARD

PNS/BAFS 398:2024
ICS 65.060.01

Grain Collector — Specifications



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Foreword

Since 2017, the University of the Philippines Los Baños (UPLB)-Agricultural Machinery Testing and Evaluation Center (AMTEC) has tested a total of 17 units of grain collector. With the emergence and increasing number of the said machinery in the Philippines, there is a need for the development of a national standard for the specifications and methods of test prior to commercialization. Hence, the UPLB-AMTEC proposed for the development of the Philippine National Standards (PNS) on Grain Collector through a presentation during the Regular Meeting of the Philippine Council for Agriculture and Fisheries (PCAF)-National Sectoral Committee on Agricultural and Fisheries Mechanization (CAFMech) last August 17, 2021. On the same year, the PCAF-CAFMech formally endorsed the proposal of the UPLB-AMTEC to the Department of Agriculture (DA)-Bureau of Agriculture and Fisheries Standards (BAFS) for prioritization through the issuance of Resolution No. 6, series of 2021 (Recommending to the BAFS the Prioritization of the Development or Revision of the PNS of Various Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development [PCAARRD]-Funded Machinery Projects).

In response, the DA-BAFS in collaboration with the UPLB-AMTEC embarked on a project entitled “Development of PNS on Grain Collector — Specifications and Methods of Test”. The development of the said standards intends to provide minimum requirements for grain collector, thereby ensuring its safety, durability, and market equity.

A Technical Working Group (TWG) was created to develop the PNS under Special Order No. 305, series of 2024 (Creation of Technical Working Group (TWG) and Project Management Team (PMT) for the Development of the PNS for Agricultural and Fishery Products and Machinery). The TWG was composed of relevant stakeholders from the government sector, academe/research institutions, private sector organizations, and Civil Society Organizations (CSO). The draft PNS underwent an extensive series of TWG meetings and stakeholder consultations, facilitated through physical and online platforms, from March 2023 to March 2024 prior to its endorsement to the DA Secretary for approval.

This document was written in accordance with the formatting and editorial rules of the Standardization Guide No. 1 (Writing the PNS) developed by the Standards Development Division (SDD) of the DA-BAFS.

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1 Scope

This Standard specifies the minimum manufacturing and specification requirements for grain collectors for agricultural use and purposes. This standard only applies to grains such as rice, corn, sorghum, adlai, and soybean.

2 Normative References

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

Agricultural Machinery Testing and Evaluation Center (AMTEC)-University of the Philippines Los Baños (UPLB). (2001). Engineering materials – Anti-friction bearings for agricultural machines – Specifications and applications. (PAES 309:2001). <https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2019/07/309.pdf>

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3 Terms and Definitions

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

3.1

collecting capacity

total weight of collected clean grains per unit time, expressed in kilograms per hour, kg/h (Aquino et. al, 2013, *modified*)

3.2

collecting efficiency

ratio of the total weight of collected grains to the total weight of initially spread grains, expressed in percent, % (Aquino et. al, 2013, *modified*)

3.3

dust collection system

part of the machine that collects and removes dust (i.e., consist of aspiration fan/blower, cyclone, etc.) (AMTEC-UPLB, 2015, *modified*)

3.3.1

fan

device for moving air which utilizes a power-driven rotating impeller (AMTEC-UPLB, 2010)

admitted term: blower

3.3.2

cyclone

device used to separate particles or dust from air or gases (Taiwo et. al, 2016)

3.4

grain collector

machine that gathers grains spread over a dried surface usually for sun drying or air drying and conveys them to an outlet which fills in sacks or bags with grains (AMTEC-UPLB, 2023b, *modified*). The following outlines the main parts and components of a grain collector:

3.4.1**bag mounting frame**

part of the grain collector on which bags are fitted and held during bagging (AMTEC-UPLB, 2023b)

3.4.2**bag platform**

part of the grain collector that carries or supports the bag filled with grains during bagging (AMTEC-UPLB, 2023b)

3.4.3**collecting head assembly**

part of the grain collector (e.g., tube, spiral auger) that gathers the grains laid on a dried surface which are then drawn to the conveyor assembly, grain outlet, or cyclone separator (AMTEC-UPLB, 2023b)

3.4.4**conveyor assembly**

part of the grain collector (e.g., tube, hose, bucket conveyor, flat belt conveyor) that transfers the grains from the collecting head assembly to the grain outlet (AMTEC-UPLB, 2023b)

3.4.5**cyclone separator**

part of the grain collector that separates the grain from the suction air to prevent the grains from entering the impeller; can also function as a grain cleaning device (AMTEC-UPLB, 2023b)

3.4.6**grain outlet**

part of the grain collector that discharges grains for bagging (AMTEC-UPLB, 2023b)

3.4.7**main frame**

structure on which all the components of the grain collector are fitted (AMTEC-UPLB, 2023b)

3.4.8**suction fan**

part of the grain collector that generates suction pressure that moves grains to a higher position (AMTEC-UPLB, 2023b)

4 Classification

The classifications of grain collectors should be based on, but not limited to the following:

4.1 Type of propulsion

4.1.1 Push-type

Type of grain collector wherein the operator is the sole source of forward propulsion.

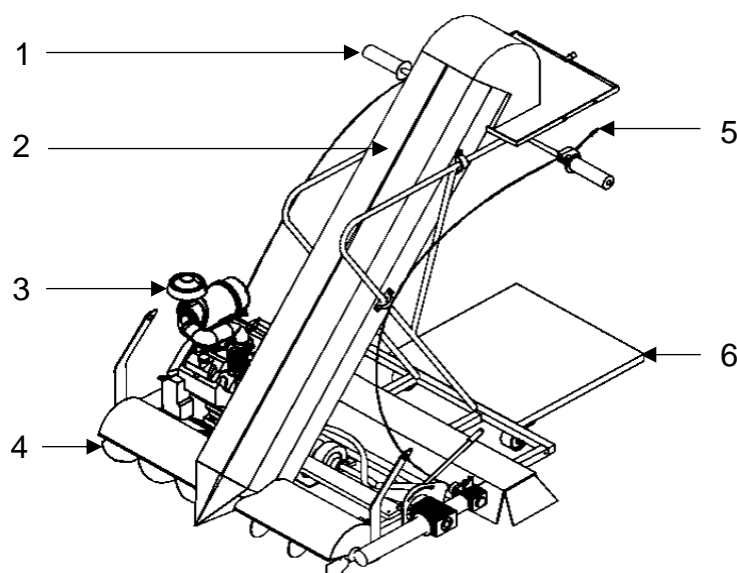
4.1.2 Self-propelled type

Type of grain collector wherein the mechanical power from the prime mover is distributed between the collecting system and the wheels for forward propulsion.

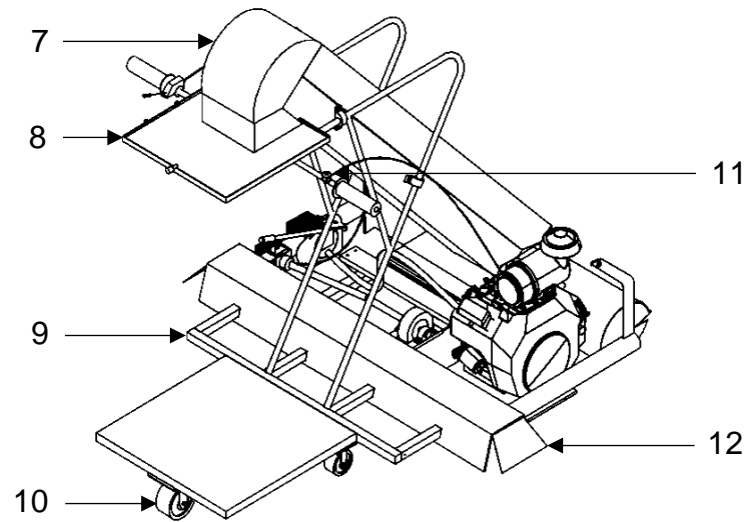
4.2 Type of collecting mechanism

4.2.1 Auger type

Type of grain collector which uses auger to gather grains as shown in Figure 1.



a) Front and right-side view



b) Rear and left-side view

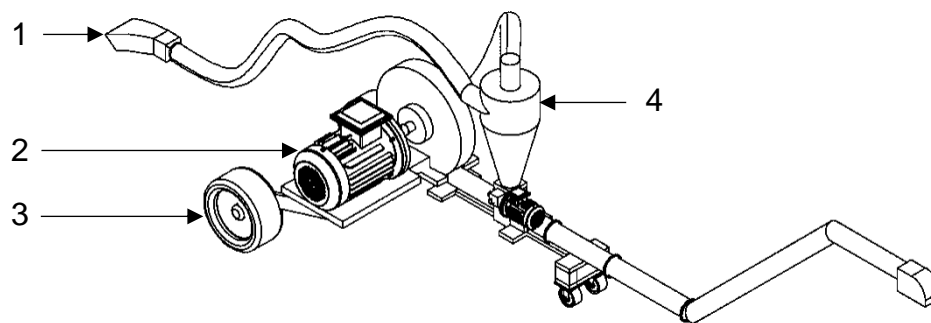
Key:

- | | | | |
|---|--------------------------|----|------------------------|
| 1 | Handle | 7 | Grain outlet |
| 2 | Conveyor assembly | 8 | Bag mounting frame |
| 3 | Prime mover | 9 | Main frame |
| 4 | Collecting head assembly | 10 | Transport wheel |
| 5 | Main clutch lever | 11 | Throttle lever |
| 6 | Bag platform | 12 | Grain brush with cover |

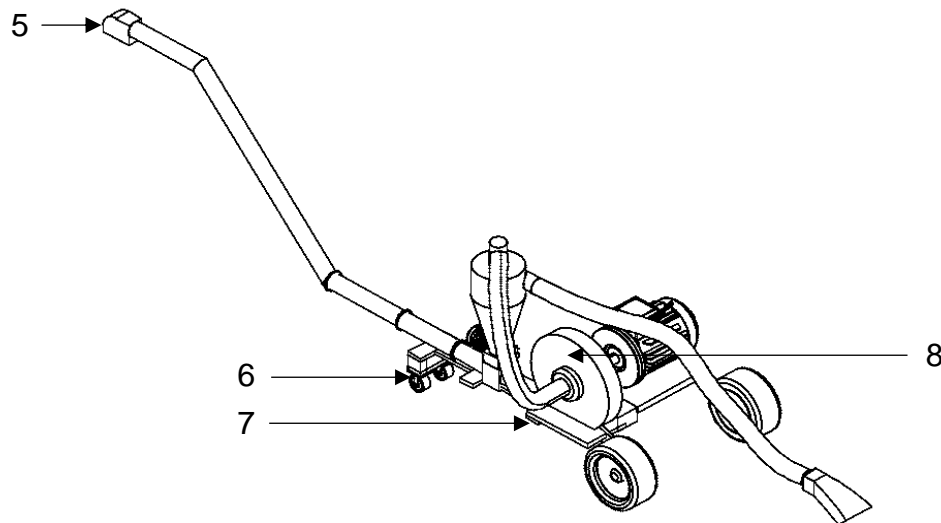
Figure 1. Typical design of auger-type grain collector (adapted from AMTEC-UPLB, 2023b)

4.2.2 Pneumatic type

Type of grain collector which uses suction pressure generated by a fan/blower to convey grains as shown in Figure 2.



a) Front and right-side view



b) Rear and left-side view

Key:

1	Collecting head assembly	5	Grain outlet
2	Prime mover	6	Caster wheel
3	Transport wheel	7	Main frame
4	Cyclone separator	8	Fan

Figure 2. Typical design of pneumatic-type grain collector (adapted from Rivakka Nipere Oy, n.d.)

5 Manufacturing Requirements

5.1 The grain collector should be generally made of steel, plastic, and rubber materials.

5.2 Bolts and nuts, screws, bearings, and bushing and seals to be used should conform to the following local and/or other international standards as applicable:

- PAES 309:2001 (Engineering materials – Anti-friction bearings for agricultural machines – Specifications and applications);
- PAES 310:2001 (Engineering materials – Journal bearings for agricultural machines – Specifications and applications);
- PAES 311:2001 (Engineering materials – Bolts and nuts for agricultural machines – Specifications and applications); and
- PAES 313:2001 (Engineering materials – Screws for agricultural machines – Specifications and applications).

5.3 Parts including conveyor assembly and collecting head assembly shall be accessible for cleaning, repair, replacement, and maintenance.

- 5.4** For pneumatic-type grain collector, there shall be provision for dust collection system.
- 5.5** For auger-type grain collector, there should be a provision for adjustment setting for the clearance between the collecting head and the ground surface.
- 5.6** For grain collectors that discharge grains into a bag, the material to be used for the platform shall be able to withstand and support a bag or container with grains weighing 50 kg while maintaining stable operation.

6 Performance Requirements

- 6.1** The collecting capacity (kg/h) specified by the manufacturer shall be attained at the recommended forward speed.
- 6.2** A minimum collecting efficiency of 96% shall be attained.

7 Safety, Workmanship, and Finish

- 7.1** The noise level shall conform to Rule 1074.01 to 1074.03 of Occupational Safety and Health Standards of the Occupational Safety and Health Center-Department of Labor and Employment (OSHC-DOLE), as shown in Annex A.
- 7.2** The grain collector should have provision for minimizing vibration.
- 7.3** The grain collector shall be free from any manufacturing defects that may be detrimental to its operation.
- 7.4** Any metallic surfaces shall be free from rust and shall be painted properly.
- 7.5** The grain collector shall be free from sharp edges and surfaces that may injure the operator.
- 7.6** Warning notices shall be provided in accordance with PNS/BAFS 330:2022 (Technical means for ensuring safety – Guidelines).
- 7.7** There shall be an emergency or shut down switch provided. The switch shall be within reach of the operator during operation.
- 7.8** The frame shall be rigid and durable without any noticeable cracks and weak joints.
- 7.9** All welded parts should be in accordance with relevant criteria specified in American Welding Society (AWS) D1.1/D1.1M:2020 (Structural welding code – Steel) which specifically include the following:

- 7.9.1** There should be no crack on the welded area.
- 7.9.2** There should be complete fusion between adjacent layers of weld and base metal.
- 7.10** All sets of moving parts shall be provided with guards.
- 7.11** Adequate arrangement for lubrication of bearings shall be provided. The bearings shall be reasonably dust-proof and shall be properly aligned.

8 After-sales Service Requirements

Requirements for the after-sales services of the grain collector shall conform to PNS/BAFS 192:2024 (After-sales service — Guidelines).

9 Maintenance and Operation

- 9.1** Each unit of grain collector shall be provided with a set of manufacturer's standard tools including but not limited to Phillip screw drivers, adjustable wrenches, and adjustable pliers required for maintenance as applicable.
- 9.2** The push-type and self-propelled type grain collectors should be easy to maneuver during operation.
- 9.3** Operator's manual shall be provided in conformance with PNS/BAFS 390:2024 (Operator's manual for agricultural and biosystems power and machinery — Guidelines).
- 9.4** Maintenance schedule and list of the warrantable parts of the grain collector shall be provided.

10 Sampling

The grain collector shall be sampled for testing in accordance with PNS/BAFS 391:2024 (Method of sampling for agricultural and biosystems power and machinery — Guidelines).

11 Testing

The sampled grain collector shall be tested in accordance with PNS/BAFS 399:2024 (Grain collector – Methods of test).

12 Marking and Labeling

12.1 Each unit of grain collector shall be engraved or embossed with the following information, either in the body of the machine or in a non-removable nameplate, attached in the clearly visible place:

- a) Registered trademark of the manufacturer;
- b) Brand;
- c) Model;
- d) Serial Number;
- e) Manufacturer/importer/distributor Information:
 - i. Name;
 - ii. Address; and
 - iii. Contact details.
- f) Country of manufacture/origin (if imported) / “Made in the Philippines” (if manufactured in the country).

12.2 Marking and labeling shall comply with the applicable regulation 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 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 fraction 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.

$$X = \frac{C_1}{T_1} + \frac{C_2}{T_2} + \frac{C_3}{T_3} + \dots + \frac{C_n}{T_n} \quad (1)$$

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 pressures level (ceiling value).

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