

**PHILIPPINE
NATIONAL
STANDARD**

PNS/BAFS 360:2023
ICS 65.060.40

**Multi-Rotor Remotely Piloted Aircraft-Powered
Sprayer — Specifications**



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Foreword

In 2022, the Department of Agriculture (DA)-Fertilizer and Pesticide Authority (FPA) proposed the development of the General Guidelines on the use of Remotely Piloted Aircraft Systems (RPAS) for fertilizer spraying in crop production. This is in compliance with the issuance of Memorandum Order No. 63, series of 2021 (Promoting the Use of Agricultural Drones Towards the Transformation of Philippine Agriculture). As part of DA-Bureau of Agriculture and Fisheries Standards (BAFS)' standards development process, the proposal was presented to the Task Force on the Identification and Prioritization of the Philippine National Standards (PNS)/Philippine Agricultural and Bioprocessing Engineering Standards (PABES) for Development, Review, and Revision (TF-PNS/PABES) of the DA-Philippine Council for Agriculture and Fisheries-Committee on Agricultural and Fisheries Mechanization (PCAF-CAFMech) for review and endorsement. The TF-PNS/PABES agreed to refocus the proposal on the standardization of the sprayer component. The DA-PCAF-CAFMech then endorsed the development of PNS on Drone-Powered Sprayer — Specifications and Methods of Test through DA-PCAF-CAFMech Resolution No. 14, series of 2022 (Recommending to the DA-BAFS and Agricultural Machinery Testing and Evaluation Center [AMTEC] the Prioritization of the Development of PNS [Specifications and Methods of test] for Cacao bean fermenter, Egg incubator, and Drone-powered sprayer).

In response, the DA-BAFS created a Technical Working Group (TWG) to develop the PNS under the following Special Order (SO):

1. SO No. 487, series of 2022 (Addendum to the SO No. 103, Series of 2022 Entitled “Creation of TWG for the Development of PNS for Agriculture and Fishery Products, Machineries, and Infrastructures”);
2. SO No. 617, series of 2022 (Amendment to SO No. 487, Series of 2022 [Addendum to the SO No. 103, Series of 2022 Entitled “Creation of TWG for the Development of PNS for Agriculture and Fishery Products, Machineries, and Infrastructures”]); and
3. SO No. 146, series of 2023 (Creation of TWG for the Development of PNS for Agricultural and Fishery Products, Machinery, and Infrastructures).

The TWG is composed of representatives from relevant DA agencies, other National Government Agencies (NGA), academe/research institutions, private sector, and Civil Society Organizations (CSO). The draft PNS underwent a series of TWG meetings and stakeholder consultations conducted via online platforms from June 2022 to March 2023 prior to its endorsement to the DA Secretary for approval.

This PNS was drafted in accordance with the editorial rules of the DA-BAFS-Standards Development Division (SDD) Standardization Guide No. 1 (Writing the Philippine National Standards).

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1 Scope

This Standard specifies the minimum requirements for a multi-rotor remotely piloted aircraft (RPA)-powered sprayer which delivers chemical solution to be used specifically in the protection and care of agricultural crops.

2 Normative References

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

Agricultural Machinery Testing and Evaluation Center (AMTEC)-University of the Philippines Los Baños (UPLB). (2000). Agricultural machinery – Method of sampling (PAES 103:2000).

<https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2019/07/PAES-103-2000-Agricultural-Machinery-Method-of-Sampling.pdf>

AMTEC-UPLB. (2001). Engineering materials – Bolts and nuts for agricultural machines – Specifications and applications (PAES 311:2001).

<https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2020/06/PNS-PAES-311-2001-Engineering-Materials-Bolts-and-Nuts-Specifications-and-Applications.pdf>

Bureau of Agriculture and Fisheries Standards (BAFS)-Department of Agriculture (DA). (2016). Agricultural machinery – Guidelines on after-sales service (PNS/BAFS PAES 192:2016).

http://www.bafs.da.gov.ph/bafs_admin/admin_page/pns_file/2021-02-26-PNS%20BAFS%20PAES%20192_2016-%20Guidelines%20on%20After-%20Sales%20Service.pdf

BAFS-DA. (2022). Technical means for ensuring safety – Guidelines (PNS/BAFS 330:2022).

https://bafs.da.gov.ph/bafs_admin/admin_page/pns_file/PNS.BAFS%20330.2022_PNS%20Technical%20Means%20for%20Ensuring%20Safety%20-%20Guidelines.pdf

BAFS-DA. (2023). Multi-rotor RPA-powered sprayer — Methods of test (PNS/BAFS 361:2023).

Bureau of Philippine Standards (BPS)-Department of Trade and Industry (DTI). (2017). Degrees of protection provided by enclosures (IP Code) (PNS IEC 60529:2017).

BPS-DTI. (2019). Secondary cells and batteries containing alkaline or other non-acid electrolytes — Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications - Part 2: Lithium systems (PNS IEC 62133-2:2019).

BPS-DTI. (2020). Secondary cells and batteries containing alkaline or other non-acid electrolytes — Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications - Part 1: Nickel systems (PNS IEC 62133-1:2020).

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

International Organization for Standardization (ISO). (2021). Unmanned Aircraft Systems (UAS) — Part 2: UAS components (ISO 21384-2:2021).

ISO. (2023). Agricultural and forestry machinery — Unmanned aerial spraying systems — Part 1: Environmental requirements (ISO/FDIS 23117-1) [Draft].

3 Terms and Definitions

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

3.1 controller

person who manipulates or maneuvers the flight controls of an RPA (Civil Aviation Authority of the Philippines-Department of Transportation [CAAP-DOTr], 2021, *modified*)

3.2 field application rate

amount of formulation applied per hectare (Matthews, 2000)

3.3 flight time

time that the aircraft moves under its own power for the purpose of flight and ends when the aircraft comes to rest after it is parked with engine or motor shut down (CAAP-DOTr, 2008, *modified*)

3.4 multi-rotor RPA-powered sprayer RPA-powered sprayer sprayer

self-contained sprayer used to apply pesticide and foliar fertilizer in liquid form, mounted and operated using RPA (Ozkan, 2023, *modified*)

3.5 nominal volume

volume indicated by the maximum filling level marked on the spray tank, expressed in liters (L) (ISO, 2013, *modified*)

3.6

nozzle

device used to form droplets from a spray liquid (ISO, 2020)

3.7

remotely piloted aircraft (RPA)

unmanned aircraft which is piloted from a remote pilot station (CAAP-DOTr, 2021)

3.8

rotor

rotating device with blades projecting from a hub (AMTEC-UPLB, 2010)

3.9

volume median diameter (VMD)

droplet size where half of the volume of the spray is in larger droplet sizes and half in smaller droplet sizes (ISO, 2020)

4 Classification

The classification of RPA-powered sprayer should be based, but not limited to, the following:

4.1 Number of rotors

4.1.1 Four-rotor

An RPA-powered sprayer which uses four propellers to facilitate movement as shown in Figure 1.

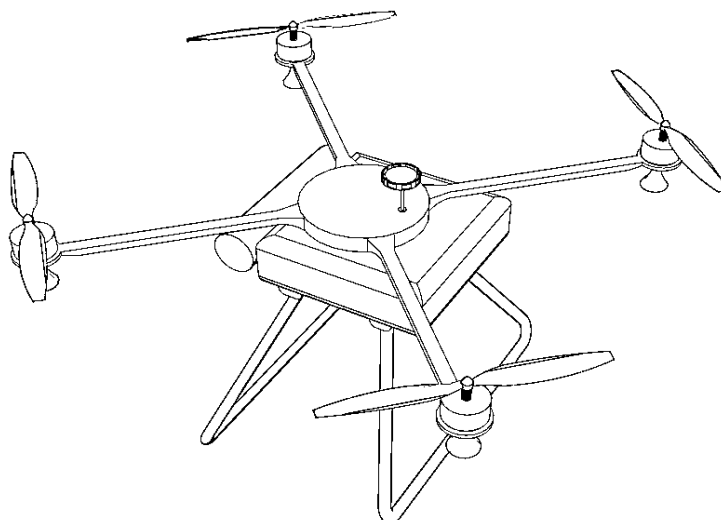


Figure 1. Four-rotor RPA-powered sprayer (BAFS-DA, 2023)

4.1.2 Six-rotor

An RPA-powered sprayer which uses six propellers to facilitate movement as illustrated in Figure 2.

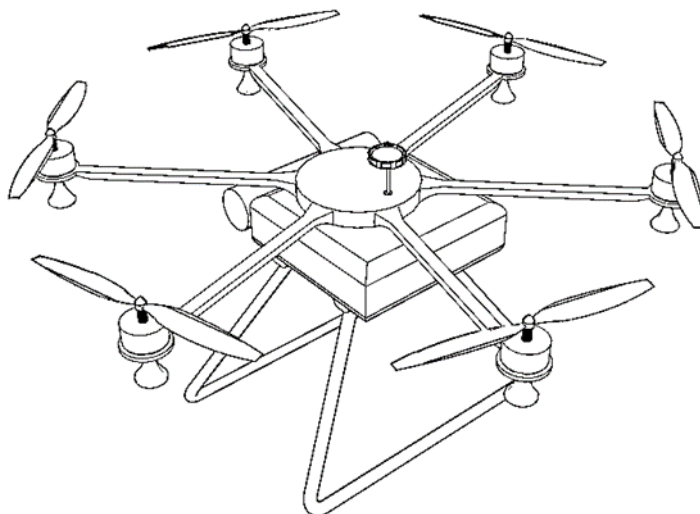


Figure 2. Six-rotor RPA-powered sprayer (BAFS-DA, 2023)

4.1.3 Eight-rotor

An RPA-powered sprayer which uses eight propellers to facilitate movement as portrayed in Figure 3.

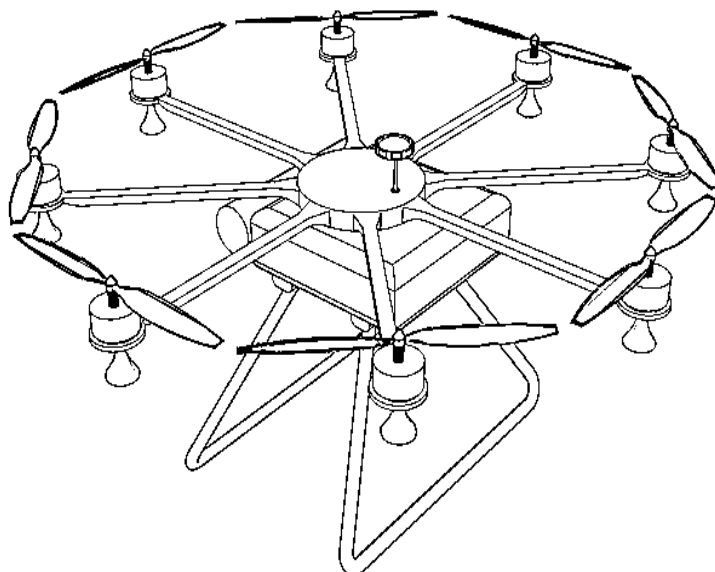


Figure 3. Eight-rotor RPA-powered sprayer (BAFS-DA, 2023)

4.2 Type of power source

4.2.1 Electric-motor driven

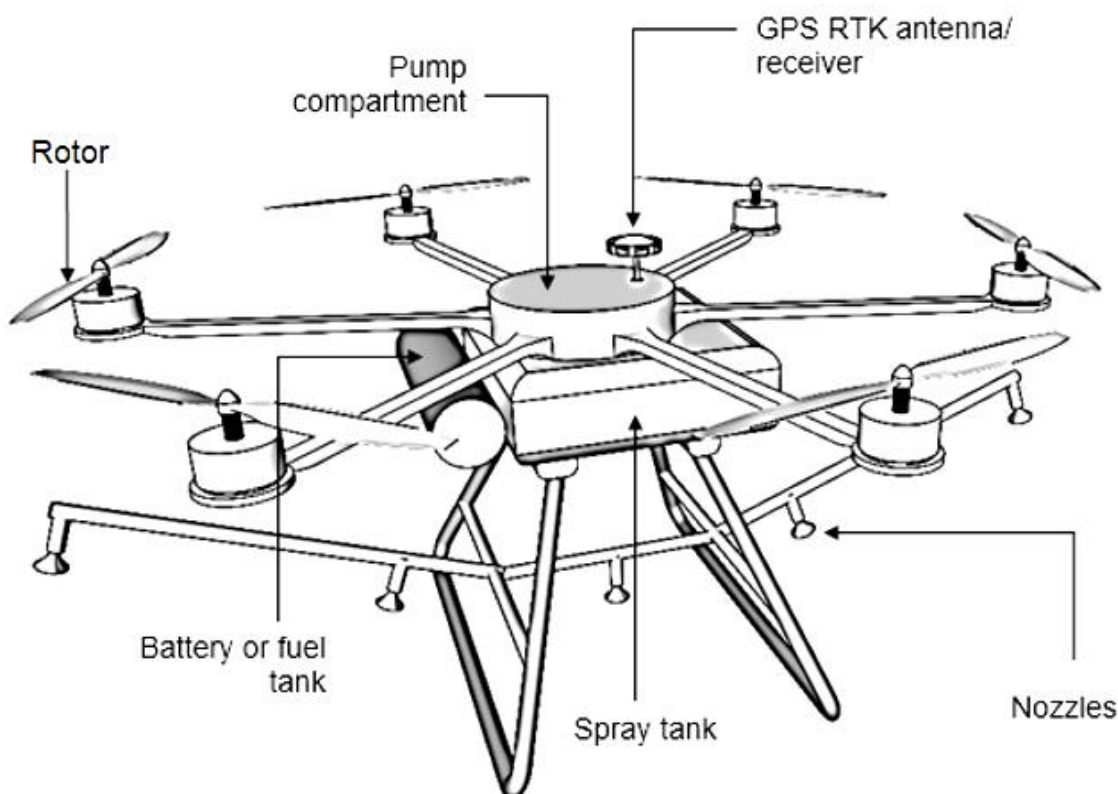
A type of RPA-powered sprayer that uses batteries as source of power to lift, navigate, and operate the application of fertilizers and spraying of pesticides.

4.2.2 Engine-driven

A type of RPA-powered sprayer that uses fuel as source of power to lift, navigate, and operate the application of fertilizers and spraying of pesticides.

5 Fabrication Requirements

5.1 The basic components for multi-rotor RPA-powered sprayer is shown in Figure 4.



NOTE Figure not drawn to scale.

Figure 4. Basic component of an RPA-powered sprayer (BAFS-DA, 2023)

5.2 The spray tank, including all parts, should be generally made of non-corrosive light materials.

- 5.3** Nozzles and atomizers shall be mounted with specification conforming to ISO/FDIS 23117-1 (Agricultural and forestry machinery — Unmanned aerial spraying systems — Part 1: Environmental requirements) which are as follows:
- 5.3.1** Nozzles/atomizers shall be properly installed to avoid disengagement during operation.
- 5.3.2** Nozzle/atomizer shall be secured at a fixed position and provided with a fast-acting anti-drip device.
- 5.4** The sprayer should be designed to withstand extreme weather conditions (e.g., intolerable wind condition, hot season, etc.).
- 5.5** The total spray tank volume shall be at least 5% greater than the tank nominal volume specified by the manufacturer.
- 5.6** The sprayer shall be provided with remote control equipped with safety feature in case of unintentional shutdown or malfunction.
- 5.7** Bolts, nuts, screws, bearings, bushing, and seals to be used should conform to PAES 311:2001 (Engineering materials — Bolts and nuts for agricultural machines — Specifications and applications) or other international standards.
- 5.8** There should be a provision for avionics, applicable to the design of the RPA.
- 5.8.1** RPA-powered sprayer should be powered either by a rechargeable battery or by petrol enough to supply the flight time specified by the manufacturer. Extra batteries should be provided, as necessary.
- 5.8.2** Nickel or lithium batteries used as part of an RPA should conform to the PNS IEC 62133 (Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications) series.
- 5.8.3** There shall be a provision for an empty-tank or low-battery indicators. An automatic return-to-home (RTH) mechanism shall be provided.
- 5.8.4** The RPA shall have a built-in Global Navigation Satellite System (GNSS) (e.g., Global Positioning System [GPS], GLONASS, etc.) or other navigation and positioning system.
- 5.8.5** Communication lights shall be provided (e.g., signal lights and blinkers).
- 5.9** The rated take-off weight specified by the manufacturer shall be attained.
- 5.10** There should be a provision for nozzle calibration of the sprayer.
- 5.11** The sprayer shall be provided with safety features such as landing pads.

5.12 A minimum of IP58 (splash proof) rating should be used as per PNS IEC 60529:2017 (Degrees of protection provided by enclosures [IP Code]).

6 Performance Requirements

6.1 The field capacity, flight time, discharge rate, field application rate specified by the operator or controller shall be attained.

6.2 The RPA-powered sprayer shall have no major breakdowns or malfunctions (e.g., failure of components, etc.). The frame shall be able to withstand its load without any noticeable cracks.

6.3 The RPA-powered sprayer shall attain a droplet classification as described in Table 1. If not specified, the droplet classification with corresponding volume median diameter (VMD) should be “medium”.

Table 1. Droplet size classification (American Society of Agricultural and Biological Engineers [ASABE], 2020).

VMD, μm	Droplet classification	Use
<60	Extremely fine	-
61-105	Very fine	-
106-235	Fine	Good cover
236-340	Medium	Most products
341-403	Coarse	Systemic herbicides
404-502	Very coarse	Soil herbicides
503-665	Extremely coarse	Liquid fertilizer
>665	Ultra coarse	Liquid fertilizer

7 Safety, Workmanship, and Finish

7.1 Appropriate Personal Protective Equipment (PPE) shall be provided in accordance with Rule 1080 of Occupational safety and health standards of Occupational Safety and Health Center (OSHC)-Department of Labor and Employment (DOLE).

7.2 The noise level shall conform to Rule 1074.01 to 1074.03 of Occupational safety and health standards of OSHC-DOLE, as shown in Annex A (Occupational safety and health standard [Rule 1074.01– 1074.03]). There shall be earmuffs or other ear protective devices provided for the pilot or controller to use when the noise level exceeds 92 dB(A) during a six-hour operation.

7.3 The RPA-powered sprayer shall be free from any manufacturing defects that may be detrimental to its operation.

7.4 Any uncoated metallic surfaces should be free from rust upon inspection.

- 7.5** The RPA-powered sprayer shall be free from sharp edges and surfaces, except for the rotor blades, that may injure the pilot during the operation. Warning notices shall be provided in accordance with PNS/BAFS 330:2022 (Technical means for ensuring safety – Guidelines).
- 7.6** Standard parts and components for the same brand and model should be maintained.
- 7.7** There shall be provision for access to parts during repair, maintenance, and operation.
- 7.8** All wiring terminals for power devices (e.g., switch, automatic pressure regulator, etc.) shall be properly insulated so that it may prevent short-circuit and corrosion.
- 7.9** The battery shall have the following protective measures as specified in ISO 21384-2:2021 (UAS — Part 2: UAS components):
- 7.9.1** The installation of the battery shall be able to firmly support the applicable inertial loads.
- 7.9.2** The battery shall automatically cease to charge if any of the protection fails to perform its function provided as follows:
- a) Protection for high and low voltages;
 - b) Overcharge control;
 - c) Protection for overheating; and
 - d) Alert or warning mechanism for fault and abnormal situations.
- 7.10** In case of damage caused by shock, drop, impact, exposure to moisture or short circuit, the battery shall be treated in accordance to ISO 21384-2:2021 (UAS — Part 2: UAS components).
- 7.11** Sprayer tank should be emptied after use for safety for purposes.

8 After-sales Services Requirements

- 8.1** The after-sales requirements shall conform to PNS/BAFS PAES 192:2016 (Agricultural machinery – Guidelines on after-sales service).
- 8.2** There shall be service center in the country authorized by the manufacturer.

9 Maintenance and Operation

- 9.1** Each unit of the RPA-powered sprayer shall be provided by the manufacturer with a set of standard tools, including specialized tools required for maintenance of the implement.

- 9.2** Information concerning battery storage, operation, handling, maintenance, safety limitations, and environmental precautions shall be provided in the operator's manual. There shall be a provision for disposal of spent batteries and components.
- 9.3** Operator's manual based on PAES 102:2000 (Agricultural machinery – Operator's manual – Content and presentation), maintenance schedule which includes re-tightening of bolts and nuts for prime mover, and list of the non-warrantable parts of the RPA-powered sprayer shall be provided.
- 9.4** There shall also be a provision for battery storage, operation, handling, maintenance, safety limitations and environmental precautions in the operator's manual as specified in ISO 21384-2:2021 (UAS — Part 2: UAS components).
- 9.5** In case of damage results from a short-circuit, drop, collision, moisture exposure, or shock, the battery should be protected against fire or explosion and resistant to leakage and cracking as specified in ISO 21384-2:2021 (UAS — Part 2: UAS components).
- 9.6** All parts of the sprayer should be replaceable and easily maintained.

10 Sampling

The sprayer shall be sampled for testing in accordance with PAES 103:2000 (Agricultural machinery – Method of sampling) or any suitable sampling method.

11 Testing

Sampled sprayer shall be tested in accordance with PNS/BAFS 361:2023 (Multi-rotor RPA-powered sprayer — Methods of test).

12 Marking and Labeling

- 12.1** Each unit of RPA-powered sprayer shall be engraved or embossed with the following information, either in the body of the implement or in a non-removable nameplate, attached in the most conspicuous place:
- a) Name and full address of the manufacturer and, where applicable, an authorized representative of the manufacturer;
 - b) Year of manufacture;
 - c) Designation of series or type;
 - d) Serial number (unit and remote controller);
 - e) Model number;
 - f) Weight of RPA-powered sprayer when the spray tank is empty (in kg);
 - g) Maximum weight of the RPA-powered sprayer (in kg);
 - h) Maximum flow rate of pump (in L/min); and

- i) Tank nominal volume.
- 12.2** In addition, marking and labeling should comply with the applicable regulations set by the competent authority.
- 12.3** The unit shall bear the mark “RP-U” followed by assigned numbers and letter, provided by the authorized aviation licensing agency, at the most visible side of the unit. The size of the mark should be legibly printed using weather-resistant or waterproof materials.
- 12.4** The nameplate shall be durably attached to the base surface material. It shall be all weather-resistant and cleaned using normal cleaning procedures.
- 12.5** Basic operation reminder shall be stated in the operator’s manual.
- 12.6** Basic safety/precautionary markings shall be provided visible to the pilot or controller.

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 A 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 A.

$$X = \frac{C_1}{T_1} + \frac{C_2}{T_2} + \frac{C_3}{T_3} \quad (\text{Equation A})$$

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 decibels peak sound pressures level (ceiling value).

Bibliography

- Agricultural Machinery Testing and Evaluation Center (AMTEC)-University of the Philippines Los Baños (UPLB). (2000a). Agricultural machinery – Method of sampling (PAES 103:2000). <https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2019/07/PAES-103-2000-Agricultural-Machinery-Method-of-Sampling.pdf>
- Agricultural Machinery Testing and Evaluation Center (AMTEC)-University of the Philippines Los Baños (UPLB). (2000b). Agricultural machinery – Operator’s manual – Content and presentation (PAES 102:2000). <https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2019/07/PAES-102-Operators-Manual-Content-and-Presentation.pdf>
- Agricultural Machinery Testing and Evaluation Center (AMTEC)-University of the Philippines Los Baños (UPLB). (2001). Engineering materials — Bolts and nuts for agricultural machines — Specifications and applications (PAES 311:2001). <https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2020/06/PNS-PAES-311-2001-Engineering-Materials-Bolts-and-Nuts-Specifications-and-Applications.pdf>
- Agricultural Machinery Testing and Evaluation Center (AMTEC)-University of the Philippines Los Baños (UPLB). (2010). Agricultural machinery – Fans and blowers – Specifications (PAES 240:2010). <https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2020/06/PNS-PAES-240-2010-Agricultural-Machinery-Fans-and-Blowers-Specifications-converted.pdf>
- American Society of Agricultural and Biological Engineers (ASABE). (2020). Droplet size classification (ASABE S-572.1). https://cdn2.hubspot.net/hub/95784/file-32015844-pdf/docs/asabe_s572.1_droplet_size_classification.pdf
- Bureau of Agriculture and Fisheries Standards (BAFS)-Department of Agriculture (DA). (2016). Agricultural machinery – Guidelines on after-sales service (PNS/BAFS PAES 192:2016). http://www.bafs.da.gov.ph/bafs_admin/admin_page/pns_file/2021-02-26-PNS%20BAFS%20PAES%20192_2016-%20Guidelines%20on%20After-%20Sales%20Service.pdf
- Bureau of Agriculture and Fisheries Standards (BAFS)-Department of Agriculture (DA). (2023). Multi-rotor remotely piloted aircraft-powered sprayer — Methods of test (PNS/BAFS 361:2023)
- Bureau of Agriculture and Fisheries Standards (BAFS)-Department of Agriculture (DA). (2023). [Unpublished raw data].
- Bureau of Philippine Standards (BPS)-Department of Trade and Industry (DTI). (2017). Degrees of protection provided by enclosures (IP Code) (PNS IEC 60529:2017).

Bureau of Philippine Standards (BPS)-Department of Trade and Industry (DTI). (2019). Secondary cells and batteries containing alkaline or other non-acid electrolytes — Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications - Part 2: Lithium systems (PNS IEC 62133-2:2019).

Bureau of Philippine Standards (BPS)-Department of Trade and Industry (DTI). (2020). Secondary cells and batteries containing alkaline or other non-acid electrolytes — Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications — Part 1: Nickel systems (PNS IEC 62133-1:2020).

Civil Aviation Authority of the Philippines (CAAP)-Department of Transportation (DOTr). (2008). Civil aviation regulation part 1: General policies, procedures, and definitions. <https://caap.gov.ph/wp-content/uploads/2021/08/PART-1-General-Policies-Procedures-and-Definitions.pdf>

Civil Aviation Authority of the Philippines (CAAP)-Department of Transportation (DOTr). (2021). Civil aviation regulation part 11: Aerial work and operating limitations for non-type certificated aircraft. <https://caap.gov.ph/wp-content/uploads/2021/08/PART-11-Aerial-Work-and-Operating-Limitations-for-Non-Type-Certificated-Aircraft.pdf>

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

International Organization for Standardization (ISO). (2013). Equipment for crop protection — Knapsack sprayers — Part 1: Safety and environmental requirements (ISO 19932-1:2013).

International Organization for Standardization (ISO). (2020). Equipment for crop protection — Vocabulary (ISO 5681:2020).

International Organization for Standardization (ISO). (2021). Unmanned aircraft systems — Part 2: UAS components (ISO 21384-2:2021)

International Organization for Standardization (ISO). (2023) Agricultural and forestry machinery — Unmanned aerial spraying systems — Part 1: Environmental requirements (ISO/FDIS 23117-1) [Draft].

Matthews, G.A. (2000). Pesticide application methods (3rd ed.). Blackwell Science, Oxford. <https://download.e-bookshelf.de/download/0000/5793/06/L-G-0000579306-0002359787.pdf>

Ozkan, E. (2023). Drones for spraying pesticides — Opportunities and challenges. Ohio State University. <https://ohioline.osu.edu/factsheet/fabe-540>

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