GOOD WAREHOUSING PRACTICES (GWP) FOR BAGGED GRAINS

PNS/BAFS 193:2017

EXPLANATORY MANUAL



Explanatory Manual

Good Warehousing Practices (GWP) for Bagged Grains (PNS/BAFS 193:2017)

Bureau of Agriculture and Fisheries Standards
(BAFS Quezon City, 2021)

Contributors: Brooklyn S. Flores, Katrina L. Maminta
Edited By: Dir. Vivencio R. Mamaril, Mary Grace R. Mandigma
Layout and Design: Brooklyn S. Flores, Katrina L. Maminta
Manual Cover Photos: Rolando B. Gomez

BAFS encourages the reproduction and dissemination of material in this knowledge product. Non-commercial uses will be authorized free of charge upon request. Applications for the permission to reproduce or disseminate these materials and all other queries shall be addressed to the publisher.

Published by:
Bureau of Agriculture and Fisheries Standards
BAFS Building, BPI Compound, Visayas Avenue, Diliman, Quezon City
(+632) 8928 8756 to 65 local 3301 - 3325
info.dabafs@gmail.com | bafs@da.gov.ph

ISBN 978-621-455-279-5 (PDF)

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Bureau of Agriculture and Fisheries (BAFS) Secretariat concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Mention of company names or commercial products does not imply endorsement by the Bureau.

Introductory Note

The Philippine National Standard (PNS) for the Good Warehousing Practices (GWP) for Bagged Grains 193:2017 was developed by the Department of Agriculture - Bureau of Agriculture and Fisheries Standards together with the Technical Working Group (TWG) created through Special Order No. 339 series of 2015. The TWG consists of experts from other government agencies, namely the Bureau of Plant Industry (BPI), Bureau of Agricultural and Fisheries Engineering (BAFE), formerly known as the Central of Agricultural and Fishery Engineering Divison (CAFED), National Corn Program, National Food Authority (NFA), Philippine Center for Postharvest Development and Mechanization (PhilMech), academe namely Isabela State University (ISU) and University of the Philippines Los Baños (UPLB) and private sector namely Grain Retailers Confederation of the Philippines (GRECON).

Consequently, BAFS and the TWG members created through DA Special Order No. 808 series 2022 developed the Explanatory Manual on PNS GWP for Bagged Grains to harmonize the interpretations of the standards thereby facilitating a better appreciation and adoption of its requirements. It also elaborates the rationale behind the requirements through the explanatory notes, and expands the meaning of standard by presenting images and documents as references.

However, this does not cover or provide information specific to a regulatory requirement.

The photo documentation for this Explanatory Manual was made possible through the assistance of the NFA East District Office, NFA Agricultural Credit Administration (ACA) Warehouse Office, NFA Region 3, and NFA Region 11.

For more information, please visit our website at www.bafs.da.gov.ph and Facebook page at www.facebook.com/da.bafs.

Director's Message



VIVENCIO R. MAMARIL, PhD
Director IV

As the Department of Agriculture's sole standard-setting agency, BAFS is dedicated to developing Philippine National Standards (PNS) that are based on sound science and ensuring that these standards are promoted and implemented by the intended users.

With the PNS Good Warehousing Practice (GWP) for Bagged Grains, we promote the proper storage practices to help achieve grain supply stability in the country and decrease postharvest losses due to poor handling and inappropriate facilities and infrastructure.

We hope that with this Explanatory Manual, you will find it easy to understand the provision of the standard as this showcases additional information and photo documentation.

Table of Contents

Section 1	Objectives, Scope and References	1
Section 2	Site Location and Construction	3
Section 3	Warehouse Designs and Specification	9
Section 4	Piling system	17
Section 5	Good Warehouse-keeping	22
Section 6	Worker's Health, Welfare and Training	35
Section 7	Management and Supervision	39
Section 8	Documentation and Records	41
Section 9	Traceability	43
Section 10	Recall procedures	45
Section 11	References	47
Technical Working Group		54

Section 1

Objective, Scope and References



1 Objective

This Code aims to provide specific guidance for the appropriate handling, storage, and transport of bagged grains to ensure the prevention and reduction of physical, biological, and chemical hazards that affect the quality, quantity, and safety of bagged grains during storage.

2 Scope

This Code covers warehouse design and warehousing practices relevant to handling, storage, and transport of bagged grains specifically for food and feed consumption. It also considers the provisions of the Good Agricultural Practices (GAP) and Good Manufacturing Practices (GMP) to ensure food safety, quality of produce, and workers' health, safety, and welfare.

Use

This Code considers the latest edition of the following references including any amendments:

a) *Republic Act 10611: The Food Safety Act and its Implementing Rules and Regulations (IRR);*
b) *National Food Authority (NFA)'s Revised Rules and Regulations on Grains Business;*
c) *Primer on Philippine Grain Standardization Program; and*
d) *Philippine National Standard on Good Agricultural Practices (GAP) for Corn (PNS/BAFPS 20:2008) and Rice (PNS/BAFS 141:2014)*

Moreover, this Code is consistent with the *Philippine Agricultural Engineering Standard (PNS/PAES) 419:2015, Agricultural Structures - Warehouse for Bag Type Storage for Grains*. Relevant provisions that pertain to practices that ensure prevention and reduction of physical, biological, and chemical hazards that affect the quality, quantity, and safety of bagged grains during storage and promote agricultural product safe-keeping and quality preservation are expounded in this Code.

3 References

The main document used as a reference in the development of the manual is the PNS 193:2017. The complete list of photo references is found on page 47.

Site Location and Construction

The provisions of the standard are written in black font color. The explanatory notes are indicated in red font color inside a yellow box. Photos and images are also found in succeeding pages.



Photo source: Mr. Roland Gomez



Photo source: Mr. Roland Gomez

3 Site Location and Construction

3.1 This Section shall conform to the provisions of the *Philippine Agricultural Engineering Standard (PNS/PAES) 419:2015, Agricultural Structures – Warehouse for Bag Type Storage for Grains.*

Explanatory Note:

The Philippine Agricultural Engineering Standard (PNS/PAES) 419:2015, Agricultural Structures – Warehouse for Bag Type Storage for Grains, specifies the functional requirements for warehouses for bag type storage of grains.

The PNS/PAES 419:2015 requires, among others, that the structural requirements shall conform with Presidential Decree No. 1906 or the National Building Code (PAES, 2015).

3.2 In addition to the requirements specified in PNS/PAES 419: 2015, the following are additional considerations:

3.2.1 The warehouse should be constructed away from sources of potential hazards that may affect the quality of produce and pose risk to the worker's health and safety.

Explanatory Note:

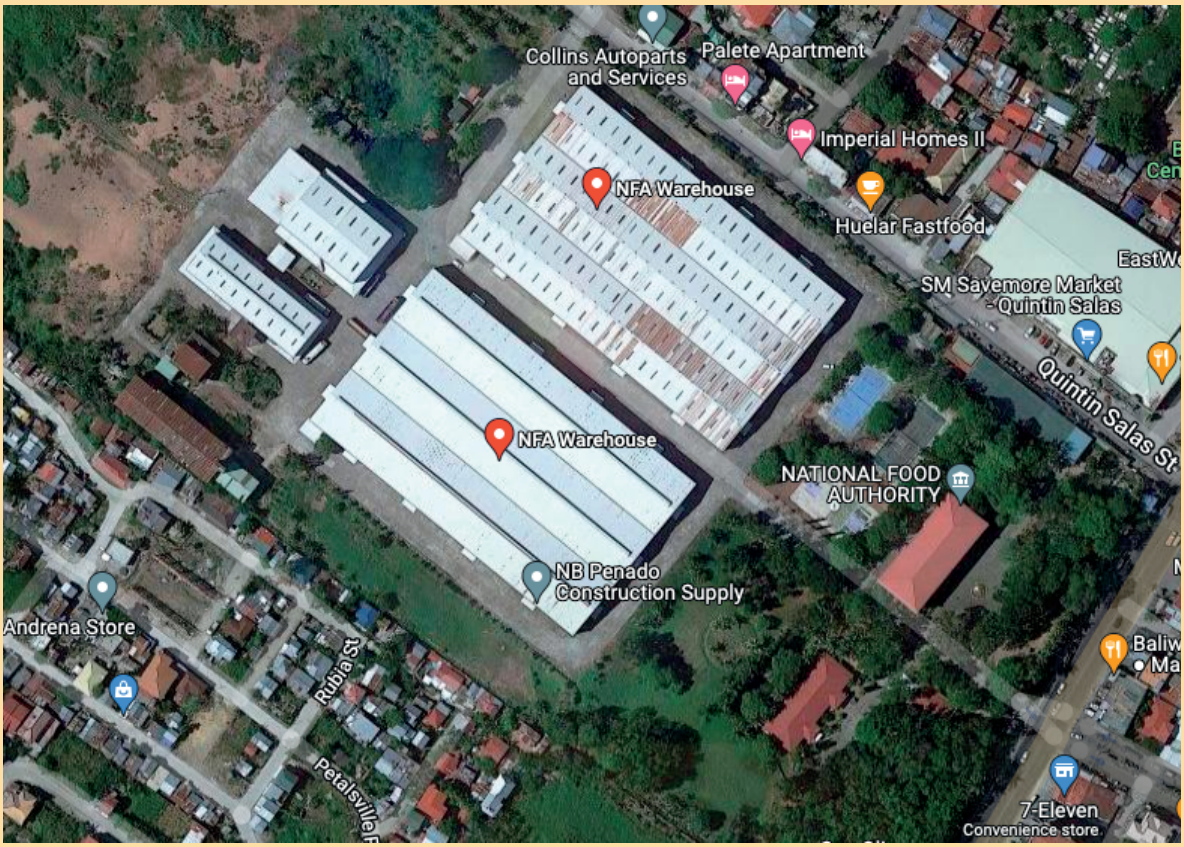


Image 1.
National Food Authority Warehouse in Iloilo situated away from sources of potential hazards (Source: Google Map, n.d.)

3.2.2 The warehouse should be located away from:

3.2.2.1 environmentally polluted areas;
3.2.2.2 sources of industrial activities;
3.2.2.3 flood-prone areas;
3.2.2.4 zones that may encourage insect infestation and entry of stray animals; and
3.2.2.5 places where waste either solid or liquid cannot be removed effectively.

Explanatory Note:

Pollutants may contaminate bagged grains which may affect the consumers.

Flood-prone areas are not suitable as a warehouse location due to possible rewetting of the grains. This may lead to grain deterioration such as sprouting, infection by pathogens (e.g., *Aspergillus* and *Fusarium* spp*)*, insect and mite infestation, and rotting due to hydrolysis and carbohydrate breakdown caused by prolonged exposure to flood water. Other contaminants may also enter the grain through flood water (FAO, 2018).

The information on flood-prone areas is available through the flood hazard map or flood risk map of the Department of Science and Technology - Philippine Atmospheric, Geophysical and Astronomical Services Administration (DOST-PAGASA).



Image 2.
Environmentally polluted area (Source: Mayuga, J.L., 2018)

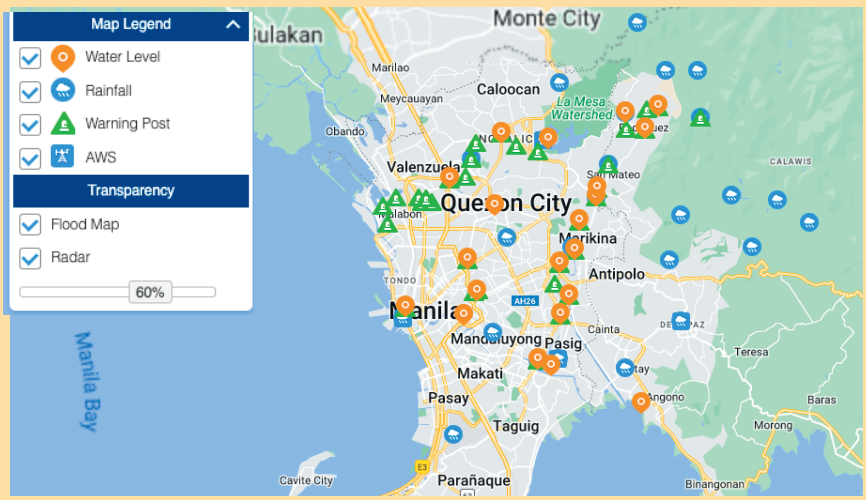


Image 3.
Metro Manila Flood Monitoring Map than can serve as reference tool (Source : DOST-PAG-ASA, n.d.)

3.2.3 The warehouse should be constructed where there is an accessible road.

Explanatory Note:

Approaches to warehouse should permit easy movement and maneuvering of vehicles.



Image 4.
Warehouse constructed where network road is accessible (Source: Gomez, 2021)

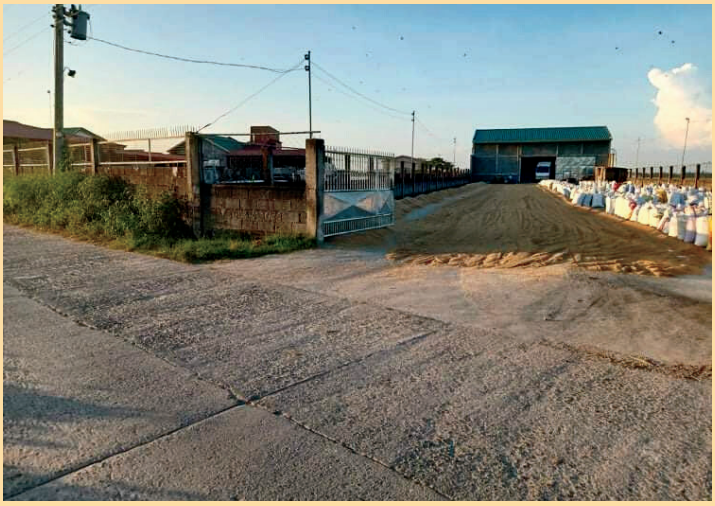


Image 5.
Warehouse constructed where network road is accessible (Source: Gomez, 2021)

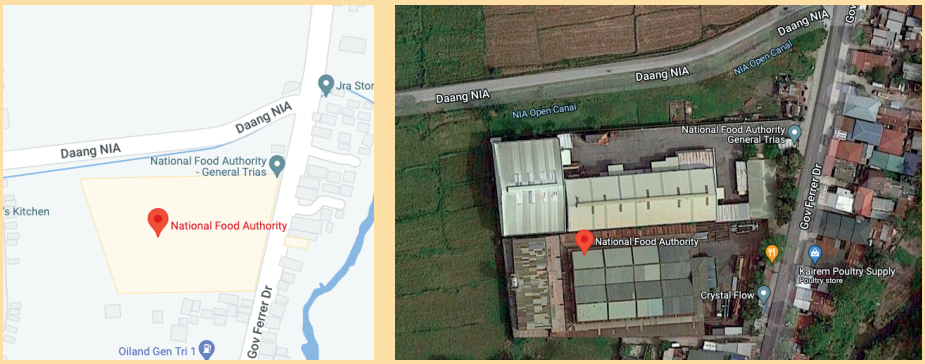


Image 6.
Aerial view of warehouse constructed where network road is accessible as seen from Google Map (Source: Google Map, n.d.)

3.2.4 The load-bearing capacity, resistance to compaction, and drainage characteristics of soil in which the warehouse is to be constructed should be considered.

Explanatory Note:

Warehouses should not be constructed on weak soil, incapable of supporting structures. An effective drainage system will be required to protect the warehouse and its surroundings from running water, and the site should be able to handle such a system (FAO, 1994).

3.2.5 The location and distance of the warehouse from other farm structures of the production area should be considered during construction.

Explanatory Note:

For easy transport of harvested and processed grains, the warehouse should be located close to the production and processing areas. The reasonably close proximity of the warehouse to the production and processing areas is also cost-effective (FAO, 2018).



Image 7.
Warehouse location in close proximity to other farm structures (Photo taken at NFA East District Warehouse)

3.2.6 Other factors that may be taken into account are the following: accessibility, ease of movement of stocks, and provision for vehicle movement and maneuvering.

Explanatory Note:

The warehouse should be as close to the road as possible for quick access and stock movement. It is also crucial to ensure that the entrances to the warehouse allow for smooth vehicle movement and maneuvering. This means that there should be enough useful space around the warehouse and the space it will take up (FAO, 1994).





Image 8.
Warehouse accessible or close to main road (Source: Gomez, 2021)



Image 9.
Warehouse with parking area for vehicle movement and maneuvering (Source: Gomez, 2021)



Image 10.
Warehouse with enough space for smooth movement and maneuvering (Source: Gomez, 2021)

Warehouse Design and Specification

The provisions of the standard are written in black font color. The explanatory notes are indicated in red font color inside a yellow box. Photos and images are also found in succeeding pages.



Photo source: Mr. Roland Gomez



This Section shall conform with the provisions of the *Philippine Agricultural Engineering Standard (PNS/PAES) 419:2015, Agricultural Structures – Warehouse for Bag Type Storage for Grains* and *Food and Agricultural Organization (FAO): The Purposes of Warehouses, and Basic Requirements*. The succeeding sections provide additional parameters that should be taken into account.

4.1 Ventilation

Ventilation and/or insulation systems shall be designed and constructed to provide proper aeration and to maintain the desired temperature. Moreover, these should be maintained in normal conditions and cleaned regularly. Low temperature storage is recommended for unpolished rice.

Explanatory Note:

According to PNS/PAES 419:2015 *Agricultural structures – Warehouse for bag type storage of grains*, to ensure proper aeration and maintain the desired temperature:

- Vents should be provided near the floor level at the top of the walls near the grid line and the top of the roof and the ridge.
- Adequate natural ventilation openings shall be provided with shutters to control ventilation.
- Continuous ridge vents are built on the rooftop, which provides good ventilation, and the louvers are all over the warehouse.
- In addition to natural ventilation, exhaust fans should be installed.

Ventilation windows or openings are required to exchange air, reduce the temperature in the warehouse, and allow some light to enter.

If possible, utilization of air conditioning units may be considered since the lower temperatures can lengthen the storability of grains. The ideal temperature does not exceed 25°C. At this temperature, the moisture content is around 14% (FAO, 2018).

Because both wet grain and molds respire and give off heat, proper ventilation is needed to keep the grain cool and slow down mold growth. With proper ventilation, grains can generally be safely held about four times longer than grains kept in a poorly ventilated warehouse (FAO, 2018).

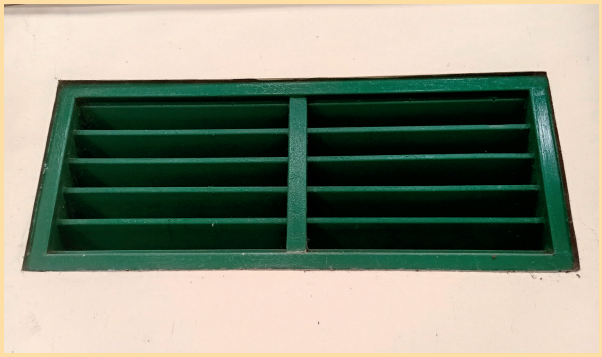


Image 11.
Warehouse ventilation window (Source: Gomez, 2021)



Image 12.
Warehouse rotary ventilation (Karnnapus, n.d.)



Image 13.
Warehouse ventilation windows (Source: Gomez, 2021)

4.2 Flooring and drainage

The floors should be constructed to be adequately strong, sufficiently above ground level, smooth, easy to clean, and free from cracks where moisture from the ground may affect and/or contaminate the stored grains. It should be made from durable, impervious, non-toxic, and non-adsorbent materials.

Proper drainage system should be installed to prevent water stagnation. The drainage canals should be protected by a grille.

Explanatory Note:

According to PNS PAES 419:2015 A*gricultural structures - Warehouse for bag type storage of grains*:

- The floor should be adequately solid and capable of withstanding heavy loads and vibrations.
- The floor shall be elevated or constructed higher than the existing ground. The floor should be 1m above the ground to permit easy loading or unloading into trucks at the sides of the warehouse.
- There shall be provisions for wear resistance and safety (refractoriness and elimination of skidding risks). The floor should be smooth and easy to clean. It should be free from cracks where moisture from the ground may affect the stored grain. Moisture sealing compound or asphalt should be provided to fill the floor cracks against moisture.
- Foundation, pillars, and beams should be made from reinforced concrete. Floor construction should conform with the National Building Code.

A proper drainage system will make cleaning the warehouse much more manageable, thus minimizing the development of bacteria and fungi. A proper drainage system is also important for the safety of workers as this will prevent accidents from happening (FAO, 2018).

In addition, proper drainage prevents the proliferation of rodents in the warehouse. This, in itself, is a physical strategy for rodent management (Sayaboc et al., 1989).



Image 14.
Drainage around the warehouse (Source: NFA Region XI, 2019)



Image 15.
Warehouse floor (Source: NFA Region XI, 2019)



Image 16.
Warehouse floor (Source: NFA Region XI, 2019)

4.3 Walls

Walls should be constructed and finished so as to prevent condensation, leakage, and the formation of mold. The walls should be painted white or any light-colored material. Moreover, it should be made of smooth, durable, impervious, crack-resistant materials that can be cleaned easily.

Partition walls should be constructed to separate the stored bagged grains from other postharvest facilities installed in the warehouse.

Explanatory Note:

According to PNS/PAES 419:2015 *Agricultural structures - Warehouse for bag type storage of grains*, white walls will facilitate the detection of insect pests, help keep the warehouse as cool as possible, and sanitary purposes.

Partition walls will help separate bagged grains from other post-harvest facilities to prevent contamination of the grains with microorganisms, insect pests, rodents, or smell from fuel and oils.

In addition, a partition wall is necessary if postharvest facilities are installed inside the warehouse to prevent dust from accumulating on the stockpiles during postharvest operations. The partition wall will also serve as an indicator of separate accountability of processed stocks and stored stocks (NFA, 1988).



Image 17.
Warehouse inside wall (side) painted in light color (Source: Gomez, 2021)



Image 18.
Warehouse inside wall (front) painted in light color (Source: Gomez, 2021)



Image 19.
Warehouse wall painted light color with stacked bagged grains (Source: NFA Region XI, 2019)

4.4 Openings/Doorways/Windows

Openings leading to the exterior should be installed with mesh screen windows and tight-fitting doors to prevent the entry of unauthorized persons, and stray animals and pests.

Secondary grilled doors are recommended for aeration and security.

Explanatory Note:

According to PNS/PAES 419:2015 *Agricultural structures - Warehouse for bag type storage of grains*, ventilation openings such as louvers shall be fitted on the outside with anti-bird grills (20mm mesh) and on the inside (10cm behind the grills) with insect screens (removable for cleaning), which will deter most insects.



Image 20.
Warehouse opening or doorway with mesh screens (Source: Gomez, 2021)



Image 21.
Warehouse opening or doorway with mesh screens (Photo taken at NFA East District Warehouse)



Image 22.
Warehouse window with mesh screen (Photo taken at NFA ACA warehouse)

4.5 Lightings

Lightings should be provided to allow adequate and effective cleaning of the warehouse facility and to ensure that storage operations can be carried out in a hygienic manner. Shatterproof materials should be used to enclose the lightings fixtures inside the warehouse to ensure that the grains are protected from contamination due to breakages.

Explanatory Note:



Image 23.
Example of shatterproof materials lighting fixtures



Image 24.
Lighting fixtures without enclosure

4.6 Roof

Roof frames should be designed in a way that it can transfer the weight of the roof to the supporting columns (in framed buildings), or the walls for small warehouses. The materials to be used in the construction of roof frames should be made of steel or wood that is well dried and chemically treated.

There should be no opening between the wall and the roof to avoid entry of pests and to minimize contamination. In the event that the existing warehouses have gaps between the roof and the wall, a mesh should be installed to prevent entry of animals, and pests.

Explanatory Note:



Image 25.
Warehouse roof; no opening between the wall and the roof (Photo taken at NFA ACA warehouse)



Image 26.
Warehouse roofs (Photo taken at NFA ACA warehouse)

Piling System

The provisions of the standard are written in black font color. The explanatory notes are indicated in red font color inside a yellow box. Photos and images are also found in succeeding pages.



5. Piling system

To provide aeration and avoid contamination, pallets, square timbers or any local substitute shall be used as the base of all the stocks of grains. The pallets may be covered with clean empty sacks or plastic sheets to prevent the accumulation of spilled grains beneath the pallets. The floor sheets may be used for fumigation purposes.

In terms of moisture content expressed in percentage (%), grains shall be stored and piled following the recommendations given on Table 1:

Table 1: Storage and piling system for grains in reference to its moisture content

Moisture Content (1%)	Storage and Piling System	Description	Remarks
≤14	Block or Chinese Method	1 layer over the other	None
14.1 - <15	Japanese Method	1 layer over the other with hole in the middle for aeration	Piling with prioritization in milling. NOTE 1 Applicable only for rice.
15-18	Japanese Method		Temporary piling should be done for not more than 7 days. NOTE 1 Applicable only for rice.

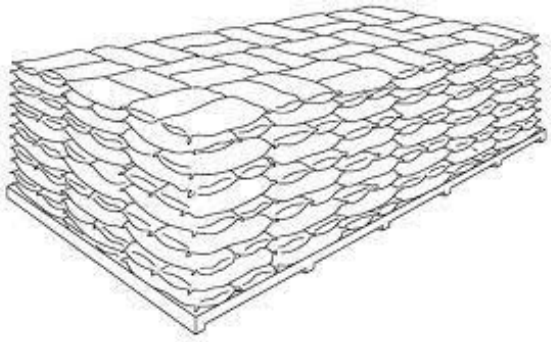


Illustration 1.
Block or Chinese Method (Source: PNS/PAES 419:2015, AMTEC)

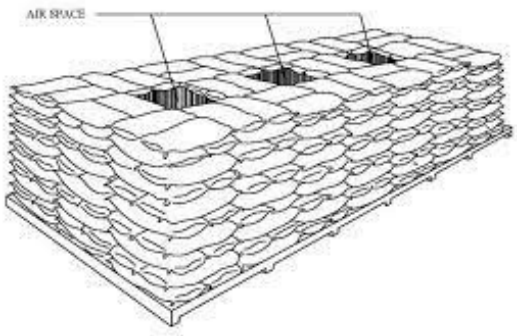


Illustration 2.
Japanese Method (Source: PNS/PAES 419:2015, AMTEC)

All grains above 14% moisture content should be subjected to further drying operations prior to storage.

Explanatory Note:

The level of moisture content for safe storage is 14% and below. Grains stored with more than 14% moisture content are susceptible to grain damage and discoloration, specifically if intended for prolonged storage.

The crop's moisture level is one of the most critical physiological elements in optimal grain storage. Because it promotes fungal and insect problems, respiration, and germination, high moisture content causes storage problems.

Grain is typically harvested at a moisture content of 18–25 percent (wb), though this can vary significantly based on various factors such as maturity stage, season, weather pattern, and drying facilities.

In general, if moisture content increases, storage life decreases. High moisture content can lead to mold growth, high insect activity, high respiration rate, and heating, especially when bulked. However, very low moisture content (MC < 4%) can result in extreme desiccation, causing mechanical damage to grains (e.g., breakage) (FAO, 2018).

Special packaging and handling are recommended for unpolished rice.

Explanatory Note:

Examples of special packaging are vacuum-sealed bags or plastic-lined sacks.

Packaging materials should be moisture resistant or moisture-proof so the grains will not be able to absorb moisture from the air. Polyethylene packaging material may be used since it is moisture resistant. Vacuum sealing may also be done to reduce the level of oxygen inside the packaging material and prolong storage (FAO, 2018).



Image 27.
Bagged grains in special packaging as seen in retail markets (Photo taken at local supermarkets)

The piles shall be stacked in a tight, neat, and squared-off manner. The stack heights and stacking density should conform with the recommended provisions of the *Philippine Agricultural Engineering Standard (PNS/PAES) 419:2015, Agricultural Structures – Warehouse for Bag Type Storage for Grains*.

Explanatory Note:



Image 28.
Stacked bagged grains in a tight, neat, and squared-off manner (Source: IRRI Rice Knowledge Bank, n.d.)



Image 29.
Stacked bagged grains in a tight, neat, and squared off manner in NFA warehouse (Source: Gomez, 2021)



Image 30.
Stacked bagged grains in a tight, neat, and squared off manner in NFA warehouse (Source: Gomez, 2021)

At least one meter space shall be provided between piles, between piles and walls, and between piles and posts to facilitate cleaning and application of pest control measures. An updated bin card shall be attached to every pile. The standard information in the bin card shall be the following:

- Date received or date procured;
- Source of stock;
- Moisture content;
- Quantity of bags;
- Variety or code;
- Pest control measures applied and date of application; and
- Traceability details.

Explanatory Note:

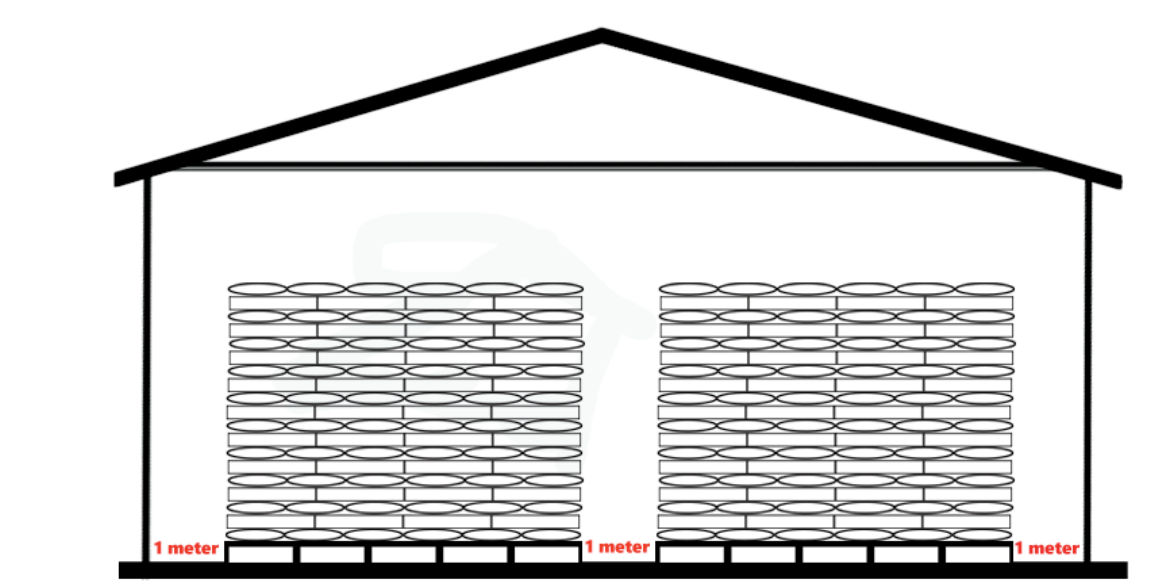
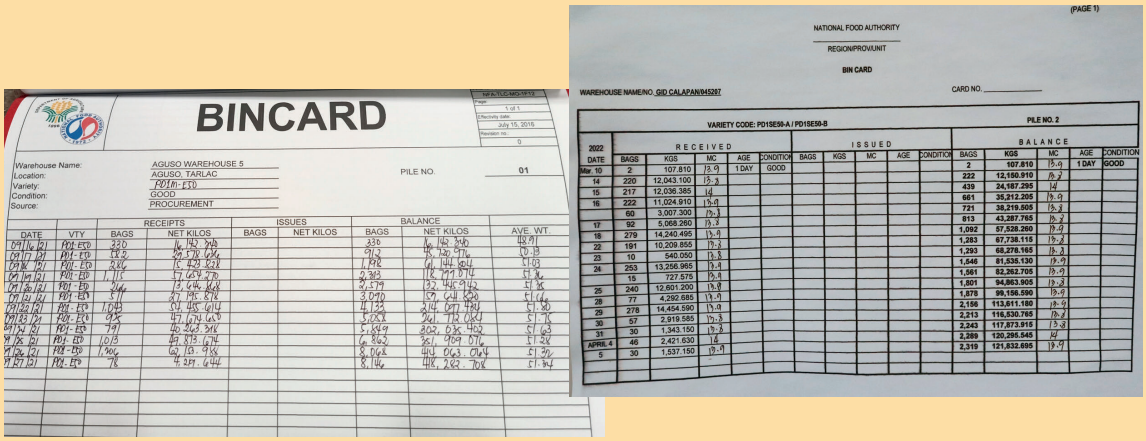


Illustration 3.
Piling and storage of bagged grains an illustration


BINCARD

Warehouse Name: AGUSO WAREHOUSE 5
Location: AGUSO, TARLAC
Variety: PD1In-ES0
Condition: GOOD
Source: PROCUREMENT

PILE NO. 01

DATE	VTY	RECEIPTS BAGS	RECEIPTS NET KILOS	ISSUES BAGS	ISSUES NET KILOS	BALANCE BAGS	BALANCE NET KILOS	AVE. WT.
01/16/21	PD1-ES0	220	11,142.240			220	11,142.240	102.91
01/17/21	PD1-ES0	222	11,024.910			442	22,167.150	101.13
01/18/21	PD1-ES0	246	12,423.630			688	34,590.780	101.03
01/19/21	PD1-ES0	1,115	57,469.270			1,803	92,060.050	51.36
01/20/21	PD1-ES0	364	18,646.460			2,167	110,706.510	51.35
01/21/21	PD1-ES0	611	31,195.810			2,778	141,902.320	51.66
01/22/21	PD1-ES0	1,043	53,485.610			3,821	195,387.930	51.20
01/23/21	PD1-ES0	952	47,674.620			4,773	243,062.550	51.15
01/24/21	PD1-ES0	791	40,249.340			5,564	283,311.890	51.03
01/25/21	PD1-ES0	1,013	51,835.670			6,577	335,147.560	51.24
01/26/21	PD1-ES0	1,906	97,315.955			8,483	432,463.515	51.34
01/27/21	PD1-ES0	78	4,001.644			8,561	436,465.159	51.44

NATIONAL FOOD AUTHORITY
REGION/PROVINCE/UNIT
BIN CARD
(PAGE 1)
WAREHOUSE NAME/NO. GID CALAPAN/845287
CARD NO. _____
VARIETY CODE: PD1SE50-A / PD1SE50-B
PILE NO. 2

2022 DATE	RECEIVED BAGS	RECEIVED KGS	RECEIVED MC	RECEIVED AGE	RECEIVED CONDITION	ISSUED BAGS	ISSUED KGS	ISSUED MC	ISSUED AGE	ISSUED CONDITION	BALANCE BAGS	BALANCE KGS	BALANCE MC	BALANCE AGE	BALANCE CONDITION
Mar. 10	2	107.810	13.9	1 DAY	GOOD						2	107.810	13.9	1 DAY	GOOD
14	220	12,043.100	13.3								222	12,150.910	13.3		
15	217	12,036.385	14								439	24,187.295	14		
16	222	11,024.910	13.9								661	35,212.205	13.9		
	60	3,007.300	13.3								721	38,219.505	13.3		
17	92	5,068.260	13.3								813	43,287.765	13.3		
18	279	14,240.495	13.9								1,092	57,528.260	13.9		
22	191	10,209.855	13.3								1,283	67,738.115	13.2		
23	10	540.050	13.3								1,293	68,278.165	13.3		
24	253	13,256.965	13.9								1,546	81,535.130	13.9		
	15	727.575	13.9								1,561	82,262.705	13.9		
25	240	12,601.200	13.8								1,801	94,863.905	13.8		
28	77	4,292.685	13.9								1,878	99,156.590	13.9		
29	278	14,454.590	13.9								2,156	113,611.180	13.9		
30	57	2,919.585	13.3								2,213	116,530.765	13.2		
31	30	1,343.150	13.3								2,243	117,873.915	13.3		
APRIL 4	46	2,421.630	14								2,289	120,295.545	14		
5	30	1,537.150	13.9								2,319	121,832.695	13.9		

Image 31.
Sample bin card

Section 5

Good Warehouse-keeping

The provisions of the standard are written in black font color. The explanatory notes are indicated in red font color inside a yellow box. Photos and images are also found in succeeding pages.



6.1 Warehouse maintenance

There should be a monthly scheduled inspection of roofs for the presence of any holes, leakages, or damages in the roofing system. The Warehouse Officer shall immediately act upon any report of leaks or damage. Structural defects in gutters and downspouts shall be immediately and properly repaired. In case of cracks and crevices, cement plaster shall be used to properly fill up the damage.

Explanatory Note:

Regular inspection will facilitate immediate action in cases where there are damages in the roofing system, or any structural defects to prevent resetting of the grains, hydrolysis, attraction of pests and exposure to direct heat from the sun.



Image 32.
Damaged warehouse roof (Source: Gomez, 2021)



Image 33.
Damaged warehouse floor - with cracks and crevices

6.2 Warehouse hygiene and sanitation

Prior to storage, thewarehouse and its immediate surroundings shall be thoroughly cleaned. The warehouse must be free from unnecessary materials like pieces of lumber and old machines. The entire warehouse structure must be cleaned and brushed down at least once a month to prevent contamination from dirt. Moreover, the surrounding areas of the warehouse should be weed-free.

A weekly cleaning of the periphery of the piles should be done to remove dust and webs and to eliminate the possible breeding place of rats, birds, and insects. Warehouse, as well as, pallets (used or unused) and machines must be cleaned immediately upon grain disposal to remove accumulated grain residues, dust, and cobwebs.

Explanatory Note:

Cleanliness and physical removal are the first lines of defense against biological agents of deterioration. Materials other than grains may harbor pockets of infestations that serve as sources for re-infestation when a new batch of rice grains is stored. Weeds and trees serve as nesting for rodent and bird pests, respectively. Water sources and trash must be eliminated to discourage rodent population build-up. Preventive action solves many later problems in pest management inside the warehouse.



Image 34.
Dusty warehouse



Image 35.
Warehouse with spilled grains (to be removed)

After cleaning, residual spraying shall be applied to the entire storage structure, which includes walls, floors, and posts.

Torn or gnawed sacks should be immediately mended to avoid spillages, the collapse of the pile, and further attack from pests. If possible, bags or containers should not be re-used since the use of returned sacks is a serious source of insect infestation. Unserviceable empty sacks and totally damaged grains should be properly disposed of.

A separate room should be provided for pesticides and cleaning materials. Sacks and pallets should be properly stored in a separate portion of the warehouse and stacked neatly and orderly and provided with a physical separator. Proper signage should be provided for all rooms. Moreover, no portion of the warehouse should be used as living quarters.

Explanatory Note:



Image 36.
Illustration of proper handling and storage of grains displayed inside of a warehouse



Image 37.
Torn or gnawed sack for mending to avoid spillage

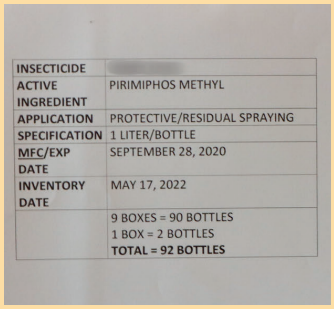


Image 38.
Unserviceable empty sacks for disposal (Source: Gomez, 2021)



Image 39.
Totally damaged grains (infested by weevils) (Source: Tomasz Klejdysz, 2021)





INSECTICIDE	
ACTIVE INGREDIENT	PIRIMIPHOS METHYL
APPLICATION	PROTECTIVE/RESIDUAL SPRAYING
SPECIFICATION	1 LITER/BOTTLE
MFC/EXP DATE	SEPTEMBER 28, 2020
INVENTORY DATE	MAY 17, 2022
	9 BOXES = 90 BOTTLES 1 BOX = 2 BOTTLES TOTAL = 92 BOTTLES



Image 40.
Pesticide storage, proper signage



6.3 Stock maintenance and preservation

Representative samples shall be taken randomly from a batch of bagged grains and measured using calibrated moisture meters. Newly received grains with moisture content above 14% MC shall be temporarily stored and subjected to drying to 14% MC and below. Dried stocks may be grouped according to their varietal characteristics.

Explanatory Note:

The goal of sampling is to obtain a sample suitable for the moisture test to be done. The sample should have the same constituents and proportion as in the whole lot. One method used in sampling is abstraction and combination, which is getting primary representatives from the required number of bags and combining them to form the composite sample (ISTA, 2021).

With the NFA Method of Sampling, representative samples are necessary for the quality assessment of large volumes of grains in stockpiles. Samples are to be taken at random using the following scales (NFA, 2019):

Table *1.* Number of samples to be taken per scale

No. of Bags	Sample Collection
Up to 10 bags	collect samples from each bag
More than 10 to 100 bags	collect samples from at least 10 bags
More than 100 bags	collect samples from at least the square root (approximately) of the total number of bags in a pile



Image 41.
Personnel taking samples for stock maintenance and preservation (Source: NFA Region 11, 2020)

Laborers shall be discouraged and prevented from using hook or "*gancho*" to maintain the integrity of the bags and avoid spillages. The spillages shall be immediately collected. These collected grains may either be placed into bags (sacks) and piled separately or cleaned and added to busted bags.

Explanatory Note:

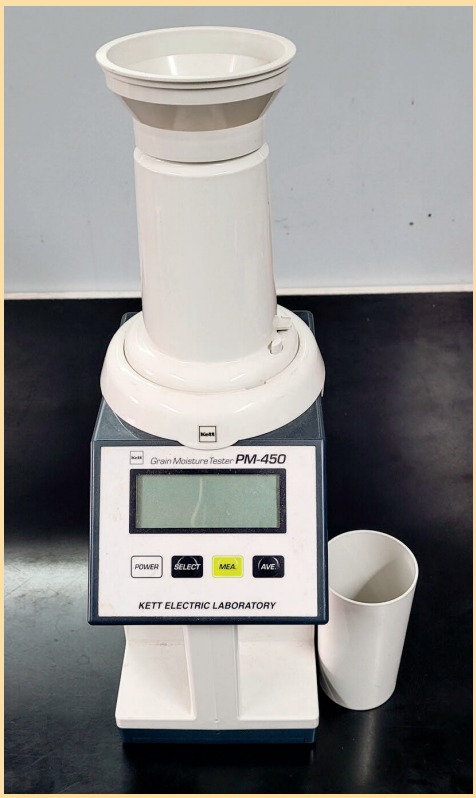


Image 42.
Grain moisture meter



Image 43.
Grain probe





Image 44.
Hook or *"guancho"*



Image 45.
Spilled grains that should be immediately collected

At least 100 gram sample of every variety of stocks of milled rice or shelled corn stored in the warehouse should be maintained at the warehouse office for easy reference. It shall be packed in plastic containers or sample bottles with proper identification.

Explanatory Note:

The milled rice or corn samples should be maintained to quickly identify the variety declared for storage.

Specifically, the 100-gram sample should be maintained to check the identity of a given variety, its authenticity, and trueness to type (ISTA, 2021).



Image 46.
Grains stored in containers with proper identification for reference

The recommended relative humidity (RH) for a warehouse is 65%. Thus, warehouse temperature/humidity as well as grain temperature must be checked and measured daily. Grain thermometer and thermohygrometer should be installed for monitoring purposes. Warehouse atmosphere must be controlled by either opening or closing windows/doors or installing ventilation fans. Windows and doors must be opened during the daytime for proper aeration of stocks. All windows and other openings except doors must be screened to avoid pilferages and entry of pests.

Explanatory Note:

Relative humidity directly affects the moisture content of grains. Grains being hygroscopic, can absorb or release moisture depending on the relative humidity of the surroundings. An RH of 65% will result in a moisture content lower than 14%, safe for grain storage.

Daily monitoring and management of temperature and RH in the warehouse and grain temperature are essential if the proper temperature and RH are to be maintained. Appropriate action may be taken if any variations from the required temperature and RH are observed (FAO, 2018).

Explanatory Note:



Image 47.
Digital Grain Thermometer
(Source: South West Seeds, n.d.)



Image 48.
Grain Thermohygrometer
(Source: Gyuszko, n.d.)

Damaged grains that are no longer fit for consumption shall be disposed immediately. Daily inspection of stocks shall be done to detect signs of infestation so that pest control measures can be recommended and effected.

Explanatory Note:

Common storage problems include the occurrence of pathogens like fungi and bacteria, insects and mites, rodents, and birds. Storage fungi include *Aspergillus*, *Fusarium*, *Alternaria*, and *Penicillium* while storage insect pests include weevils, grain borers, moths, and beetles.

A sign of fungal growth is grain discoloration including white, pink, black, blue-green/olive colors. Fungi also produce mycotoxins such as aflatoxin that cause harm to humans and animals. Insect damage includes holes (pinhole to large, irregular) due to voracious chewing, decrease in weight due to endosperm feeding of the insects especially weevils, with related quality deterioration manifested through unpleasant smell, and off-taste (FAO, 2018).



Image 49.
Damaged grain; wet grains
(Source: Gomez, 2021)

Explanatory Note:



Image 50.
Damaged grains; moldy grains (Source: Gomez, 2021)

6.4 Pest control administration

A pest monitoring and inspection program must be in place to prevent harborage and breeding of pests on the grounds and within the warehouse facility. Whenever stocks are disposed of and the warehouse is vacated, residual spraying of the whole or sections of the storage structure with chemical pesticides should be carried out after thorough cleaning. Space treatment (fogging) should be conducted at dawn or dusk when flying insects are most active. For crawling insects, external stock treatment consisting of spray application of pesticides to the four sides and the top surface of the pile should be conducted regularly. For heavily infested stocks, fumigation, conducted or supervised by certified fumigators only, should be done as a remedial measure to control internal infestation. Rodent control through the use of traps or poison baits should be carried out regularly.

Explanatory Note:

The Fertilizer and Pesticide Authority (FPA) certifies Agricultural Pesticide Applicator (CPA), including exterminator, fumigator, drone controller, or drone spray crew supervisor. A fumigator is a CPA that uses restricted gaseous pesticides or fumigants/coded compounds in the control/ treatment of agricultural pests. A fumigator may be an employee of an FPA-licensed PCO or company/institution doing in-house work (FPA, 2020).

Only pesticides for stored products approved by the competent authority shall be used. Monitoring of the efficacy of the treatment used should be done at least one week after the application.

Explanatory Note:

For the safety of consumers, only pesticides approved by the Fertilizer and Pesticide Authority (FPA) or Food and Drug Administration (FDA) shall be used, whichever is applicable.

An initial application of the approved pesticide is required to determine if the pesticide is indeed effective in controlling the pests and to determine possible problems (FAO, 2018).

Fumigators should be equipped with protective gear such as gas masks. Proper disposal of pesticides/fumigants should be practiced.

Explanatory Note:

For safety and health reasons, fumigators should use protective gears such as gas mask to protect them from the possible harmful effects of the fumigants.



Image 51.
Pest control personnel monitoring the gas concentration reading of fumigated stocks (Photo taken at NFA ACA warehouse)

Explanatory Note:





Image 52.
Pest control applicator wearing full protective gear (Photo taken at NFA East District warehouse)

To prevent contamination and pollution of the surroundings, including air and bodies of water, proper disposal of pesticides should be observed (FAO, 2018).

The disposal of empty pesticide containers shall be the shared responsibility of the pesticide companies, their network of dealers/distributors, the users, local government units, and accredited waste generators/transporter and treatment/ storage/ disposal entities. As general guidelines to manage the empty pesticide container, measures indicated in the FPA Pesticide Regulatory Policies and Implementing Guidelines should be followed (FPA, 2020).

The FPA Guidelines may be updated from time to time to introduce new provisions on the disposal of pesticide containers and FPA acceptance of third-party authorizations (TPA).

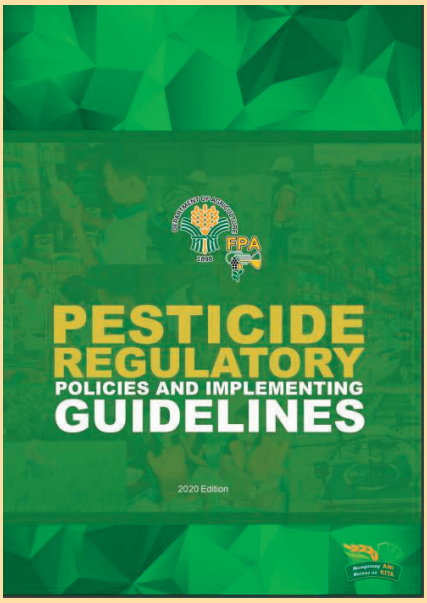


Image 53.
FPA Pesticide Regulatory Policies and Implementing Guidelines (Source: FPA, 2020)

6.5 Transport

The harvested grains or stored grains should be transported using clean vehicles or other appropriate modes of transportation. Transport vehicles should be cleaned before and after usage to avoid contamination and residual infestation.

Explanatory Note:



Image 54.
Vehicle for transporting bagged grains (Source: Gomez, 2021)







Image 55.
Vehicle for transporting bagged grains (Photo taken at NFA East District warehouse)

Section 6

Worker's Health, Welfare and Training

The provisions of the standard are written in black font color. The explanatory notes are indicated in red font color inside a yellow box. Photos and images are also found in succeeding pages.



Photo source: NFA

7.1 Personal hygiene

There shall be a strict observance of the "no smoking", "no spitting" and "no eating" policy inside the warehouse since these practices will induce contamination. Any person who has or appears to have an infectious disease, open lesion, including boils, sores, or infected wounds, or any other abnormal source of microbial contamination must be excluded from any operations.

Hygienic practices through established/documented procedures including specific instructions should be made for all personnel.

Explanatory Note:

For the guidance of the workers, Standard Operating Procedures or Work Instructions for occupational health and safety hazards should be available.



Image 56.
Example of "No Littering" and "No Spitting" signage inside the warehouse (Source: Gomez, 2021)



Image 57.
Safety Protocol implemented in NFA Warehouse (Source: Gomez, 2021)

Grain handlers should follow personal hygiene recommendations as indicated in the FDA/BFAD Revised Guidelines on Current Good Manufacturing Practice in Manufacturing, Packing, Repacking or Holding Food (AO No. 153 s.2004) or the latest issuance and the Codex Recommended International Code of Practice General Principles of Food Hygiene (CAC/RCP 1-1969, Rev. 4-2003) or the latest issuance. The following recommendations should include but are not limited to:

7.1.1 Wearing appropriate clothing and shoes applicable to the operation and can serve as protection for food contamination and aid on the worker's health and welfare.

7.1.2 Wearing of appropriate masks during handling and transport of grain.

7.1.3 Washing of hands thoroughly and sanitizing, if necessary, in the appropriate hand-washing facility before the start of any handling operation, after each absence from the work station, and at any given time when possible contamination can be encountered by the worker.

Explanatory Note:

Grain handlers should wear full clothes. Should PPE will be used, there should be a balance between protection and comfort in the design and materials of the PPE, considering the hot and humid conditions of the Philippine climate.

Appropriate clothing would be a clean t-shirt, long pants, and closed shoes. Wearing shorts and slippers is not recommended.

A bathroom where workers can bathe to remove discomfort from itchy and sweaty feelings is a reasonable consideration as an ancillary facility. Provision of soap, alcohol, disposable wipes, and tissue are also acceptable.



Image 58.
Grain handlers wearing inappropriate clothing during operation

7.2 Personnel Training

Before a job is assigned, the personnel shall be trained on good warehousing practices. Training and re-orientation of the warehouse personnel should be done at least every two (2) years. The following training are recommended for the personnel specific on his/her assigned task:

7.2.1 Inventory and management

7.2.2 Acquisition and purchasing

7.2.3 Supply chain and logistics

7.2.4 Transportation and freight operations

7.2.5 Personnel hygiene and food safety

Explanatory Note:

The training is for updating personnel on current information or new practices specific to the assigned task. Training is also a way to reaffirm and assess whether the tasks are done properly, or protocols are observed.

Section 7

Management and Supervision

The provisions of the standard are written in black font color. The explanatory notes are indicated in red font color inside a yellow box. Photos and images are also found in succeeding pages.



8 Management and Supervision

Grain operators should have adequate knowledge on food hygiene principles and practices to be able to assess potential risks, take appropriate preventive and corrective action, and ensure that effective monitoring and supervision is carried out. Formal training on food safety (Good Manufacturing Practices) is necessary and further trainings in Hazard Analyses and Critical Control Points (HACCP) are extremely helpful. Trainings on food safety for grains businessmen, grains operators and warehouse personnel should be conducted.

Explanatory Note:

Hazard Analysis and Critical Control Points (HACCP) system is an internationally accepted food safety management system that ensures food safety throughout the food chain from primary production to final consumption. Prerequisites of this system include Good Agricultural Practices (GAP), Good Hygienic Practices (GHP) or Good Manufacturing Practices (GMP), and Standard Operating Procedures (SSOP).

The Codex General Principles of Food Hygiene (CXC 1-1969 Revised in 1997, 2003, 2020) provides the general guidelines for applying the HACCP System to identify and enhance the control of significant hazards (CAC, 2020).

Documentation and Records

The provisions of the standard are written in black font color. The explanatory notes are indicated in red font color inside a yellow box. Photos and images are also found in succeeding pages.



9 Documentation and records

All cleaning and pest management activities should be properly documented in a recommended form.

Appropriate records from all warehousing practices should be kept and retained for a period that exceeds the shelf life of the product. Records should be to facilitate recalls and product safety investigations, if required.

Explanatory Note:

A simple record-keeping system can be effective and easily communicated to personnel. It may be integrated into existing operations and may use existing paperwork, such as delivery invoices and checklists, to record, for example, moisture content. Where appropriate, records can also be maintained electronically.

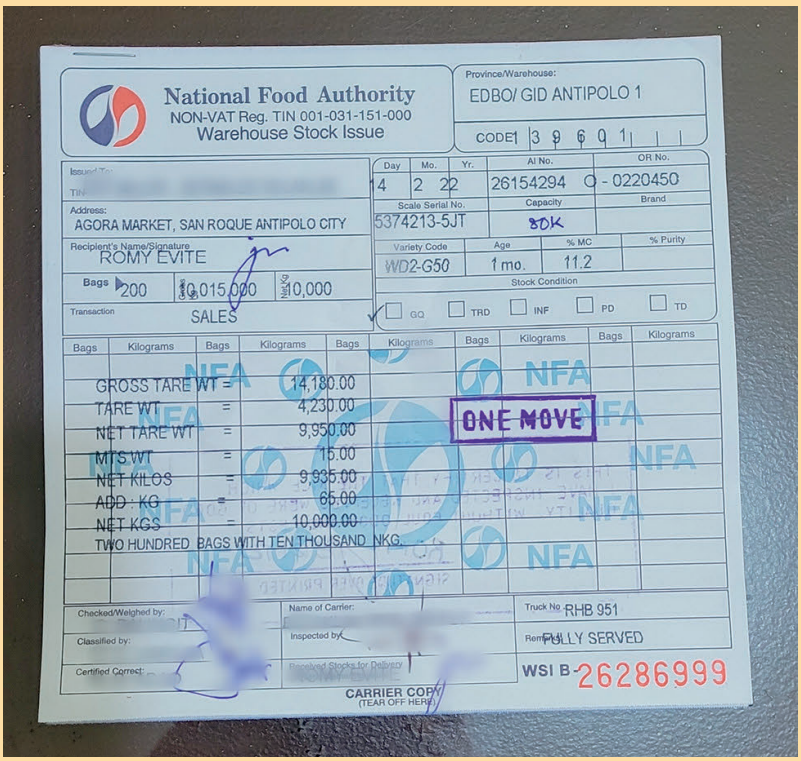


Image 59.
Example of a recording system used (Photo taken at NFA East District warehouse)

Traceability

The provisions of the standard are written in black font color. The explanatory notes are indicated in red font color inside a yellow box. Photos and images are also found in succeeding pages.



10 Traceability

10.1 Proper packaging and labeling for grains shall conform with the provisions stated under the relevant Philippine National Standards and current edition of the National Food Authority's Primer on Philippine Grains Standardization Program.

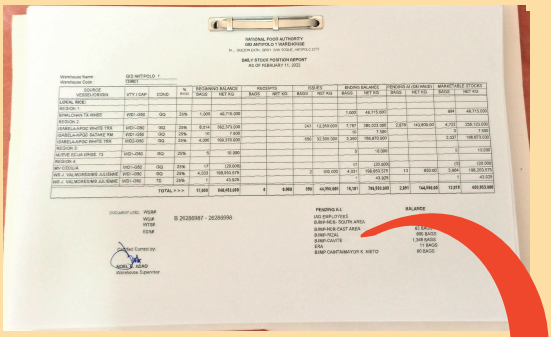
10.2 The labeling information shall contain the following:

10.2.1 classification;
10.2.2 grade;
10.2.3 variety(optional except for special rice);
10.2.4 net weight;
10.2.5 name and address of the miller and in case of custom milling, name and address of owner; and
10.2.6 date of milling (for rice).

10.3 Proper labeling and record-keeping should be made to facilitate any forward or backward tracing of food products. Records of deliveries should be kept (delivery receipt, personnel coming in and out of the warehouse, date of delivery, and classification of goods delivered).

10.4 Geotagging of warehouses and farm sites where the grain product came from should be considered.

Explanatory Note:





[NAME OF WAREHOU
Address

DAILY STOCK POSITION R
AS OF [DATE]

Warehouse Name: _____
Warehouse Code: _____

SOURCE VESSEL / ORIGIN	VTY / CAP	COND	% BKNS	BEGINNING BALANCE		RECEIPTS		ISSUES		ENDING BALANCE		PENDING AI (ON HAND)		MARKETABLE STOCKS	
				BAGS	NET KG	BAGS	NET KG	BAGS	NET KG	BAGS	NET KG	BAGS	NET KG	BAGS	NET KG
LOCAL RICE:															
TOTAL >>>															

Certified Correct by:

[Name and Signature]
Warehouse Supervisor

Image 60.
Sample photo of a proper record-keeping (Photo taken at NFA East District warehouse)

Recall Procedures

The provisions of the standard are written in black font color. The explanatory notes are indicated in red font color inside a yellow box. Photos and images are also found in succeeding pages.



11 Recall Procedures

Warehouse operators should ensure that effective procedures are in place to deal with any food safety hazard and to enable the complete, rapid recall of any implicated lot of the bagged grains (finished food) from the market in case of complaints or issues regarding product quality and safety. Where a product is withdrawn because of an immediate health hazard, other products which are produced under similar conditions, and which may present a similar hazard to public health, should be evaluated for safety. The need for public warnings should be considered.

Recalled products (grains) should be held under supervision until they are destroyed, used for purposes other than human consumption, determined to be safe for human consumption, or reprocessed in a manner to ensure their safety.

Explanatory Note:

The ISO 22000:2018 Food Safety Management may be used as a guide in drafting recall procedures. Under Clause 8.9.5 *Withdrawal/recall:*

"*The organization shall be able to ensure the timely withdrawal/recall of lots of end products that have been identified as potentially unsafe, by appointing a competent person(s) having the authority to initiate and carry out the withdrawal/recall.*"

The organization shall establish and maintain documented information for:

- notifying relevant interested parties (e.g., statutory and regulatory authorities, customers and/or consumers);
- handling is withdrawn/recalled products as well as products still in stock;
- performing the sequence of actions to be taken.

Withdrawn or recalled products and end products still in stock shall be secured or held under the organization's control until they are managed following 8.9.4.3.

The cause, extent, and result of a withdrawal/recall shall be retained as documented information and reported to the top management as input for the management review (see 9.3).

The organization shall verify the implementation and effectiveness of withdrawals/recalls through appropriate techniques (e.g., mock withdrawal/recall or practice withdrawal/recall) and retain documented information.

Section 11

References



Document References

Bureau of Agriculture and Fisheries Standards. (2017). PNS/BAFS 193:2017 Good Warehousing Practices (GWP) for Bagged Grains.

FAO. (1994). Agricultural Engineering in Development - Postharvest Operations and Management of Foodgrains. Rome, Italy.

FAO. (2018). Seeds toolkit - Module 6: Seed storage. Rome, Italy.

ISTA. (2021). International Rules for Seed Testing: Seed Sampling. Bassersdorf, Switzerland.

Joint FAO/WHO Codex Alimentarius Commission. (2020). Codex Alimentarius: general principles of food hygiene. Rome: World Health Organization: Food and Agriculture Organization of the United Nations

National Food Authority. (1988). Standard Operating Procedure (SOP) No. GM-PG03, Section 3. Quezon CIty

National Food Authority. (2019). Standard Operating Procedure (SOP) No. TS-SQ06 Palay and Corn Classification Coding System during Process. Quezon CIty

National Food Authority. (2020). Standard Operating Procedure (SOP) No. TS-SQ06. Quezon City

Sayaboc, P.D., F.M. Caliboso, E.A. Benigno and J.M. Hilario. (1989). Rodent Pests and Their Control in Commercial Storages. Technical Bulletin No. 6. National Postharvest Institute for Research and Extension. Central Luzon State University Compound, Science City of Munoz, Nueva Ecija

Photo References

Cover Photo
Untitled image of stacked grains in a warehouse [Picture]. (2021). Retrieved from Rolando Gomez

Page 1 (Objectives, Scope, and References
Atilayunal (2018). Bagged grain [Picture]. Retrieved from https://www.canva.com/media/MAC8trjf3XI

PAGE 3 (Site Location and Construction)
Section Page Photo
Untitled image of warehouse [Picture]. (2021). Retrieved from Rolando Gomez
Untitled image of warehouse pathway [Picture]. (2021). Retrieved from Rolando Gomez

PAGE 4 (Site Location and Construction)
Google Map. (n.d.). NFA Warehouse Region VI in Jaro, Iloilo [Picture]. Retrieved from https://www.google.com.ph/maps/place/NATIONAL+FOOD+AUTHORITY/@10.740631,122.5604359,818m/data=!3m1!1e3!4m5!3m4!1s0x33aee4e993956a91:0x87b14c6891d4ea6c!8m2!3d10.74029!4d122.5625795?hl=en-GB&authuser=0

PAGE 5 (Site Location and Construction)
Mayuga. J.L., (2018), Plastic pollution, land reclamation threatening PHL bodies of water. Retrieved from https://businessmirror.com.ph/2018/06/10/plastic-pollution-land-reclamation-threatening-phl-bodies-of-water/
DOST-PAG-ASA (n.d.). Metro Manila Flood Monitoring. Retrieved from https://www.pagasa.dost.gov.ph/flood

Photo References

PAGE 6 (Site Location and Construction)
Untitled image of warehouse entrance [Picture]. (2021). Retrieved from Rolando Gomez
Untitled image of warehouse entrance with grains sun-dry [Picture]. (2021). Retrieved from Rolando Gomez
Google Map. (n.d.) NFA Warehouse in General Trias, Cavite. Retrieved from https://www.google.com.ph/maps/place/National+Food+Authority,+General+Trias,+Cavite/@14.3515718,120.8783873,807m/data=!3m2!1e3!4b1!4m5!3m4!1s0x33962b396535759b:0x8b85c98e72a1f667!8m2!3d14.3515718!4d120.880576?hl=en-GB&authuser=0

PAGE 7 (Site Location and Construction)
BAFS. 2022. *Warehouse in close proximity to other facility structures.* [photograph] (BAFS' photo collection)

PAGE 8 (Site Location and Construction) L to R
Gomez, R. (2021). *Warehouse accessible or close to the main road A.* [photograph]. Retrieved from Rolando Gomez
Gomez, R. (2021). *Warehouse accessible or close to the main road B.* [photograph]. Retrieved from Rolando Gomez
Gomez, R. (2021). *Warehouse with parking space for vehicle maneuvering.* [photograph]. Retrieved from Rolando Gomez
Gomez, R. (2021). *Enough space inside the warehouse.* [photograph]. Retrieved from Rolando Gomez

PAGE 9 (Warehouse Design and Specification)
Section Photo
Untitled image of warehouse outside vent [Picture]. (2021). Retrieved from Rolando Gomez
Untitled image of warehouse roof [Picture]. (2021). Retrieved from BAFS photo collection

PAGE 10 (Warehouse Design and Specification) L to R
Untitled image of warehouse vent [Picture]. (2021). Retrieved from Rolando Gomez
Karnnapus. (n.d.). *Roof ventilators of the industrial factory* [Picture]. (2021). Retrieved from https://www.shutterstock.com/image-photo/roof-ventilators-industrial-factory-samutsakorn-estate-425582236

PAGE 12 (Warehouse Design and Specification) L to R
Untitled image of the warehouse outside drainage [Picture]. (2021). Retrieved from Rolando Gomez
Untitled image of the warehouse floor [Picture]. (2019). Retrieved from NFA Region XI
Untitled image of the warehouse floor [Picture]. (2019). Retrieved from NFA Region XI

PAGE 13 (Warehouse Design and Specification) L to R
Untitled image of a warehouse walls A [Picture]. (2021). Retrieved from Rolando Gomez
Untitled image of a warehouse walls B [Picture]. (2021). Retrieved from Rolando Gomez
Untitled image of a warehouse walls C [Picture]. (2021). Retrieved from NFA Region XI

Photo References

PAGE 14 (Warehouse Design and Specification) L to R
Untitled image of a warehouse doorway/opening with mesh screen A [Picture]. (2021). Retrieved from Rolando Gomez
Untitled image of a warehouse doorway/opening with mesh screen B [Picture]. (2022). Retrieved from BAFS Photo Collection
Untitled image of a warehouse window with mesh screen A [Picture]. (2022). Retrieved from BAFS Photo Collection

PAGE 15 (Warehouse Design and Specification) L to R
Warehouse Light Fixture with grills[Picture]. (n.d.) Retrieved from https://www.pinterest.ph/pin/373728469063664588/
Untitled image of improper lighting fixture [Picture]. (2021). Retrieved from BAFS Photo Collection
Warehouse roof (inside). (2022). Retrieved from BAFS Photo Collection

PAGE 16 (Warehouse Design and Specification) L to R
Untitled image of a warehouse roof taken at NFA ACA warehouse (1) [Picture]. (2021). Retrieved from BAFS Photo Collection
Untitled image of a warehouse roof taken at NFA ACA warehouse (2) [Picture]. (2021). Retrieved from BAFS Photo Collection
Untitled image of a warehouse roof taken at NFA ACA warehouse (3) [Picture]. (2021). Retrieved from BAFS Photo Collection

PAGE 17 (Piling System) L to R
Section Photo
Untitled image of a stack bagged of grains in a warehouse[Picture]. (2021). Retrieved from BAFS Photo Collection

PAGE 18 (Piling System) Top to Bottom
AMTEC. 2015. Block or Chinese Method [Illustration]. Retrieved from
AMTEC. 2015. Japanese Method [Illustration]. Retrieved from

PAGE 19 (Piling System) Top to Bottom
Bagged grains in special packaging in retail markets (1). (2022). Retrieved from BAFS Photo Collection
Bagged grains in special packaging in retail markets (2). (2022). Retrieved from BAFS Photo Collection
Bagged grains in special packaging in retail markets (3). (2022). Retrieved from BAFS Photo Collection

PAGE 20 (Piling System) Top to Bottom
IRRI Rice Knowledge Bank. (n.d.). Storage - stacked bag grains in a tight, neat, and squared-off manner [Picture]. Retrieved from
Untitled image of a warehouse stack bagged of grains [Picture]. (2021). Retrieved from Rolando Gomez
Untitled image of a warehouse stack bagged of grains (d) [Picture]. (2021). Retrieved from Rolando Gomez

Photo References

PAGE 21 (Piling System) Top to Bottom; L to R
Illustration of piling and storage of bagged grains. (2022). Retrieved from BAFS Photo Collection
Sample Bin Card (1). (2022). Retrieved from BAFS Photo Collection
Sample Bin Card (2). (2022). Retrieved from BAFS Photo Collection

PAGE 22 (Good Warehouse-keeping)
Section Photo
Untitled image of a warehouse with stacked of bagged grains [Picture]. (2021). Retrieved from BAFS Photo Collection

PAGE 23 (Good Warehouse-keeping) T to B
Untitled image of damaged warehouse roof [Picture]. (2021). Retrieved from Rolando Gomez
Untitled image of damaged warehouse floor 1 [Picture]. (2021). Retrieved from BAFS Photo Collection
Untitled image of damaged warehouse floor 2 [Picture]. (2021). Retrieved from BAFS Photo Collection

PAGE 24 (Good Warehouse-keeping) L to R
Untitled image of dusty warehouse [Picture]. (2022). Retrieved from BAFS Photo Collection
Untitled image of grain residue in a warehouse [Picture]. (2022). Retrieved from BAFS Photo Collection

PAGE 25 (Good Warehouse-keeping) L to R
Fundamental Standards on Stock Quality Maintenance and Good Warehousing Practices. (n.d.). Retrieved from NFA East District Warehouse
Untitled image of damaged sack used to bagged grains 1 [Picture]. (2021). Retrieved from BAFS Photo Collection
Untitled image of damaged sack used to bagged grains 2 [Picture]. (2021). Retrieved from BAFS Photo Collection
Untitled image of unserviceable empty sacks 1. (2021). Retrieved from Rolando Gomez
Untitled image of unserviceable empty sacks 2. (2021). Retrieved from Rolando Gomez

PAGE 26 (Good Warehouse-keeping) L to R
Tomasz Klejdysz - Getty Images. (2021) Wheat weevil Sitophilus granarius beetle on damaged grain [Picture]. Retrieved from https://www.canva.com/media/MAEWEvHydsA
Untitled image of a pesticide storage door [Photograph] (2022). Retrieved from BAFS Photo Collection
Untitled image of pesticide proper signage 1 [Photograph]. (2022). Retrieved from BAFS Photo Collection
Untitled image of pesticide proper signage 2 [Photograph]. (2022). Retrieved from BAFS Photo Collection
Untitled image of pesticide proper signage 3 [Photograph]. (2022). Retrieved from BAFS Photo Collection

PAGE 27 (Good Warehouse-keeping)
Untitled image of personnel taking samples for stock maintenance. (2020). Retrieved from NFA XI

Photo Reference

PAGE 28 (Good Warehouse-keeping)
Grain moisture meter. (2022). Retrieved from BAFS Photo Collection
Grain probe. (2022). Retrieved from BAFS Photo Collection
Hook or "guancho". (2022). Retrieved from BAFS Photo Collection
Spilled grains that should be collected immediately [Photograph]. (2022). Retrieved from BAFS Photo Collection

PAGE 29 (Good Warehouse-keeping)
Grains are stored in containers with proper identification for reference [Photograph]. (2022). Retrieved from BAFS Photo Collection

PAGE 30 (Good Warehouse-keeping)
South West Seeds. (n.d.) Digital Grain Temperature Probe 2M [Picture]. Retrieved from https://www.swseeds.co.uk/grainstore-equipment/digital-grain-temperature-probe-2m/
Gyuszko - Getty Images. (n.d.). Hand-held thermo-hygrometer [Picture]. Retrieved from https://www.canva.com/media/MAC_9oJo5qc
Damaged grain: wet grains [Photograph]. (2021). Retrieved from Rolando Gomez

PAGE 31 (Good Warehouse-keeping)
Damaged grain: moldy grains [Photograph]. (2021). Retrieved from Rolando Gomez

PAGE 32 (Good Warehouse-keeping)
Untitled image of a Pest Control personnel monitoring gas concentration [Picture]. (2022). Retrieved from BAFS Photo Collection

PAGE 33 (Good Warehouse-keeping)
Pest Control personnel wearing full protective gear 1 [Picture]. (2022). Retrieved from BAFS Photo Collection
Pest Control personnel wearing full protective gear 2 [Picture]. (2022). Retrieved from BAFS Photo Collection
FPA. (2020). FPA Pesticide Regulatory Policies and Implementing Guidelines [Photograph]

PAGE 34 (Good Warehouse-keeping)
Vehicle for transporting bagged grains [Photograph]. (2021). Retrieved from Rolando Gomez
Vehicle for transporting bagged grains photo taken at NFA East District warehouse [Photograph]. (2022). Retrieved from BAFS Photo Collection

PAGE 35 (Worker's Health, Welfare, and Training)
Section Photo
Untitled image of training in a warehouse [Photograph]. (n.d.). Retrieved from NFA Region XI

PAGE 36 (Worker's Health, Welfare, and Training)
No Littering and No Spitting signage inside the warehouse [Photograph]. (2021). Retrieved from Rolando Gomez
Safety Protocol implemented in NFA Warehouse [Photograph]. (2021). Retrieved from Rolando Gomez

PAGE 37 (Worker's Health, Welfare, and Training)
Improper clothing of grain handlers during operation [Photograph]. (2022). Retrieved from BAFS Photo Collection

Photo Reference

PAGE 39 (Management and Supervision)
Section Photo
Untitled image of supervising the handling of grains [Photograph]. (2022). Retrieved from BAFS Photo Collection

PAGE 41 (Documentation and Records)
Section Photo
Untitled image of personnel checking the bin card of a bagged grains' pile [Photograph]. (2022). Retrieved from BAFS Photo Collection

PAGE 42 (Documentation and Records
Example of recording system used [Photograph]. (2022). Retrieved from Rolando Gomez

PAGE 43 (Traceability)
Section Photo
Untitled image of stacked bagged grains with bin card [Photograph]. (2022). Retrieved from BAFS Photo Collection

PAGE 44 (Traceability)
Sample photo of proper record-keeping taken at NFA East District warehouse [Photograph]. (2022). Retrieved from BAFS Photo Collection

PAGE 45 (Recall Procedures)
Section Photo
Untitled image of stacked bag grains [Photograph]. (2022). Retrieved from BAFS Photo Collection)

PAGE 47 (References)
Section Photo
Stacked bagged grains {Photograph]. (2022). Retrieved from BAFS Photo Collection

PAGE 54 (Technical Working GRoup
Section Photo
Bagged grains {Photograph]. (n.d.). Retrieved from Canva

Section 12

Technical Working Group



Department of Agriculture
Technical Working Group (TWG) on the Development of the
Explanatory Manual for Good Warehousing Practices (GWP) for Bagged Grains

Members:



Mr. Rolando B. Gomez
Former TWG member of
PNS/BAFS 193:2017



Engr. Arlene F. Tanseco
Former TWG member of
PNS/BAFS 193:2017

National Food Authority (NFA)



Mr. Christopher G. Alingod
Senior Grains Operations Officer
National Food Authority



Ms. Jocelyn R. Adarna
Senior Grains Operations Officer
National Food Authority

National Corn Program (NCP)



Dr. Candido Damo
Technical Consultant
National Corn Program

Bureau of Agricultural and Fisheries Engineering (BAFE)



Engr. Janice P. Vargas
Engineer V
Bureau of Agricultural and Fisheries Engineering



Engr. Emmanuel R. Lanuza
Engineer III
Bureau of Agricultural and Fisheries Engineering

University of the Philippines - Los Baños Institute of Crop Science (UPLB-ICS)



Dr. Annalissa Aquino
Assitant Professor
University of the Philippines - Los Baños Institute of Crop Science



Ms. Maria Fatima Mercado
Assistant Professor
University of the Philippines - Los Baños Institute of Crop Science

Philippine Center for Postharvest Development and Mechanization (PhilMech)



Engr. Elijah Z. Davalos
Senior Science Research Specialist
Philippine Center for Postharvest Development and Mechanization

Bureau of Agriculture and Fisheries Standards

Adviser:



Dr. Vivencio R. Mamaril
Director IV



Ms. Mary Grace R. Mandigma
Assistant Director

Technical Secretatiat:



Ms. Katrina L. Maminta
Science Research Specialist II



Ms. Brooklyn S. Flores
Science Research Specialist I

Department of Agriculture
Technical Working Group (TWG) on the Development of the Philippine National Standard Good Warehousing Practices (GWP) for Bagged Grains

Chairperson

Engr. Arlene F. Tanseco
National Food Authority (NFA)

Vice-Chairperson

Ms. Miriam Acda
Philippine Center for Postharvest Development and Mechanization (PHilMech)

Members

Mr. Rolando B. Gomez
National Food Authority

Ms. Cristy Cecilia P. Polido
Ms. Noemie Carpio
Central Agricultural and Fishery Engineering Division (CAFED)

Dir. Antonio Gerundio
Corn Program - Department of Agriculture

Mr. Jaime Magbanua
Grain Retailers Confederation of the Philippines (GRECON)

Dr. Rufino Calpatura
Isabela State University (ISU)

Dr. Annalissa Aquino
University of the Philippines - Los Baños

Technical Secretariat:

Ms. Lara Navarro / Ms. Mary Grace Mandigma
Ms. Farlash Pancho
Ms. Katrina Maminta / Ms. Jila Carla Reyes
Bureau of Agriculture and Fisheries Standards (BAFS)

This Explanatory Manual (EM) serves as supplementary material for the Philippine National Standard (PNS) Good Warehousing Practices (GWP) for Bagged Grains (PNS/BAFS 193:2017). The EM aims to aid stakeholders by presenting uniform understanding and interpretation of the PNS to ensure efficient adoption and implementation of the Standard.


fb.com/da.bafs


instagram.com/da.bafs


www. bafs.da.gov.ph


bafs@da.gov.ph


(+632) 8273-2474 loc. 3303