

## **Foreword**

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled “Enhancing the Implementation of the AFMA Through Improved Agricultural Engineering Standards” which was funded by the Bureau of Agricultural Research (BAR) of the Department of Agriculture (DA).

This standard has been technically prepared in accordance with PNS 01-4:1998 (ISO/IEC Directives Part 3:1997 – Rules for the Structure and Drafting of International Standards. It specifies the general requirements for the construction of farm workshop and machinery shed.

The word “shall” is used to indicate requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted.

The word “should” is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required.

In the preparation of this standard, the following references were considered:

Farm Structures in Tropical Climates, FAO, Rome, 1988

Grisso, R. D and G. R. Bodman. Estimating Floor Space for Farm Equipment Storage. NebFacts, Nebraska Cooperative Extension, 1995.

Hofman, V and K Hellevang. Planning Farm Shops, NDSU Extension Service, North Dakota State University, March 1994.

Pole Machine Shed Plan, Midwest Plan Service, Cooperative Extension Work in Agriculture and Home Economics and Agricultural Experiment Stations of North Central Region, 1978.

Richey, C. B, P. Jacobson and C Hall. Agricultural Engineers’ Handbook. McGraw-Hill Book Company, 1961.

Stone, R.P. and H.W. Fraser. Farm Workshops. FactSheet, Ontario, Canada. November 1991.

Workshop Layout for Safe and Efficient Production. Economic and Social Commission for Asia and the Pacific Regional Network for Agricultural Machinery.

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**Agricultural Structures – Farm workshop and Machinery Shed**

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**1 Scope**

This standard specifies the general requirements of farm shop and machinery shed. It includes location, space, structural and functional requirements. Machinery shed and farm workshops may be placed close together or housed in one building.

**2 Reference**

The following normative document contains provisions which through reference in this text constitute provisions of this National Standard:

**National Structural Code of Building****Philippine Electrical Code 2000****National Plumbing Code of the Philippines**

**PAES 101:2000**      Agricultural Machinery – Technical Means for Ensuring Safety

**3 Definitions**

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

**3.1****workshop**

building for fabrication, repair and maintenance of tools, implements, equipments and parts of structures and provides a place where tools, supplies and spare parts are stored

**3.2****machinery shed**

area to protect machinery from weather, theft, vandalism and to allow easy maintenance and adjustment of machines

**3.3****hazardous material**

substances on farms that are highly flammable or poisonous

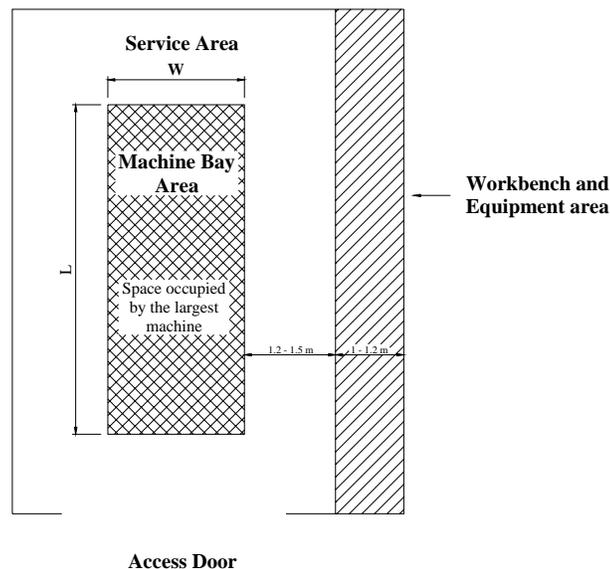
**EXAMPLE** engine fuels and oils such as gasoline, diesel, kerosene and lubricating oils; gases such as butane, propane and acetylene; paints containing flammable solvents, cellulose thinner or alcohol; herbicides, insecticides, rat poison; acids and alkalies such as detergents, cleaning liquids, lye and quicklime (CaO); and wood preservatives and corrosion inhibiting paints.

## 4 Location

- 4.1** The building shall be constructed in a well-drained area.
- 4.2** The building shall be situated at least 45 m from other buildings to reduce fire hazard, to allow for future expansion, and maneuvering and parking of machinery.
- 4.3** The site shall be accessible to service drives, electrical and water lines.

## 5 Space Requirements

- 5.1** The minimum area for farm workshop shall be calculated as the sum of the area occupied by the largest machinery plus service space, and workbench and equipment area as shown in Figure 1.



**Figure 1 - Recommended minimum dimensions for a farm workshop.**

- 5.2** The minimum storage area for machinery shed shall be calculated by multiplying the width plus 0.6 m by length plus 0.6 m for each machine (refer to Annex B). The area calculated for each machine shall be added to get the total required area.

## 6 Structural Requirements

### 6.1 Floor

- 6.1.1** The floor shall be at least leveled and gravel packed for ease of movement of machines and attachment and detachment of tractor-mounted equipment.

**6.1.2** For the approach aprons, the slope shall be 3 % - 5 % away from the building.

## **6.2 Walls**

The building shall be enclosed with solid walls or wire netting,

## **6.3 Roof**

**6.3.1** When the roof span is 3 m or less, a beam shall be used. For larger spans or very heavy loads a truss shall be required.

**6.3.2** The minimum clear height from floor to truss shall be at least 3 m. For machines higher than 3 m, the height shall be the sum of the machine height plus 0.3 m.

**6.3.3** Roofing materials shall be made of G.I. sheets.

**6.3.4** Skylights (i.e. plastic roofing sheets) at strategic locations for natural lighting are recommended.

## **6.4 Door/Gate**

**6.4.1** Minimum dimension of a doorway shall be 3 m high and 3.7 m wide. For bigger equipment, a clearance of 0.6 m on both sides shall be added.

**6.4.2** The door height shall be provided with a clearance of at least 0.3 m above the tallest machinery.

**6.4.3** Overhead or rolling doors are recommended to be used than the hinged doors.

**6.4.4** There shall be provision for a smaller service door so that the large door does not have to be opened for routine activities.

**6.5** All other matters concerning structural design of the building not provided in this Standard shall conform with the provisions of the National Structural Code of Building.

## **7 Functional Requirements**

### **7.1 Workshop**

**7.1.1** Gravel packed apron to work on equipment outside the shop shall be provided. This provides a firm surface to park machinery on and reduces the amount of dirt carried into the shop by implement tires.

**7.1.2** Facilities for lifting and supporting heavy loads such as A-beam and portable hoist shall be provided.

**7.1.3** Workbenches shall be at least 1m high. The bench width shall be 0.8 m and at least 3 m long. Benches shall be equipped with a large vice and anchored securely.

**7.1.4** For a welding area, a welding hood with a fan that will move air about 28 m<sup>3</sup>/min - 57 m<sup>3</sup>/min shall be provided.

**7.1.5** If vehicles are to be operated in the shop for a period of time, an exhaust hose through the wall or a small suction fan pulling exhaust through a tube from the exhaust pipe shall be provided. The fan shall be capable of moving air about 7 m<sup>3</sup>/min per vehicle through the pipe.

## **7.2 Fuel and chemical storage**

**7.2.1** A concrete storage room shall be provided for the hazardous materials inside the workshop.

**7.2.2** The floor shall be concreted to form a reservoir to contain any accidental spills. Drain in the floor shall not be provided to prevent any spillage or wash down water containing the materials from entering any watercourse.

**7.2.3** Ventilation openings such as louvers or decorative blocks shall be constructed at both low and high levels.

**7.2.4** The storage room, including the ventilation openings, shall be vermin proof to prevent rodents from breaking open packages.

**7.2.5** Appropriate security device shall be provided to keep unauthorized persons, in particular children, from accidentally coming into contact with the hazardous materials.

## **7.3 Electricity and Lighting**

**7.3.1** Refer to Philippine Electrical Code for the design and installation of electrical service.

**7.3.2** A 120-volt or 240-volt outlet shall preferably be installed every 1.2 m along workbenches and every 3 m along walls. If power tools are located away from walls, outlets shall be provided on the floor or suspend from the ceiling.

**7.3.3** At least one welder outlet near the large door so welding can be done outside shall be installed.

**7.3.4** Recommended lighting levels are shown in Table 3.

**Table 3 – Recommended Lighting Levels**

<b>Area</b>	<b>Lighting intensity lux (Lumen/m<sup>2</sup>)</b>
General	200
Bench	500
Outside the shop and Active storage area	100
Machine shed	50

\*Refer to Annex C

**7.3.5** All electrical installation shall meet the standards of the Philippine Electrical Code.

#### **7.4 Drainage and plumbing system**

Drainage and plumbing system shall be in accordance with the National Plumbing Code. It shall collect all liquid wastes incidental to the operation and properly connected to an approved sewage treatment and disposal system.

### **8 Safety**

**8.1** Shield screens shall be provided around the arc-welding area to prevent injury to the eyes of personnel in the vicinity.

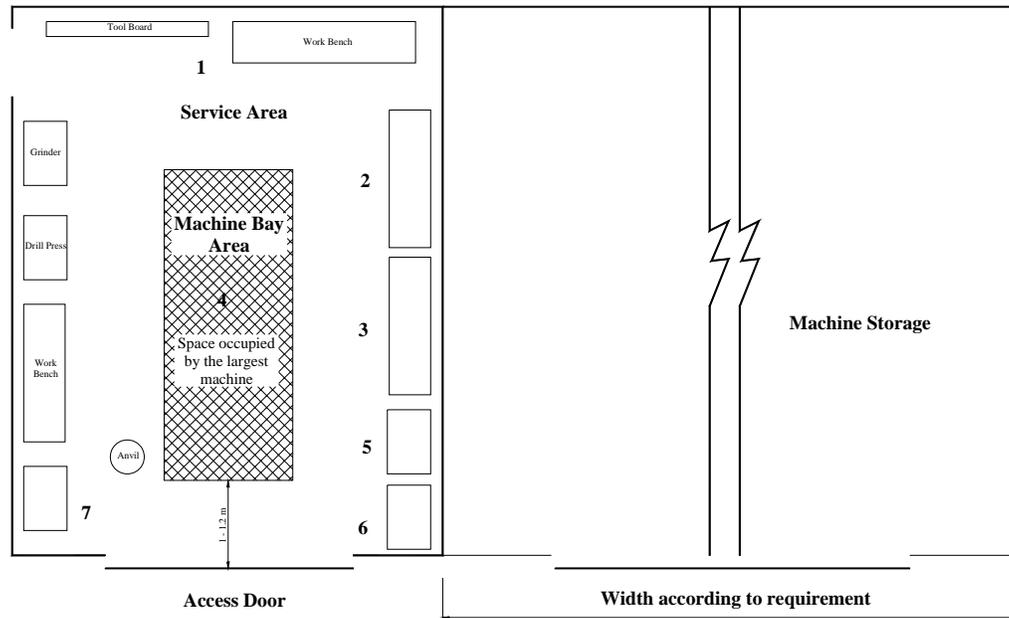
**8.2** Safeguards for rotating and moving parts

Install guard and/or cover to protect against rotating couplings, keyways on shaft, belt and pulley installation, gear drives and flywheels. Refer to **PAES 101:2000**.

**8.3** Washing facilities, emergency shower and fire extinguishers shall be available nearby for immediate use.

**Annex A**  
(informative)

**Sample Layout of a Farm Workshop and Machinery Shed**



- 1 Wood working area
- 2 Parts storage
- 3 Lumber and steel storage
- 4 Service area
- 5 Paint storage
- 6 Lubrication equipment
- 7 Metal working and welding area

**Annex B**  
(informative)

**Space requirements for machinery storage**

Item	Requirement, m		
	width	height	length
<b>Automotive:</b>			
Car	2.1	2	5.5
Tractor			
One-plow	1.5	1.5	2.7
Two-plow	2.3	1.5	3.7
Three-plow	2.3	1.5	3.7
Truck			
Pickup	2.3	2.1	6
Stock rack	2.4	3	7.9
Grain bed	2.4	2.1	7.9
Semi-trailer	2.4	2.7	7.9
<b>Binder:</b>			
Grain			
2.4 m, reel off	3	1.5	4.9
3 m tractor, reel on	3.7	2.4	5.8
Corn			
One-row	2.1	2.1	3.7
Two-row	2.7	2.1	4.9
<b>Baler</b>	4	1.5 - 1.8	6.4
Baler sleds	1.8	----	1.8
<b>Combine:</b>			
1.5 – 1.8 m	2.7 - 3.7	2.6	4.9 – 6
3.7 m	4	3 – 3.7	6.7
4.9 m	6	4.3	7.6
<b>Cultivator:</b>			
Corn			
One-row	1.5	1.2	1.8
Two-row, tractor	3	---	2.3
Four-row, tractor	4.6	---	2.4
Two-row, 3-point hitch	3	1.2	1.2
Rotary hoe, two-row	3	0.9	1.8
<b>Cutter:</b>			
Rotary field shredder	2.9	---	2
Stalk cutter	1.8	---	1.2
<b>Digger, potato</b>	1.5	---	2.4
<b>Drill, grain:</b>			
2.4 m, 14-7	3.3	1.5	1.8
3 m, 16-7	4	1.5	1.8
4.3 m, 24-7	5.5	1.5	2.1
<b>Hammer mill</b>	1.2	0.9	2.9
<b>Harrow:</b>			
Spike-tooth	1.2	---	1.8
Spring-tooth	0.9	---	1.8
Disk, animal	2.4	---	1.8
Disk, tractor, 3 m	3.7	0.9	3.3
Disk, tractor, 2.1 m lift	2.4	1.2	1.8
<b>Harvester, tobacco</b>	2.9	3.7 - 4.3	4.9
<b>Loader:</b>			

Item	Requirement, m		
	width	height	length
Hay	2.4	3	3.7 – 4.6
Manure	0.9 – 1.2	1.8 - 2.7	1.2 – 3
Cane loader	2.7	3.7	8.8
<b>Mower:</b>			
Horse, bar up	1.5	1.8	2.4
Tractor, trailer type, 2.1 m, bar up	1.5	2.4	1.2 - 1.8
Tractor, rear mounted, bar down	3.7	0.6	1.8
<b>Picker:</b>			
Corn			
One-row, pull type	2.4	1.8 – 2.1	3.7
Two-row, pull type	4.9	1.8 – 2.1	5.2
Two-row, mounted	3	2.4	5.2
Cotton			
One-row	3	4	5.8
Two-row	3.3	4	6.1
Peanut	1.8	----	5.2
<b>Planters:</b>			
Corn or cotton:			
Two-row (without hitch)	3	----	1.8
Four-row (without hitch)	4.6	----	1.8
Potato	1.8	----	2.4
<b>Plow:</b>			
Walking	0.6	----	2.4
Sulky	1.5	1.2	2.1
Two-bottom, animal	1.5	1.2	2.4
Two-bottom, tractor	1.5 – 1.8	1.2	2.9 – 3.4
Three-bottom, tractor	1.8	1.2	3.4 – 4
Four-bottom, tractor	2.1	1.2	4.3
One-way disc	2.7	----	3 – 4.3
<b>Rack, hay</b>	2.4	2.4	4.9
<b>Rake:</b>			
Dump, 3 and 3.7 m	3.7 – 4.6	1.4	1.8
Side delivery	2.4 – 3.4	1.4	3.7
Sweep, tractor	2.7 – 4	0.9 - 1.2	2.7 – 3
Tedder, 8-fork	2.7	1.5	1.8
<b>Seeder, box type, 3.4 m</b>	4	1.2	1.8
<b>Silo filler</b>	1.5	1.8	3
<b>Sprayer, orchard and potato</b>	2.4	----	1.8
<b>Spreader:</b>			
Manure, animal	1.8	1.4	4.6
Manure, tractor	1.8	1.4	5.5
Lime, 2.4 m	3.2	----	1.2
<b>Stripper, cotton</b>			
One-row	0.6	3	3.7
Two-row	2.4	3	6
<b>Tiller</b>	3.7 – 4.9	----	3.7
<b>Thresher, grain separator</b>	2.4 - 3	3	7 – 8.8
<b>Wagon:</b>			
Box and gear, high wheel	1.8	1.7	4.3
Gear	1.8	0.9	2.7
Box and gear, rubber tire	1.8	1.4	4.3

**Annex C**  
(informative)

**Lighting Requirements**

<b>Lighting Intensity lux</b>	<b>No. of Bulbs Required per m<sup>2</sup></b>							
	<b>Incandescent lamp</b>						<b>Fluorescent lamp</b>	
	<b>25W</b>	<b>40W</b>	<b>60W</b>	<b>100W</b>	<b>150W</b>	<b>200W</b>	<b>20W</b>	<b>40W</b>
500	3.935	1.989	1.052	0.520	0.314	0.226	0.682	0.266
400	3.148	1.591	0.842	0.416	0.251	0.181	0.546	0.213
300	2.361	1.193	0.631	0.312	0.189	0.136	0.409	0.160
200	1.574	0.796	0.421	0.208	0.126	0.090	0.273	0.107
150	1.180	0.597	0.316	0.156	0.094	0.068	0.205	0.080
100	0.787	0.398	0.210	0.104	0.063	0.045	0.136	0.053
50	0.393	0.199	0.105	0.052	0.031	0.023	0.068	0.027
10	0.079	0.040	0.021	0.010	0.006	0.005	0.014	0.005