

## **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 swine housing.

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 formulation of this standard reference were made to:

Building Your Farm, Book 5, Basic Pig Keeping Manual, ITCPH, Lipa City.

DA AO No. 41, Series of 2000 Code of Practice and Minimum Standards for the Welfare of Pigs.

Developing Good Dunging Habits of Swine for Partially Slotted Floors. Farm Structures, May 1982.

Esmay, M. L. and Dixon, John E. Environmental Control for Agricultural Buildings.

HSUS Recommended Humane Standards for Raising Livestock and Poultry.

Jacobson, Larry D. Natural Ventilation for Pig Housing, AEU-5.

MacDonald, Ronald Newton and Sue Penman. Pig Husbandry for Warm Climates. Agriculture and Natural Resources Series, UK.

Squibb Swine Farming Manual.

Structures and Environment Handbook. MWPS, September 1977, 9<sup>th</sup> Edition.

Swine Barn Construction and Services Plan. Canada Plan Service, June 1987.

Swine Care Handbook.

Swine Housing and Equipment Handbook, MWPS.

Swine Housing and Equipment Plan. Canada Plan Service, April 1986.

The Philippines Recommends for Pork Production. PCARRD.

Training Manual for Swine Production. SEARCA.

**Agricultural Structures – Housing for Swine Production**

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**1 Scope**

This standard specifies the minimum requirements for swine housing. It includes space requirement, feeding and watering facilities.

**2 Reference**

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

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

**PAES 414:2002** Agricultural Structures – Waste Management Structures

**3 Definition**

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

**3.1****boar**

refers to a male breeding swine which is at least 8 months old

**3.2****creep area**

place for piglets inside the farrowing pen

**3.3****culling rate**

rate of removing undesirable or unproductive animals within the herd

**3.4****dry sows**

unbred sows which have just been weaned; non-pregnant sows

**3.5****farrowing**

act of giving birth in swine

**3.6**

**farrowing pen**

area in which a sow is confined during farrowing and lactation periods, but in which the sow can turn around

**3.7**

**farrowing stall**

farrowing crate

device in which a sow is confined during farrowing and lactation periods and which prevents sow from turning around

**3.8**

**fattener**

swine raised for meat production usually starts at 15 kg

**3.9**

**finisher**

swine which are 66 kg and up

**3.10**

**gilt**

female swine that has not farrowed

**3.11**

**grower**

swine from 40 to 65 kg

**3.12**

**litter**

piglets born in one farrowing

**3.13**

**litter index**

farrowing index

average number of farrowings of one sow per year

**3.14**

**occupancy**

number of days an animal stays in a pen

**3.15**

**sow**

any breeding female pig that has farrowed

**3.16**

**weaner**

weanling

piglet that has been recently separated from its mother

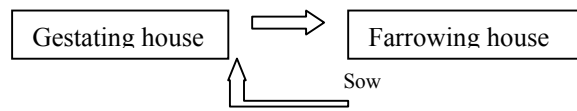
## 4 Location

- 4.1 The location shall conform to the land use plan of the area.
- 4.2 The site shall be accessible to service roads, water supply and electric lines.
- 4.3 The site shall be well drained and allows for free air circulation.
- 4.4 The building shall be constructed in an east-west orientation and the structure for marketable animals shall be located near the service road.
- 4.5 The site shall be located where the prevailing winds will not carry odors to the farmhouse.

## 5 Swine housing system

### 5.1 One-unit system

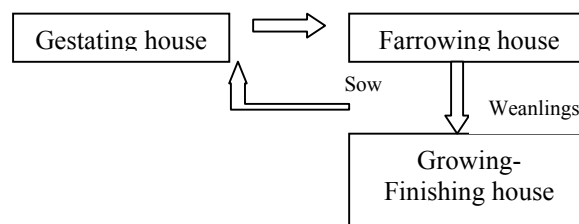
In this system, the sows are removed when the piglets reach weaning age. The pigs remain in the same building from farrowing until they reach the desired weight for slaughtering.



**Figure 1 – One-unit system**

### 5.2 Two-unit system

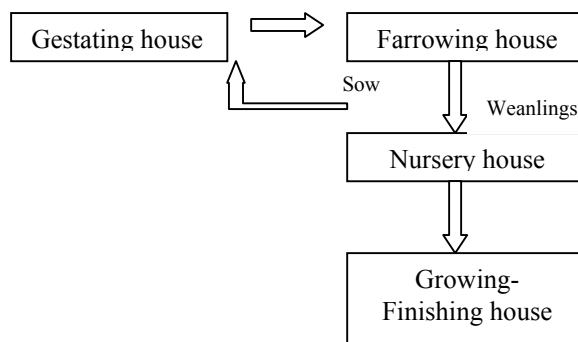
The sows and piglets remain in the farrowing house until the piglets are weaned. The weanlings are transferred to a growing-finishing house.



**Figure 2 – Two-unit system**

### 5.3 Three-unit system

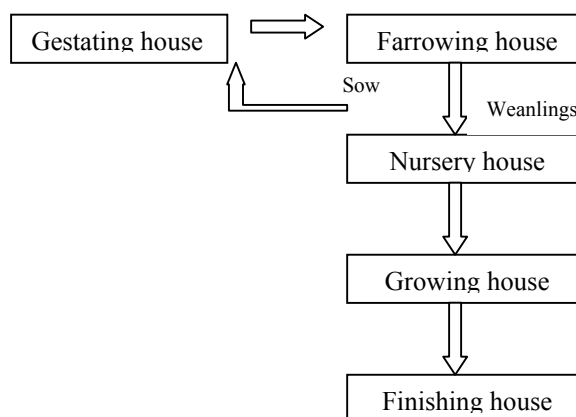
The sows and piglets remain in the farrowing house until weaning. The weanlings are moved to a nursery house and finally to a growing-finishing unit where they stay until they are ready for slaughter.



**Figure 3 – Three-unit system**

#### 5.4 Four-unit system

The sows and piglets remain in the farrowing house until weaning. After weaning, piglets are moved to a nursery house, then to a growing house and finally to a finishing house until they are ready for slaughter.



**Figure 4 – Four-unit system**

### 6 Space requirements

Minimum space requirement for swine is shown in Table 1.

**Table 1 – Minimum recommended space requirement for swine**

Age and size of animal	Space requirements per animal m <sup>2</sup> /animal
Groups of growing swine	
Up to 10 kg	0.11
11 - 20 kg	0.20
21 - 40 kg	0.35
41 - 60 kg	0.50
61 - 80 kg	0.70
81 - 100 kg	0.85
Gilts up to mating	1.00
Adult pigs in groups	2.50

**Table 1** (continued)

<b>Age and size of animal</b>	<b>Space requirements per animal m<sup>2</sup>/animal</b>
Gestating sows	1.20
Boar pens	7.50
Lactating sows and litters	
Individual pens	7.40
Multi-suckling groups	5.60
Dry sows	1.80

## **7 Structural requirements**

### **7.1 Roof**

**7.1.1** Roofing material should be made of corrugated G.I. sheets and other durable roofing materials. At least one-meter roof overhang shall be provided to ensure shade and to protect the swine from rain.

**7.1.2** Roof should be equipped with gutters so that rainwater can be drained away separately.

**7.1.3** The types of roof for swine housing are semi-monitor, semi-shed, monitor, double span and shed as shown in Figure 5.

### **7.2 Ceiling (optional)**

Ceiling height shall be at least 2.4 m high.

### **7.3 Walls**

Building sidewalls shall have a minimum height of 1 m and shall be made of durable materials.

### **7.4 Floors**

#### **7.4.1 Solid floors**

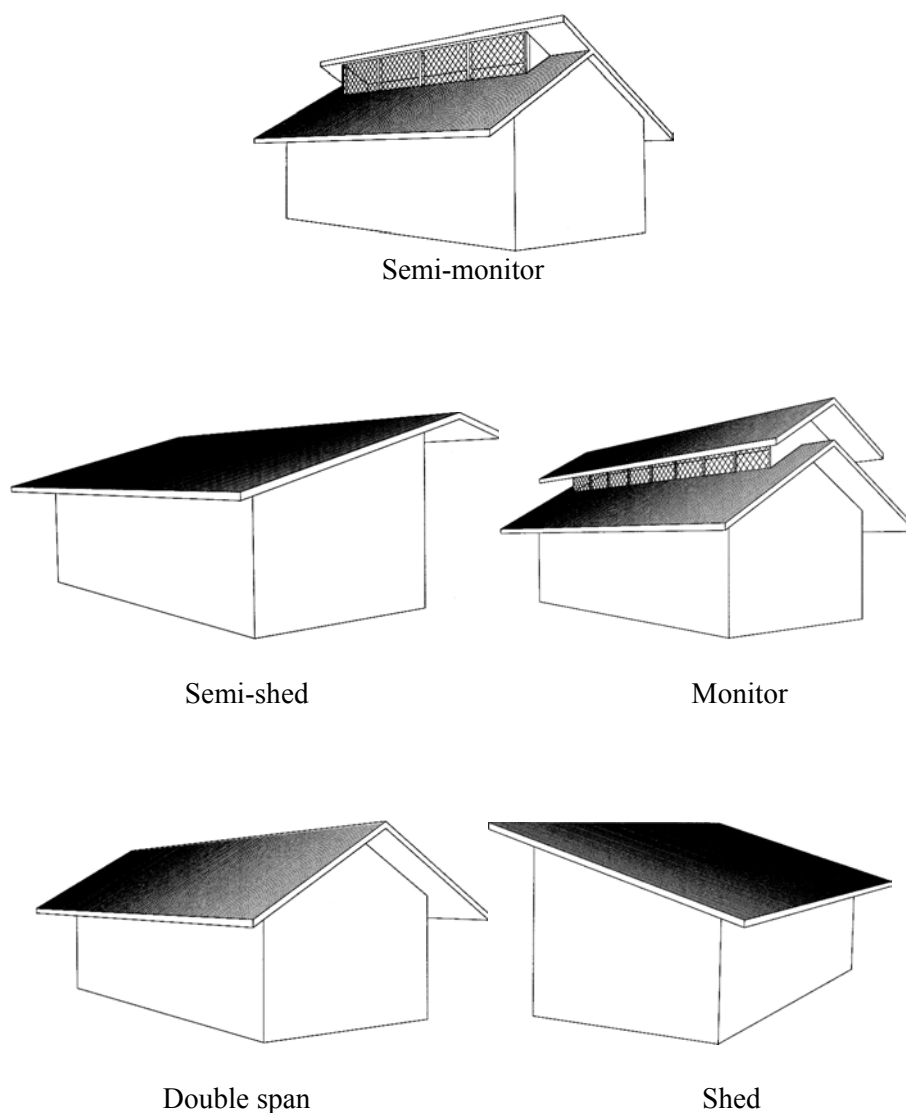
**7.4.1.1** Concrete floors shall be paved on a well compacted gravel fills.

**7.4.1.2** Floor shall be skid-resistant with 2% - 4 % slope towards a gutter or drainage canal. The direction of the slope shall be away from the feeding trough.

#### **7.4.2 Slotted floors**

**7.4.2.1** Slotted floors should be made of concrete, plastic, metals or combination of such materials. It shall be constructed to allow manure and urine to pass through.

NOTE Wood is not recommended as flooring material because it is less durable, difficult to dry hence may harbor pathogenic organisms, and wood splinters may cause injury to swine.



**Figure 5 – Types of roof**

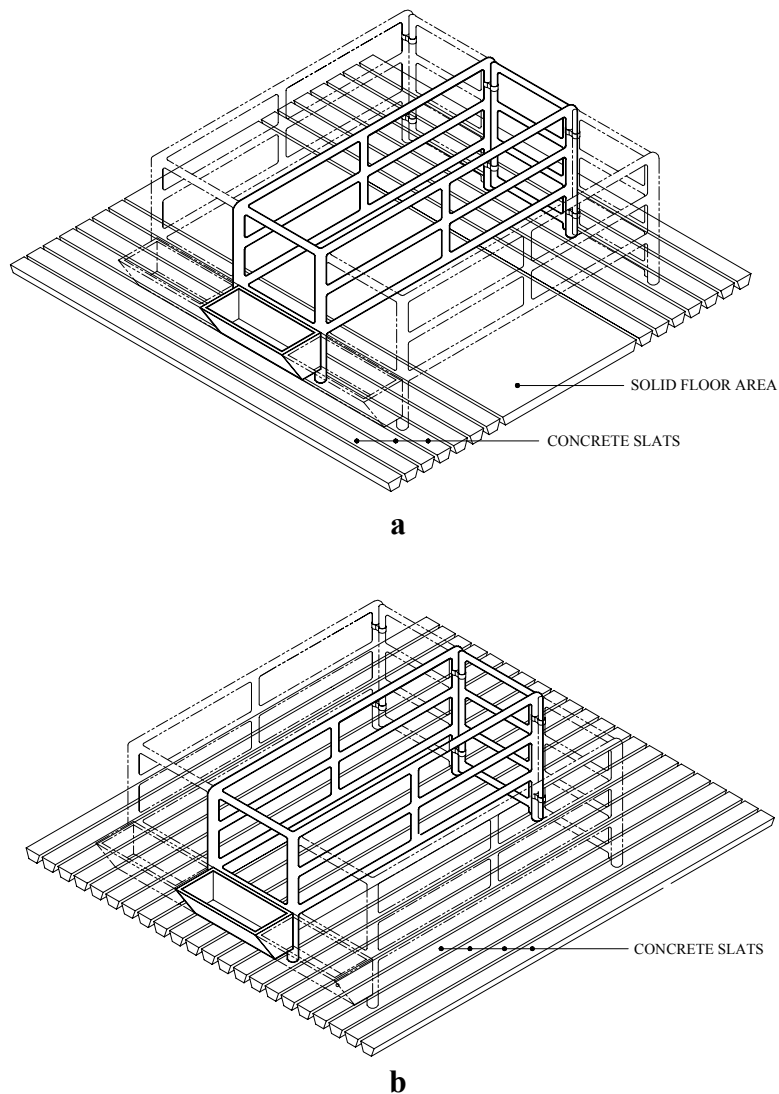
7.4.2.2 . Slotted floors shall be constructed to allow manure and urine to pass through. The recommended slat width and spacing between slats is given in Table 2.

**Table 2 – Recommended slat width and spacing**

<b>Size and type of swine</b>	<b>Width of slat mm</b>	<b>Slat spacing mm</b>
Farrowing sows and piglets (up to 30 kg)	18 - 25	8 - 9
Weaners	18 - 25	10 - 14
Finishers	60 - 100	10 - 20
Sows, finishers and boars (over 100 kg)	80 - 125	10 - 25



7.4.2.3 In partially slotted floors (Figure 6a), the slats shall be placed perpendicular to the long dimension of pens. For totally slotted floors (Figure 6b), slat should be place parallel to the sow.



**Figure 6 – Pens with (a) partially slotted floor; (b) completely slotted floor**

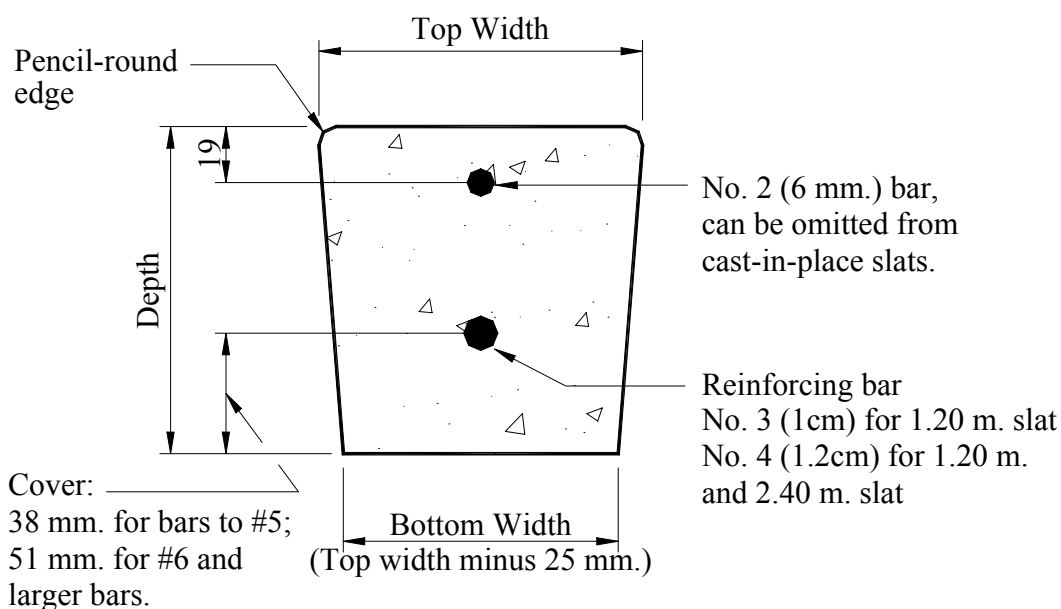
7.4.2.4 Concrete slats shall be used preferably for swine over 30 kg, including gestating sows. The top finish shall be smooth wood float finish and slat top edges shall be rounded. Refer to Table 3 and Figure 7 for the recommended specification and design of concrete slat.

**Table 3 – Recommended specification for concrete slat**

Span m	Slat dimensions		Reinforcing bar
	Top width mm	Depth mm	
1.20	102	102	No. 3 (10 mm)
	152	102	No. 3
	204	102	No. 3

**Table 3 (continued)**

Span m	Slat dimensions		Reinforcing bar
	Top width mm	Depth mm	
1.80	102	102	No. 4 (12 mm)
	152	102	No. 4
	204	102	No. 4
2.40	102	127	No. 4
	152	127	No. 4
	204	127	No. 4
3.0	102	152	No. 5 (14 mm)
	152	152	No. 5
	204	152	No. 5

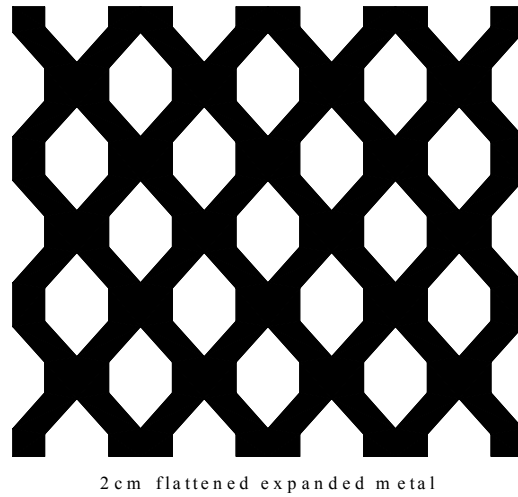


**Figure 7 – Details of concrete slat design**

**7.4.2.5** For swine under 20 kg, flattened expanded metal (20 mm, 9 –11 gauge) shall be used (Figure 8). Supporting joists shall be spaced at 300 mm. Expanded metal shall be treated to prevent corrosion. Sharp edges shall be avoided.

**7.4.2.6** Welded wire flooring shall be made of 5.3 mm (5 gauge) wire spaced at 12.5 mm, 15 mm or 18 mm. It shall be supported every 300 mm.

**7.4.2.7** Plastic flooring shall be coated with rough surface. Fiberglass reinforced T-slats should be used for creep areas in farrowing pens/crates and nursery. Slats shall be 38 mm wide and slots shall be 9 mm. It shall be supported every 600 mm.



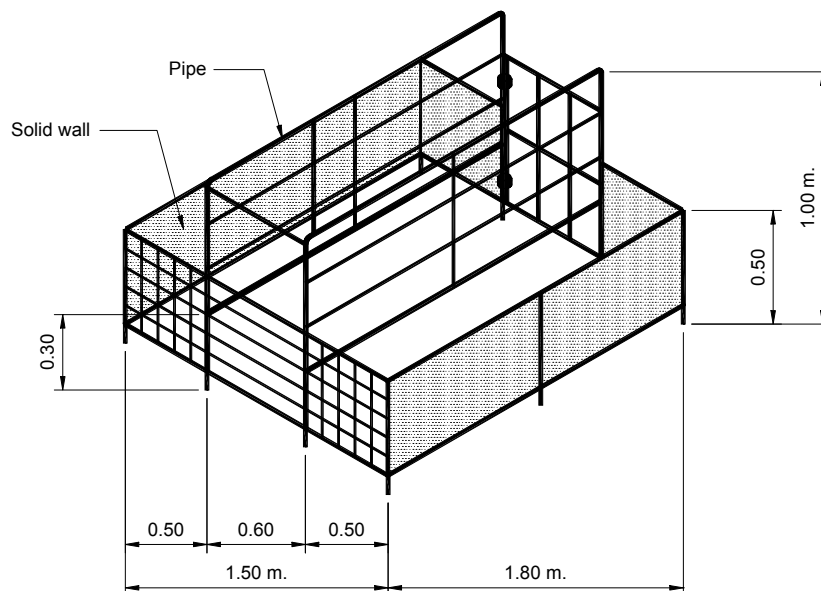
**Figure 8 – Expanded metal slotted flooring**

## 8 Functional Requirements

### 8.1 Pens

#### 8.1.1 Farrowing pens

**8.1.1.1** Farrowing pens shall be provided with farrowing crates to avoid crushing by the sow Figure 9.



**Figure 9 – Typical farrowing crates**

**8.1.1.2** In case rearing pen is used, guardrail should be provided on both sides of the pen. It should be fixed 250 mm from the pen wall and 250 mm above the floor.

**8.1.1.3** The recommended dimension of a farrowing crate is shown in Table 4.

**Table 4 – Minimum farrowing crate dimension**

<b>Measurement</b>	<b>Dimension m</b>
Length	1.80
Width of stall	0.60
Width of creep	0.50
Height of stall	1.00
Height of creep	0.40

**8.1.2 Pens for weaners/nursery**

**8.1.2.1** Weaners should be either penned in a ground pen or in an elevated nursery cages. These cages shall be provided with slatted floor with slot space clearance of 10 mm – 14 mm.

**8.1.2.2** It is recommended that the weaners with the same size shall be housed in a pen or cage.

**8.1.3 Growing pen**

Separate pens for growers should be provided. The size of each pen shall be designed to hold not more than 25 growers.

EXAMPLE Growing pen with a dimension of 1.5 m x 4.8 m shall accommodate 20 growers.

**8.1.4 Finishing pen**

Separate pens for finishers should be provided. The size of each pen shall be designed to hold not more than 25 finishers.

EXAMPLE Finishing pen with a dimension of 1.5 m x 4.8 m shall accommodate 10 finishers.

**8.1.5 Gestating pen**

**8.1.5.1** Sows should be either housed individually (box/stall) or by group. For individual pen, the dimension should be 0.66 m x 1.8 m.

**8.1.6 Boar pens**

Pen for boars should be located close to the dry sow accommodation. The pen should be provided with a service crate.

**8.2 Pen partition**

**8.2.1** Pen partitions should be either solid or slotted. The slot shall be within the range of 160 mm – 210 mm.

**8.2.2** The minimum height of pen partitions is shown in Table 5.

**Table 5 – Minimum height of pen partition**

Swine	Height of pen partition m
Under 25 kg	0.70
25 kg – 100 kg	0.90
Sow	1.00
Boar	1.20

**8.2.3** Fittings and internal surfaces to which the animals have access shall not have sharp edges or projections.

**8.2.4** Surfaces shall not be treated with paints that may cause illness or death.

### **8.3 Pen gate**

**8.3.1** Pen gate should be made of at least 10 mm iron bars or at least 30 mm pipe fastened securely to a G.I. pipe frame.

**8.3.2** The dimension of the gate shall be 600 mm wide and 0.9 m – 1m high. For weanling, a height of 750 mm shall be used.

### **8.4 Aisles and Walkways**

Primary and secondary walkways shall have a minimum width of 1.5 m and 1 m, respectively.

### **8.5 Equipment and facilities**

#### **8.5.1 Heaters**

**8.5.1.1** Heaters shall be installed in creep areas to provide newborn pigs its required temperature of 27°C - 35°C until they are 3 days old.

**8.5.1.2** Heat lamps shall be placed 762 mm above the floor or 152 mm above the sow.

#### **8.5.2 Feeding facilities**

**8.5.2.1** A properly designed feeding trough shall be provided. Table 5 shows the minimum recommended length of feeding trough per swine.

**Table 5 – Minimum recommended length of feeding trough per swine**

Swine weight	Linear length of trough mm/animal
15 – 25	150
25 – 50	200
50 – 75	250
75 – 100	300
100 - 130	350

**8.5.2.2** The feeding trough width shall be at least 300 mm and the depth shall be 250 mm.

### **8.5.3 Watering facilities**

**8.5.3.1** Water trough or waterers shall not be placed beside the feeding trough to keep feeding area of the swine dry and clean. The linear space requirement for watering is the same for the space requirement for feeding.

#### **8.5.3.2 Optional watering facilities**

**8.5.3.2.1** For automatic watering cups or bowls, 1 cup/20 weaner, 1cup/12 gilts, and 1 cup/10 sows, shall be provided. The bottom rim of the bowl should be 120 mm and 300 mm above the floor level for weaners and finishers, respectively.

**8.5.3.2.2** If nozzle type waterers are used it shall be adjustable and it shall be installed at a height of 450 mm - 650 mm from the floor for sows and growing-finishing pigs and 305 mm for weanlings. Waterer spacing should be 300 mm apart for nursery pigs, 450 mm for growing pigs and 600 mm – 900 mm apart for finishing pigs and group housed gestating sows.

**8.5.3.2.3** For nursery, 1 nipple/10 pigs and 1 nipple/12-15 growing-finishing pigs should be installed.

**8.5.3.3** All plumbing design and installation shall conform to the National Plumbing Code of the Philippines.

### **8.5.4 Lighting**

**8.5.4.1** Artificial lighting shall always be available for use during the night or darkened periods of the day.

**8.5.4.2** Table 6 shows the recommended lighting intensity for swine housing.

**Table 6 - Recommended lighting intensity for swine housing**

<b>Area</b>	<b>Lighting intensity* lux (Lumen/m<sup>2</sup>)</b>
Breeding, gestation and farrowing	150
Nurseries	100
Growing and finishing	50
Inspection areas	200

\*Refer to Annex C.

**8.5.4.3** All electrical design and installation shall conform to Philippine Electrical Code.

### **8.5.5 Ventilation**

#### **8.5.5.1 Natural ventilation**

**8.5.5.1.1** Outlets should be either ridge or chimney opening on the downwind side of the building, preferably located at the highest point in a building.

**8.5.5.1.2** Inlets should be through vent doors, curtains or other large openings along the long sides of the building.

**8.5.5.1.3** If necessary, automatic controls should be provided to maintain the indoor temperature and provide air exchange as weather changes hourly and seasonally. Natural ventilation system controllers should be available to regulate air exchange by adjusting inlet and outlet opening sizes. Various devices should be used to adjust the opening size: pneumatic systems; either manual or motorized cable and winch systems; and motorized mechanical arms.

**8.5.5.2** Mechanical ventilation (if necessary)

**8.5.5.2.1** Mechanical ventilation (e.g. fan) should be provided to deliver the required air-flow rate (Table 7).

**Table 7 – Minimum ventilation rates under normal condition**

<b>STAGE</b>	<b>Ventilation rate m<sup>3</sup>/min</b>
Farrowing unit (sow and litter)	0.28
Nursery pens	0.08
Growing-finishing pens	0.12
Breeding and gestating pens (gilts, sows and boars)	0.28

**8.5.5.2.2** Fans should be installed on the side opposite to the prevailing winds.

**8.5.6** Temperature

**8.5.6.1** The recommended maximum temperature that shall be maintained is shown in Table 8.

**Table 8 – Maximum temperature for housed swine in still air**

<b>Class</b>	<b>Temperature °C</b>
Sows and boars	30
Piglets newborn	35
3 weeks	30
Weaners	30
Growers and Finishers	30

**8.5.6.2** Optional facility

Water spray nozzles should be provided to provide cooling effect. Nozzles should be placed approximately 1.8 m above the floor and pointing straight down to obtain the best pattern and cover the width of the pen.

## **9 Storage for feeds and supplies**

**9.1** A well-ventilated area should be provided for feed storages. It should be provided with mesh wire.

**9.2** The space required should be based on two weeks supply of feeds.

## **10 Waste disposal**

For waste management, refer to PAES 414:2002 Agricultural Structures – Waste Management Structures.



**Annex A**  
(informative)

**Computation of the number of pens**

**A.1 Formula for the computation of period of occupancy/pen**

**A.1.1 Farrowing/Rearing Pen-FRP (in days)**

acclimatization period of sow.....	7
lactation period.....	28-35
cleaning and disinfection.....	3
<b>Total period of occupancy.....</b>	<b>38-45</b>

**A.1.2 Nursery/Weaners' Pen (in days)**

rearing period (weaning up to transfer to fattening pen).....	30-35
cleaning and disinfection.....	3
<b>Total period of occupancy.....</b>	<b>33-38</b>

**A.1.3 Fattening Pens (in days)**

fattening period.....	90-150
cleaning and disinfection.....	3
<b>Total period of occupancy.....</b>	<b>93-153</b>

**A.1.4 Dry and Pregnant Pens**

365 – (occupancy in FRP x Litter Index)

**A.1.5 Gilts Pen (selection at 6 months)**

rearing period.....	60
cleaning and disinfection.....	3
<b>Total period of occupancy.....</b>	<b>63</b>

**A.1.6 Boar's Pen (selection at 6 months)**

rearing period (2 months).....	60
cleaning and disinfection.....	3
<b>Total period of occupancy.....</b>	<b>63</b>

**A.2 Formula for the computation of the number of pens**

$$\text{A.2.1 Farrowing/Rearing Pens} = \frac{\text{No. of Sows} \times \text{Litter Index} \times \text{Occupancy Period}}{365} \times 1.1$$

$$\text{A.2.2 Nursery/Weaners Pens} = \frac{\text{No. of Sows} \times \text{Litter Index} \times \text{Weaned/Litter} \times \text{Occupancy}}{365 \times \text{No. of Piglets/Pen}} \times 1.1$$

$$\text{A.2.3 Fattening Pens} =$$

$$\frac{(\text{No. of Sows} \times \text{Litter Index} \times \text{Reared/Litter} - \text{Gilts and Boars raised as replacement}) \times \text{Occupancy} \times \% \text{Retained for Fattening}}{365 \times \text{No. of Fatteners/Pen}}$$

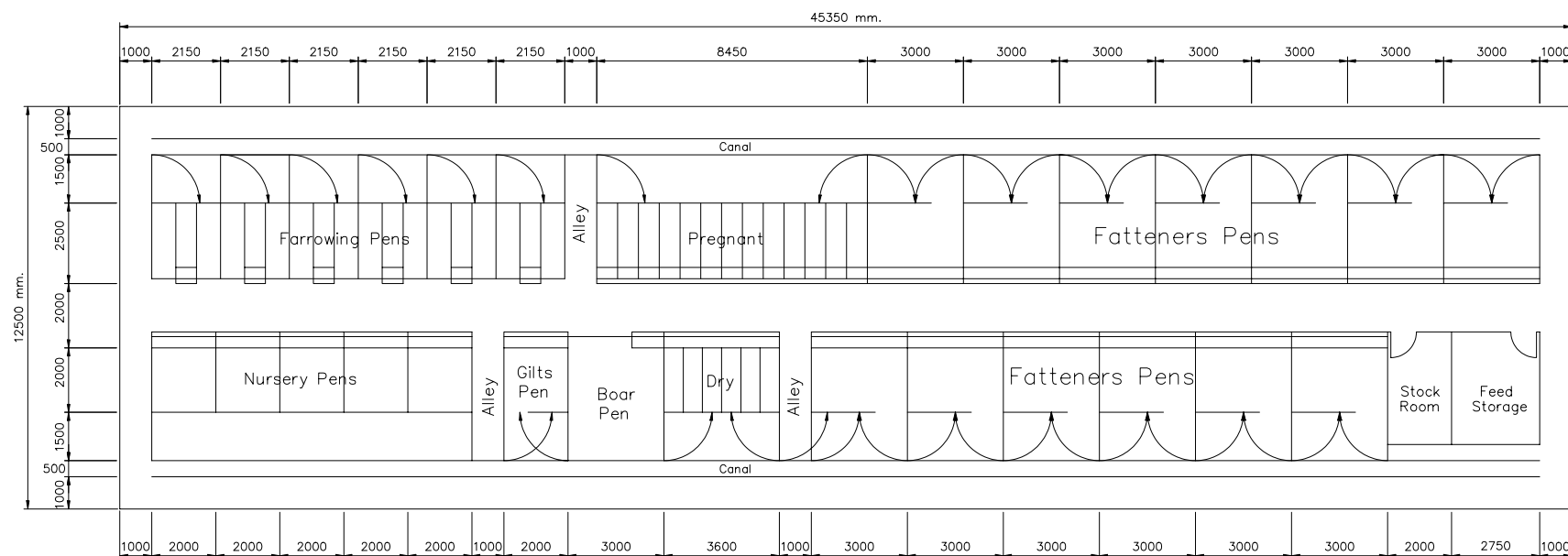
$$\text{A.2.4 Dry and Pregnant Sows Pens} = \frac{\text{No. of Sows} \times \text{Occupancy Period}}{365} \times 1.1$$

$$\text{A.2.5 Gilt Places} = \frac{\text{No. of Sows} \times \text{Culling Rate} \times \text{Occupancy Period}}{365 \times \text{Selection Rate}} \times 1.1$$

$$\text{A.2.6 Boar Pens} = \frac{\text{Number of Sows}}{\text{Boar to Sow Ratio}}$$

**Annex B**  
(informative)

**Sample of a 24-sow level fattener production**



FLOOR PLAN

SCALE: 1:200 M.

**Annex C**  
(informative)

**Lighting Requirements**

Lighting Intensity lux	No. of Bulbs Required per m <sup>2</sup>							
	Incandescent lamp						Fluorescent lamp	
	25W	40W	60W	100W	150W	200W	20W	40W
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