

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 dairy cattle.

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:

ASAE EP344.1, Lighting for Dairy Farms and the Poultry Industry, ASAE Standard, 1986

Farm Structures in Tropical Climates, FAO, Rome, 1988.

Grant, R. and J. Keown, Managing Dairy Cattle for Cow Comfort and Maximum Intake, NebGuide Cooperative Extension, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, 1996.

Maghirang, R.G, V. G. Gayanilo, V.S. Luis and N.G. Natural. An Assessment of Animal Housing Systems in Beef and Dairy Cattle Farms in the Philippines. Philippine Technology Journal, Vol. XII No. 3, July – September 1987.

Merrill, W.G. and W.W. Irish, Design and Management Considerations for Free-Stalls for Dairy Cows, Facilities and Equipment, 1989.

Structures and Environment Handbook. MWPS, September 1977, 9th Edition.

Agricultural Structures – Housing for Dairy Cattle

1 Scope

This standard specifies the minimum requirements for dairy cattle loose 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 Standards:

PAES 409:2002 Agricultural Structures – Milking Parlor

Philippine Electrical Code 2000

PAES 414:2002 Agricultural Structures – Waste Management Structures

3 Definitions

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

3.1**loose housing**

animals are free to move between resting, feeding and watering areas

3.2**calf**

young male or female under one year of age

3.3**cow**

mature female that has already calved

3.4**yearling**

one to two year old cattle of either sex

3.5**heifer**

female between two to three years of age which has not given birth

3.6

parturition

act of giving birth

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 Space requirement

The minimum floor space requirement is shown in Table 1.

Table 1 – Minimum floor space requirement for dairy cattle

Class, Age, Size of Animal	Shed or Barn Floor Area m²/animal
Calves (up to 3 months)	1
Calves (3 - 6 months)	2
Calves (7 months – one year)	3
Yearlings (1 – 2 years)	4
Heifer/Steer (2 – 3 years)	5
Milking and dry cows	6
Cows in maternity stall	10

6 Structural requirement

6.1 Floor

6.1.1 Concrete floors shall be skid resistant. The minimum floor thickness shall be 76 mm with 2-4% slope towards the drainage.

6.1.2 If the floor is earth lot, it shall have a slope of 4-7%.

6.2 Roof

6.2.1 Adequate roofing materials shall be provided for the protection against rain and direct sunlight.

6.2.2 The roof slope shall not be less than 25%. If roofing is made of indigenous materials, the minimum roof slope shall be 58%.

6.2.3 The minimum height of the top of the roof beam shall be 2.5 m from the floor.

6.3 Pen wall

6.3.1 Pen walling and post shall be preferably made of G.I. pipes schedule 40. The diameter of vertical and horizontal railing member of the pen wall shall be at least 50 mm and 75 mm for the post.

6.3.2 The maximum center to center spacing between vertical railing member shall be 1.5 m and for horizontal railing member, spacing shall be 0.4 m.

6.3.3 The maximum center to center spacing between post shall be 3 m and shall be embedded in a concrete pedestal with a minimum depth of 0.4 m (Figure 1).

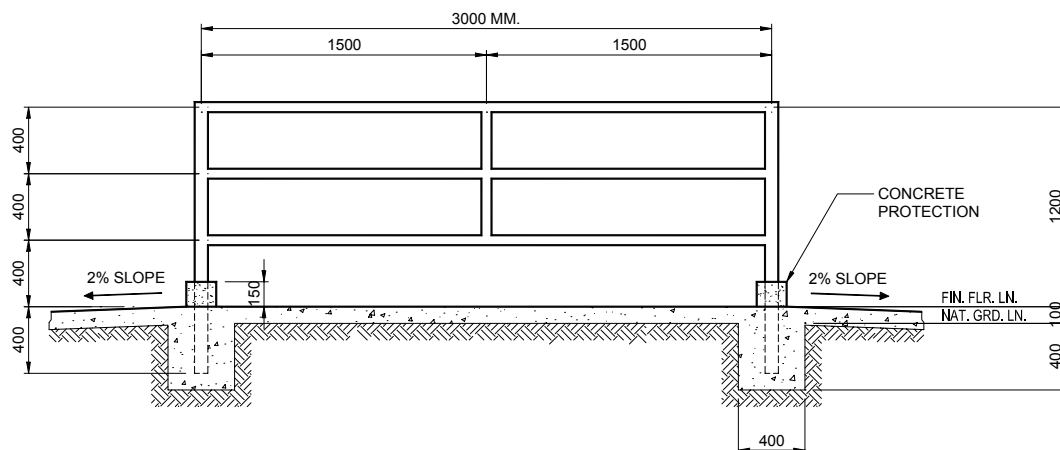


Figure 1 – Sample of slotted pen wall

6.3.4 Each post shall be provided with 0.15m concrete protectors.

6.3.5 The pen shall be 1.2 m – 1.5 m high.

6.3.6 Fittings and internal surfaces of the pens shall be free from sharp edges or projections to avoid injury to the animals.

6.3.7 Paints that may be toxic to animals shall not be used on surfaces accessible to them.

7 Functional requirement

7.1 Pens

7.1.1 Maternity pen/Calving pen

7.1.1.1 Maternity pen shall be provided for cows that are two months away from parturition.

7.1.1.2 The pen shall be bedded with straw or any suitable bedding materials for use during calving. Rice hull is preferred than straw because it drains off easily.

7.1.1.3 The pen shall be equipped with feeding and watering facility (refer to Pen facilities).

7.1.1.4 A pen shall be provided for every 20-25 mature cows.

7.1.2 Calf pen (up to 3 months)

7.1.2.1 Calves under 3 months should be placed in individual stalls for easier feeding and for closer observation (Figure 2).

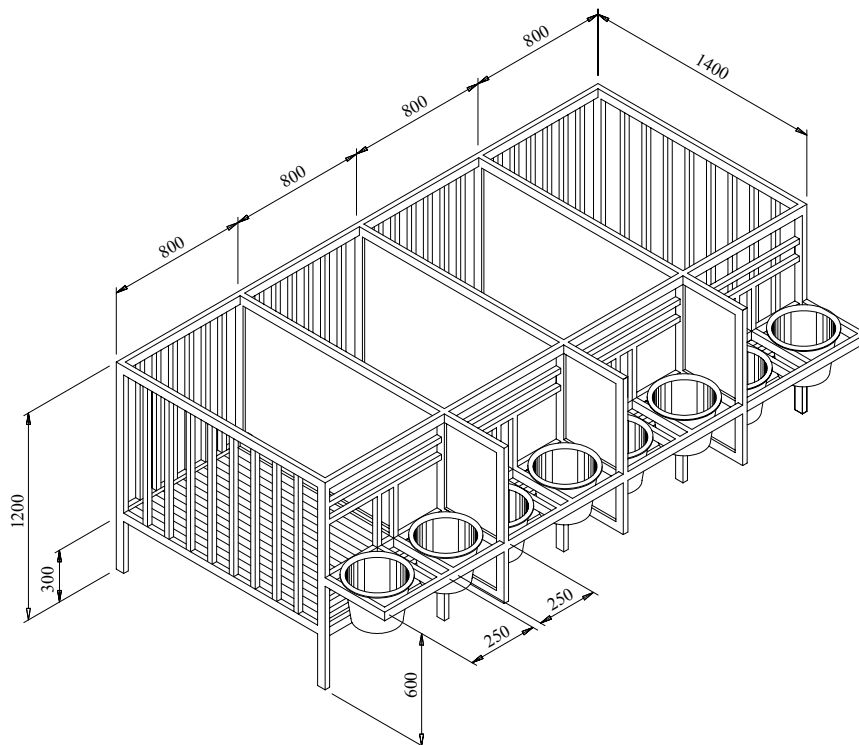


Figure 2 – Individual calf pen

7.1.2.2 The minimum height of the pen shall be 1.2 m and it shall be elevated at least 0.3 m from the ground.

7.1.2.3 Solid partition to prevent calves from licking each other. Hairballs could be formed in the underdeveloped rumen of the calf.

7.1.2.4 Pen wall and floor shall be made of metal pipes or bars. The slat space clearance in the pen wall shall be 115 mm - 130 mm and the slat space clearance in the pen floor shall be 25mm-30 mm.

7.1.3 Pen for calves (3 months – one year)

The pen should be equipped with feeding and watering facilities (refer to Pen facilities).

7.1.4 Heifer, milking and dry cow pen

7.1.4.1 Each group of animals shall be penned separately as they differ in animal movement, feeding system and management system.

7.1.4.2 The pen shall be equipped with feeding and watering facilities (refer to Pen facilities).

7.2 Pen facilities

7.2.1 Feeding facility

7.2.1.1 Feeding trough shall be placed along the sides of the pen and should either be made of wood or concrete (Figure 3).

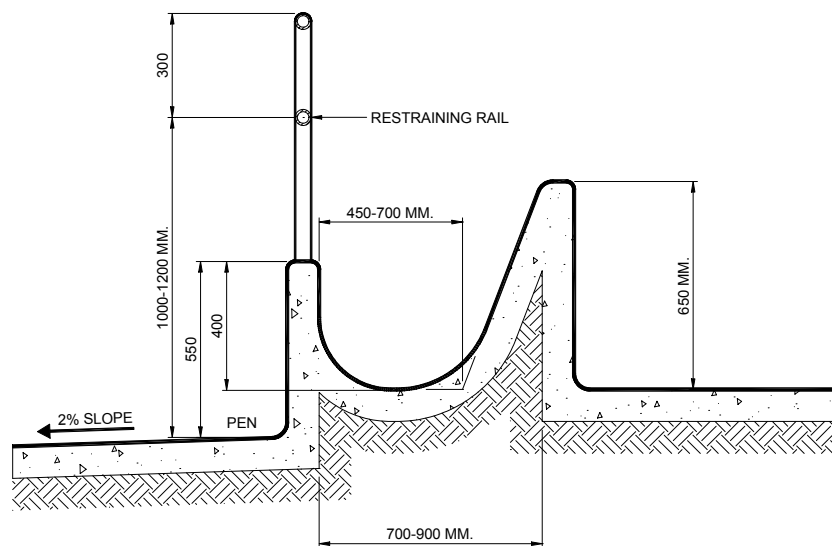


Figure 3 – Typical cross section of a feeding trough

7.2.1.2 Feeding trough shall be provided with horizontal rail to restrain the animals from stepping the trough. For calves up to 6 months, the height of the horizontal rail shall be 0.7m, while for 7 months calves, it shall be 0.9 m. For yearling, heifer, dry, and milking cow, the height should be 1m - 1.2 m.

7.2.1.3 Inside surfaces of the feeding trough should be smooth and it should have rounded corners to facilitate cleaning.

7.2.1.4 The bed of the trough should be 0.15 m above the level of the apron to facilitate natural feeding stance.

7.2.1.5 For calves up to one year, the dimension of the feed trough shall be 0.25 m depth 0.4 m – 0.65 m bottom width and 0.65 m – 0.85 m top width.

7.2.1.6 For older animals, the dimension of the feed trough shall be 0.4 m depth, 0.45 m – 0.7 m bottom width and 0.7 m – 0.9 m top width.

7.2.1.7 The linear feeding space is shown in Table 2.

Table 2 – Minimum feeding space requirement for dairy cattle

Class, age, size of animal	Linear feeding space mm/animal
Calves (3-6 months)	45
Calves (7 months – one year)	50
Yearling, heifer, milking and dry cows Cows in maternity stall	75

7.2.1.8 If the feeding trough is separate from the shed or building, concrete or gravel packed aprons along the feeder shall be constructed and shall be at least 1.5 m wide. It shall have a slope of 2-4% towards the drainage.

7.2.2 Watering facility

7.2.2.1 Water troughs should be made of concrete or galvanized metal tanks. Float activated valve should be provided to regulate the water level.

7.2.2.2 The water troughs shall be provided with concrete or gravel packed aprons with a slope of 2-4% to improve sanitation and keep the water clean.

7.2.2.3 For the open water tank, 250 linear mm shall be provided for 8-10 head.

7.2.2.4 If automatic waterer is used, one automatic waterer shall be provided for 15 animals and it shall be placed at a height of 1 m.

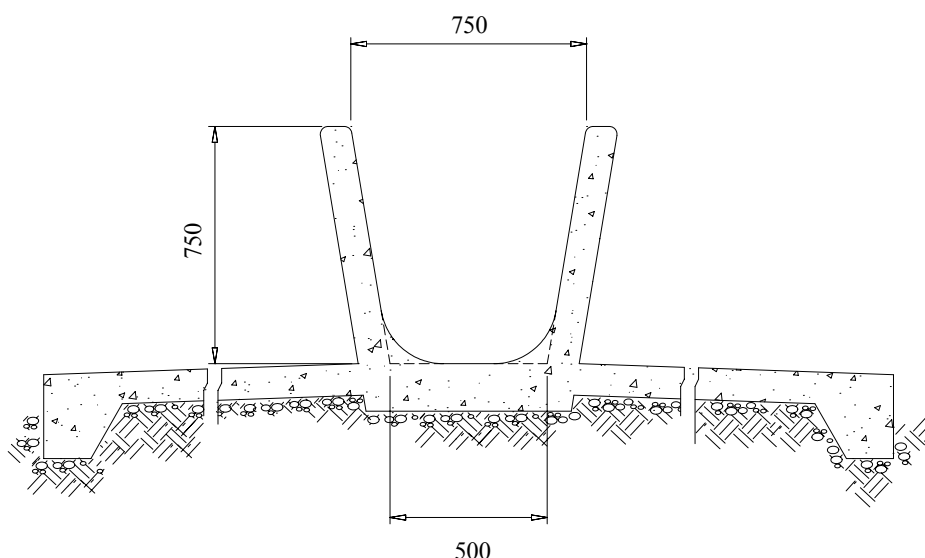


Figure 4 – Cross section of a typical drinking trough

7.2.3 Lighting

Adequate lighting shall be provided within the housing. For feeding area, 200 lux should be provided, 70 lux should be provided for the pens and 30 lux should be provided for feed storage area (refer to Annex B).

7.3 Milking parlor

For the milking parlor structural and facilities requirements, refer to PAES 409:2002 Agricultural Structures - Milking Parlor.

7.4 Passage

The central alley or the driveway should be elevated and shall have a minimum width of 3 m if vehicles are allowed to enter within the building and it shall have a solid base.

7.5 Drainage

The gutter shall have a minimum width of 0.46 m and a minimum depth of 0.2 m.

7.6 Feed storage

7.6.1 Storage sheds for all feedstuffs – hay, grain, mineral salt, shall be provided to keep it dry, protect from rodents and be inaccessible to animals.

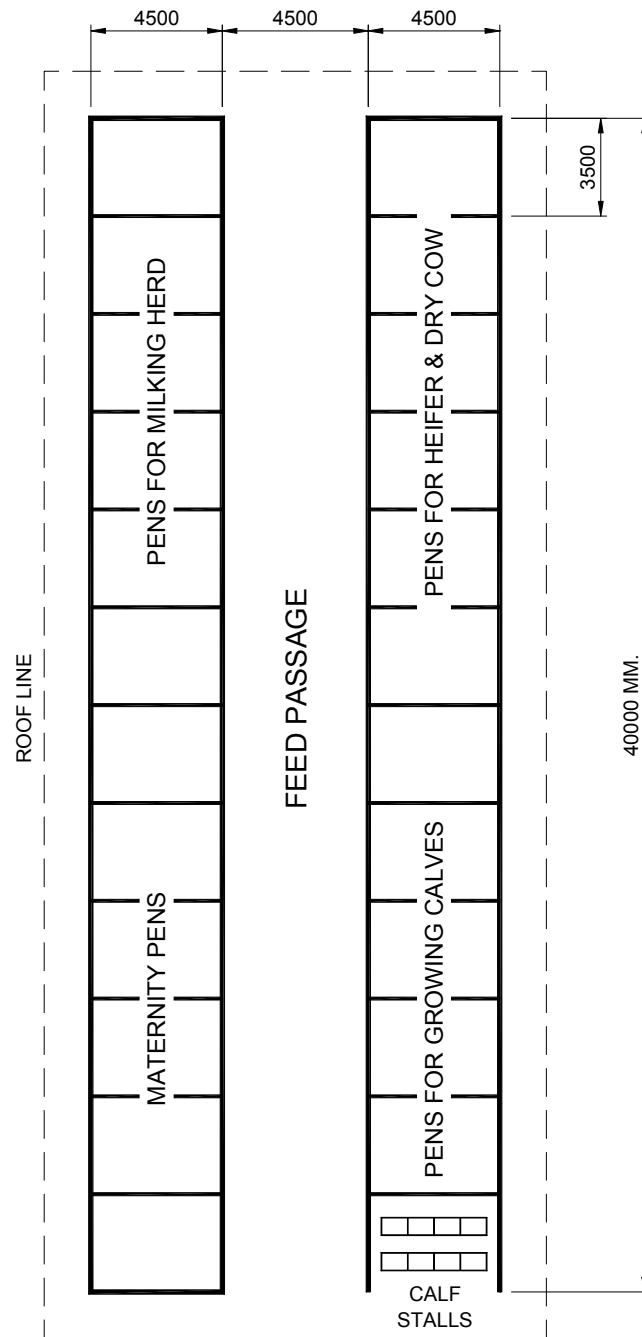
7.6.2 If silo is necessary, the walls should be smooth and air-tight. For a horizontal silo, the walls should slope about 1:4.

8 Waste disposal

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

Annex A
(informative)

Typical layout of a dairy housing



TOP VIEW

Annex B
(informative)

Lighting Requirements

Lighting Intensity lux	No. of Bulbs Required per m ²							
	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