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RECOMMENDATIONS FOR
FARM CATTLE HOUSING FOR LARGE
DAIRY FARMS

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RECOMMENDATIONS FOR FARM CATTLE HOUSING FOR LARGE DAIRY FARMS

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RECOMMENDATIONS FOR FARM CATTLE HOUSING FOR LARGE DAIRY FARMS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 29 December 1970, after the draft finalized by the Animal Housing and Equipment Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 India has a vast cattle population. They form the mainstay of our agricultural economy. Despite this, a large majority of animals is inefficient producers of milk and draught power. This large number also militates against selection for quality.

0.2.1 Besides, better breeding coupled with selection, feeding and disease control, proper housing is an important feature in raising the productivity of animals. At present only a small proportion of cattle is maintained on scientific lines. Proper housing, which is conducive to good health, comfort and protection from inclement weather, and which would enable the animals to utilize their genetic ability and feed for optimal production, is grossly lacking except at a few organized farms. The adverse effects of the situation among the large numbers of privately maintained animals are specially manifest in the dairy animals. A series of standards is, therefore, being prepared to provide guidelines and help in meeting the requirements of various categories of dairy enterprises.

0.3 India's climatic conditions, unlike most of the principal dairy countries of the world, are very varied. Hence designs of cattle sheds would also vary according to the climatic conditions prevailing in a particular region. In order to meet these varied requirements, the following classification has been adopted for this series of Indian Standards:

- a) Plain areas with medium rainfall,
- b) Heavy rainfall and high humidity areas,
- c) Arid areas, and
- d) High altitude areas.

0.4 Dairying is practised in the country by various interests. Generally these interests are:

- a) an average farmer who has generally not more than a pair of bullocks and two or three milch animals with their calves;

- b) rural milk producers normally having an average of about 20 animals including about 12 milch animals, their followers and a pair of bullocks;
- c) *GAUSHALAS* and other organized milk producers having about 130 animals which include 40 milking animals and 40 dry animals, two bulls, 3 pairs of bullocks and followers; and
- d) large dairy farms having a herd of about 500 animals (*see 4.1*).

0.4.1 Requirements of (a), (b), and (c) for plain areas with medium rainfall are covered respectively in different parts of IS : 4466*. Similarly requirements of these interests for heavy rainfall and high humidity areas are covered in three parts of IS : 5605†. However, the requirements for large dairy farms were found not to vary significantly for plain areas with medium rainfall and heavy rainfall and high humidity conditions. Hence, instead of separate parts of IS : 4466* and IS : 5605†, this consolidated standard covering requirements for large dairy farms is issued.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960‡. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the recommended layouts and constructional requirements of cattle sheds and ancillary structures for large dairy or breeding farms having an average of about 500 animals (*see 4.1*).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Paddock or Pen or Yard — An open area enclosed by walls or fencing with an adequate space to provide free movement. It generally contains manger or water-trough with or without ties to control animals for different purposes.

*Recommendations for farm cattle housing for plain areas with medium rainfall:

- Part I Cattle shed for an average farmer.
- Part II Cattle shed for a rural milk producer.
- Part III Farm cattle shed for *GAUSHALAS* and other organized milk producers.

†Recommendations for farm cattle housing for heavy rainfall and high humidity areas:

- Part I Cattle shed for an average farmer.
- Part II Cattle shed for a rural milk producer.
- Part III Cattle shed for *GAUSHALAS* and other organized milk producers.

‡Rules for rounding off numerical values (*revised*).

2.2 Standing — The floor space provided within shed for animals to stand or to sit on.

3. SELECTION OF SITE

3.1 The sheds and other ancillary structures shall be located on dry, elevated and well-drained area where there is sufficient scope for future expansion.

3.2 The site shall be such where good water supply would be available preferably at low cost.

3.3 The site shall be away from public road, but be easily accessible throughout the year.

3.4 The site shall be such that the cattle sheds may preferably be oriented east to west.

4. HERD SIZE

4.1 In an organized dairy or breeding farm, the herd size and its composition generally vary in accordance with the objectives of the farm. However, this standard prescribes the requirements for a typical herd of about 500 animals. The herd is likely to consist of 140 milking animals, 70 dry animals, 175 heifers, 15 young males, 6 bulls, 10 bullocks and remaining calves. Where progeny testing programme is followed, the herd shall be having 300 breeding females as base with necessary replacement stock. In case a single herd of this kind is not possible, it would not be unusual to have this programme on two herds of 150 females each as base. However, in a breeding herd, the number of heifers shall be proportionately larger than indicated above.

5. LAYOUT

5.1 Two recommended layout plans comprising various building units are given in Fig. 1A and 1B. Any one of these layouts may be adopted.

NOTE — There could be many variations of layouts with these units depending upon available land, size of enterprise, finance, etc.

6. SECTIONS OF LARGE DAIRY OR BREEDING FARMS

6.1 Large dairy or breeding farm shall have four important sections of activity, namely, cattle section, dairy section, cultivation section and administration section.

7. CATTLE SECTION

7.0 This section, which is the most important section in a dairy farm, shall have various units as described in **7.1** to **7.16**. All units shall be so planned as to provide for comfort, protection and operational conveniences.

7.1 Milking Animal Shed — The standings of the milking animal shed shall be of tail-to-tail system. The length and width of the standing shall be decided according to the average size of the animals and may vary from 1.5 to 1.7 m in length and 1 to 1.2 m in width. The width of the central passage may be 1.8 m. The central passage shall have slope of 1 in 25 from the central axis towards both the sides. There shall be two drains laid on either side of the central passage. There shall be two continuous mangers on outer side of the standings. The floor of the standings shall be sloped 1 in 40 towards the drains. There shall be pillars along the length of the shed to support the beams of the roof and walls at the end of the shed. The roof of the shed shall be gabled. The eaves of the roof shall project out 75 cm from the pillars.

7.2 Suckling Calves Room — When calves are unweaned, four rooms 4×5 m shall be provided between two milking animal sheds for housing suckling calves (see Fig. 1).

7.3 Ration Room — There shall be a room of at least 3×4 m near to the milking animal shed to store feed concentrates temporarily to meet the requirements of the animals for the day. The ration room shall be made damp- and rodent-proof.

7.4 Dry Animal Shed — The shed may be of the loose housing type and may consist of centrally placed manger with curbs of 0.6 m and 1.2 m width, and length at the rate of 0.6 m per animal under a roof in paddock. The manger shall be surrounded by a 2.2 m wide paved platform with drains. The roofed portion will be 5.6 m wide and may be gabled. Ties may be provided on the outside of the manger curb at 1.5 m approximately for occasional use, if required.

7.5 Down-Calver Shed — The down-calvers shed may at least have 8 calving boxes (see 7.5.1) for housing those animals very close to calving and 20 standings (see 7.5.2) adjacent to the boxes for accommodating those animals heavy-in-calf. However, for indigenous breeds of cows having two calving seasons in a year, and due to seasonality of calvings in buffaloes, this provision may be increased. The down-calvers shed shall be a separate unit.

7.5.1 Calving Boxes — The dimensions of each calving box shall be 3×4 m with partition of at least 1.2 m high between the two calving boxes. A manger and a water-trough, each 0.5 m wide shall be constructed at the rear end of the calving box. A single-leaved door 2 m high and 1.2 m wide shall be provided for each calving box. The lower half portion of angle iron frame of the door leaf may be of galvanized steel sheet and the upper half of the same may be covered with wire netting. The floor of the calving boxes shall be sloped towards the drains.

7.5.2 Standings — The standings of the down-calver shed shall be constructed with a continuous manger along the wall and provided with

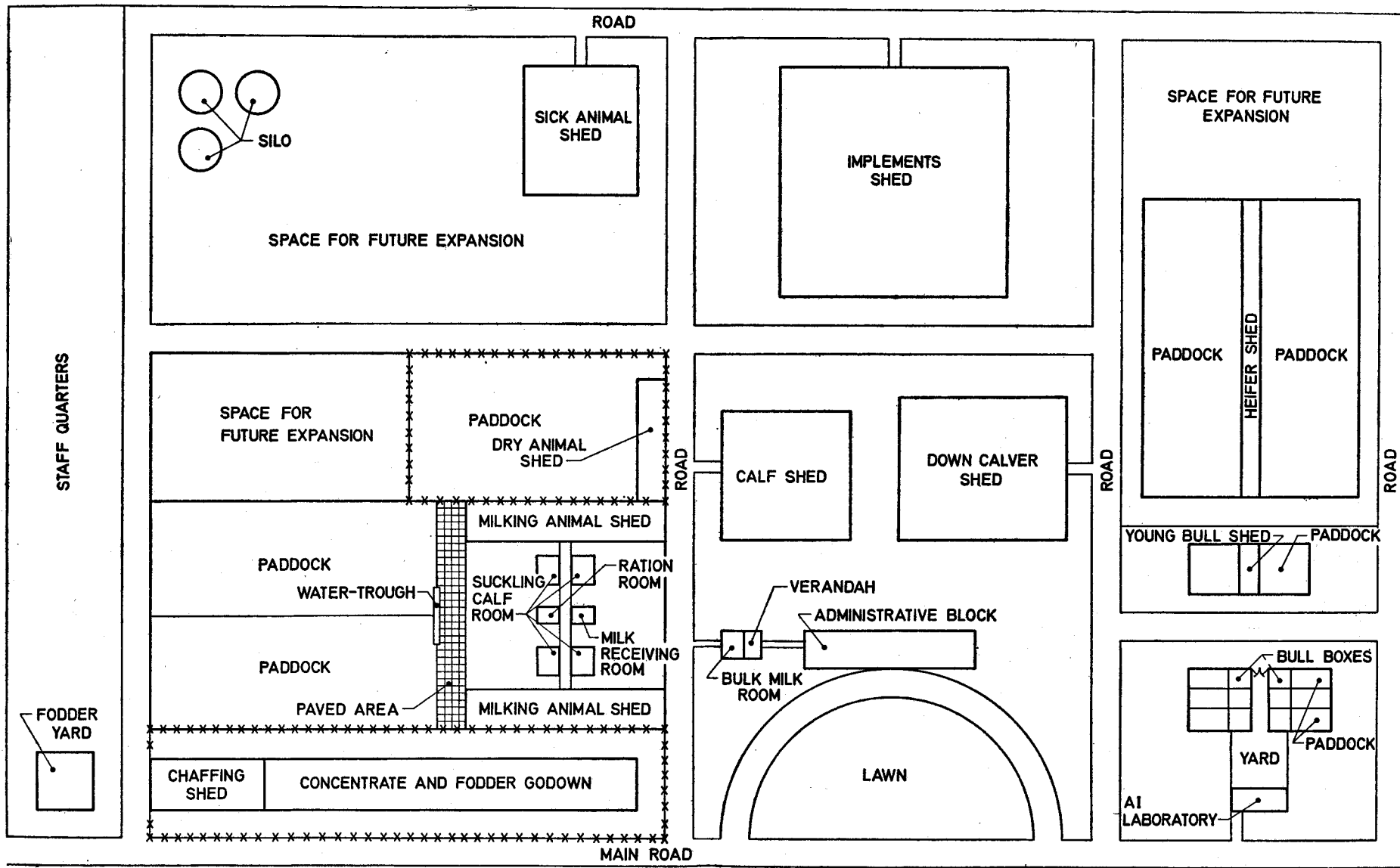


FIG. 1A LAYOUT PLAN FOR LARGE DAIRY FARMS

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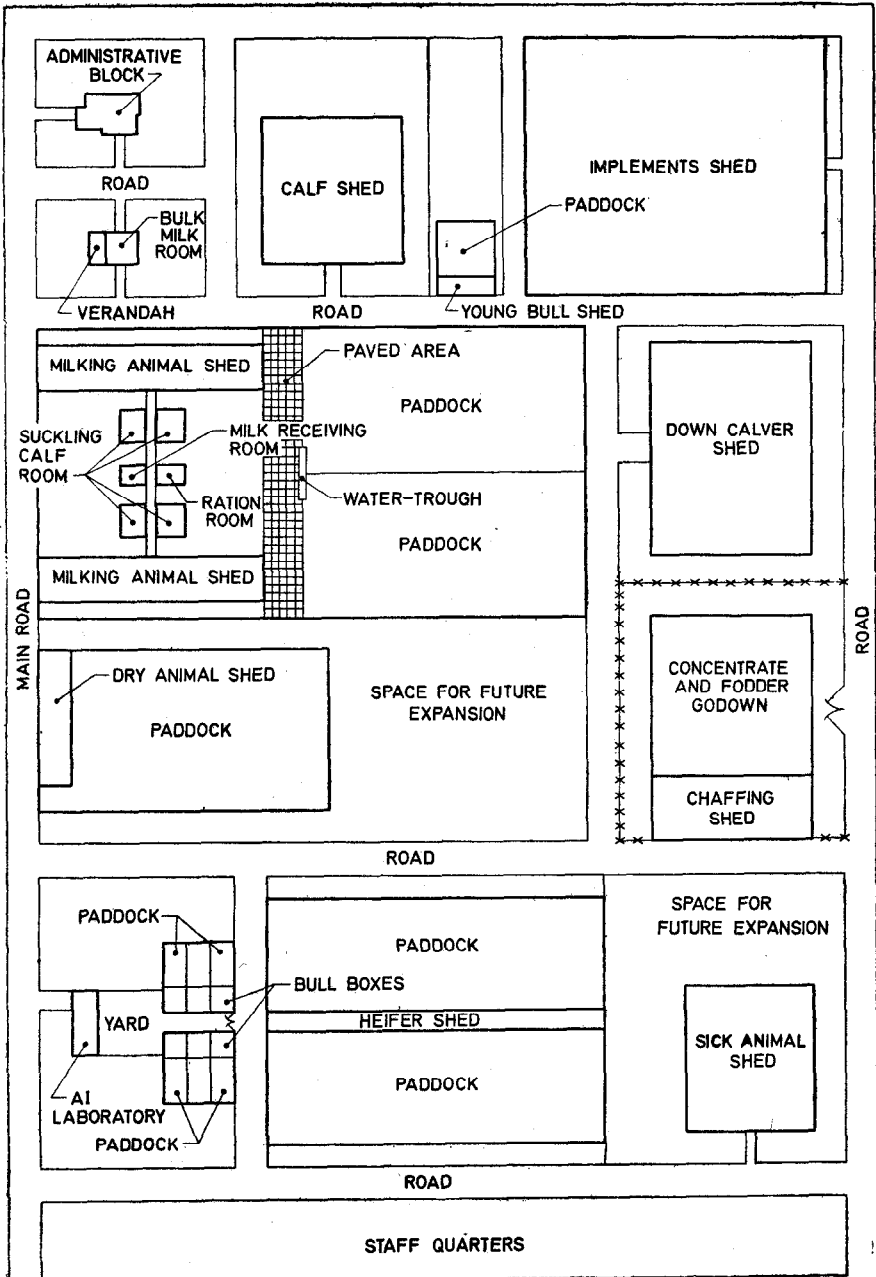


FIG. 1B LAYOUT PLAN FOR LARGE DAIRY FARMS

tying arrangements so that the animals are tethered facing the wall. The length and width of each standing shall be 2.0 m and 1.6 m respectively. There shall be a drain laid on the other side of the standing.

7.6 Young Stock Shed

7.6.1 Young bulls and heifers should not be kept in close proximity. However, their housing requirements shall be similar.

7.6.2 The shed shall be loose housing type and shall be constructed in such a way that the animals are facing each other with a central manger at a rate of 0.6 m length per animal. The manger shall be surrounded by 1.8 m wide paved platform. There shall be drains on the both sides of the standings. The roof shall be gabled or lean-to type in case of one-way feeding and it shall be supported on the length by a series of pillars. The roofed portion shall be 5.4 m wide for gable and 3.2 m for lean-to type. The ties may be provided in the outer side of the manger for occasional tying.

7.7 Calf Shed

7.7.1 The dimensions of the calf shed shall depend upon the number of animals. The floor space provided for each calf shall be not less than 1 m². The calves may be kept loose. The manger shall be constructed along with the wall of the shed. The flooring of the shed shall be sloped towards the drains. The drain shall be laid outside the shed. The roof may be gabled. A water-trough shall be provided at one end of the shed.

7.7.2 Calf Boxes — A portion of the calf shed shall provide individual calf boxes for the calves up to the age of 6 to 8 weeks. These boxes shall be arranged in two rows along the two sides of the central passage in the room. The individual boxes shall be of 1.2 × 1.5 m with a manger towards the central passage and a water-trough common to two boxes. There shall be a gate at the front. The height of the box partitions shall be at least 75 cm high. A paddock shall also be attached with the calf room for exercise.

7.8 Bull Shed and Artificial Insemination Laboratory

7.8.1 The bull shed shall have six boxes, each measuring 3 × 4 m. The partition wall between the two boxes may be 1.2 m high with a rail at the top having a clearance of 30 cm. A 0.5 m wide raised manger with feed and water sections shall be provided in each box. The gable roof of the shed shall be supported from all the three sides by walls up to a height of 1.2 m from the floor level and the rest of the height of the shed of 1 m may be kept open. The roof of the shed shall be supported on pillars and walls up to a height of 1.2 m from the plinth level.

7.8.2 Adjacent to bull shed, there shall be a 10 × 10 m service yard with a service crate in the centre for the collection of semen. To this a

laboratory shall be attached. Where the use of processed semen is contemplated, necessary facilities for testing, processing and storage have to be provided. The minimum dimensions for laboratory shall be 3×4 m, and 3×4 m each for wash-up room and room for supervising officer.

7.9 Service Crate and Trevis

7.9.1 Service Crate — This shall be used both for artificial insemination and veterinary treatment. It shall be a U-shaped structure and may be made of 5-cm galvanized steel pipes supported by five pillars. One horizontal pipe shall be welded on the sides across the two rear pillars to protect the working technician from side kicks. One adjustable pipe shall be affixed with a chain which may be put across the last two pillars through the clamps fixed on both sides of these pillars to prevent the animals from backing out. One iron ring for tying the animals shall be provided at the top of front pillar to prevent the animal from jumping off the crate. A typical crate with the following dimensions is given in Fig. 2 :

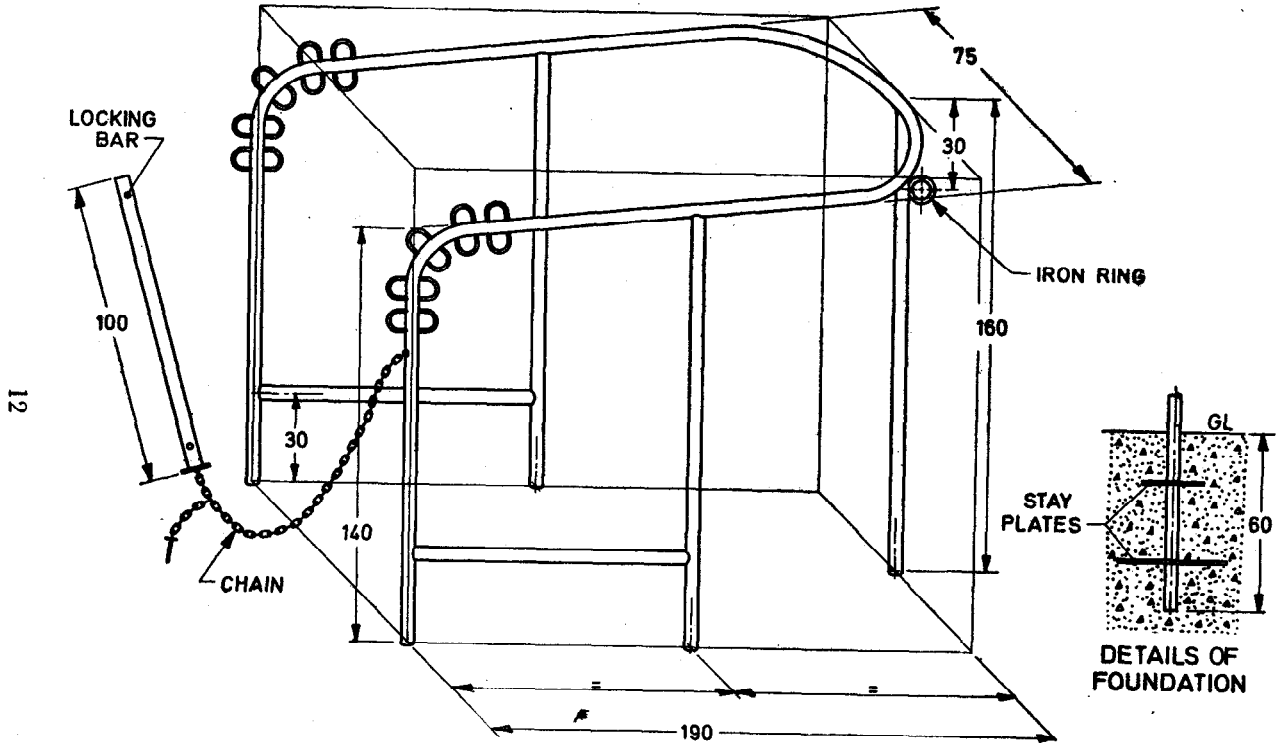
Length	195 cm
Width	75 cm
Height at front	165 cm
Height at rear	140 cm

7.9.2 Trevis — The trevis may be made by fixing five strong *BALLIES* in two parallel rows. The distance between rows shall be about 60 cm. The distance between *BALLIES* in the same row should be 50 cm. Mild steel rings 11.5 mm thick and 150 to 200 mm diameter placed on strong mild steel inlet shall be fixed securely on the *BALLIES*. On each of the two end *BALLIES* in the row having three *BALLIES*, two such rings shall be fixed at a height of 68 cm and 180 cm respectively from the ground. The *BALLIES* shall be embedded in the ground with 60 cm cement concrete base.

7.10 Sick Lines and Dispensary

7.10.1 Sick Lines — The sick lines shall be located well away from the other animal sheds. The dimensions and arrangements for sick boxes and standings for animals shall be the same as given for calving boxes and standings respectively of down-calver shed (see 7.5.1 and 7.5.2). The paddock of the sick lines shall be paved and shall regularly be washed. The washings and other sick line disposals shall not be allowed to flow in the drains which flow towards the healthy animals. A treatment crate shall be placed at one of the corners of the paddocks.

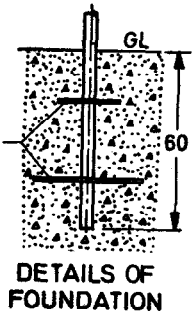
7.10.2 Pharmacy Room — There shall be a room of at least 3×4 m preferably having built-in dispensing counter, shelves, and two or three cupboards. It shall also be provided with a porcelain sink and a power plug for sterilization of materials.



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All dimensions in centimetres.

FIG. 2 SERVICE GRATE



7.10.3 Adjacent to pharmacy room, there shall be a diagnostic laboratory of at least 3×4 m. This may also have built-in shelves and cupboards and a working table.

7.11 Isolation Yard— It shall consist of a shed with attached yard. The shed shall be for 2 to 6 animals, the number depending upon the size of the herd maintained at the farm and shall be away from other sheds. The shed shall have independent drain which should be connected to the main drain running behind the shed, so that no animal comes in contact with potentially infective discharges and washings. The yard shall be suitably fenced. Each shed shall be provided with a manger and tie chain and a water-trough and a wicket-gate.

7.12 Post-mortem Platform— A raised platform of 3×4 m with a roof shall be provided away from the sick animal shed for performing post-mortem examination. This shall also be away from other cattle sheds. An incinerator may be provided to incinerate the carcass of animals suffering from contagious diseases.

7.13 Concentrate- and Fodder-Godowns

7.13.1 These shall be located near other animal sheds.

7.13.2 The concentrate godown and miscellaneous rooms shall be provided to keep requirements for three months, at the rate of 0.2 m^3 per livestock unit. It shall be made rodent-proof and be provided with 3 m wide roller shutter. A *PUKKA* road shall lead to the godown to enable feed to be unloaded directly into the godown.

7.13.3 The fodder godown may be sufficient to hold two-month's requirements of hay or straw. It shall be provided at the rate of 40 m^3 per livestock unit per year. The floor of the godown may be 30 to 45 cm above ground and roof may be high gabled type to permit hay stacks to be placed therein. The roof shall have sufficient hangover to provide protection from sun and rain. The fodder godown shall be enclosed in a strong fence about 5 m away from the godown on all sides and having a lockable gate for safety from fire. A water-hydrant and other fire-fighting equipment may be provided in the compound.

7.14 Chaffing Shed

7.14.1 The chaffing shed may be preferably located near the fodder godown and shall be so positioned as to facilitate the chaffing and removal of the chaffed fodder.

7.14.2 This shall consist of two portions. One portion which shall be used for holding fodder to be chaffed, and the other portion for realising chaffed material.

7.14.3 The floor of the chaffing shed shall be sufficiently hard and preferably be constructed by cement concrete. It may have a gabled roof supported on wooden posts and trusses. The floor area shall be at least 14×4 m.

7.15 Silos — Silos are of two types, namely, tower silo or pit silo. The silos shall be constructed on elevated ground where seepage of water is encountered. The capacity and number of silos shall depend upon the number of animals and also the quantity of green fodder available. A capacity of 200 tonnes of silage shall be sufficient to feed the herd at the rate of 13 kg per day for a month. Full advantage of constructing silos shall be derived if silage is sufficient to feed for a period of about three months. The contents of each silo shall be consumed in about 3 to 4 weeks and the size of the silo determined accordingly. The silage of a good quality shall weigh 0.4 to 0.48 tonnes/m³.

7.15.1 Tower Silo — The tower silo, when adopted, shall be cylindrical in shape. The height and diameter may be about 15 m and 5 m respectively. There shall be a steel ladder to provide access to workers to enter the tower at different heights through embrasures in the main wall for filling and emptying the tower. A ramp may be provided from the ground level to entrance hatch of the tower and feed may be loaded into the silo through this door manually or mechanically. After filling, compacting and treating with fermenting materials, a polyethylene or similar impervious sheet may be stretched across the top of the ensiled mass and covered either with cement blocks or stone blocks or with a layer of soil about 30 cm thick.

7.15.2 Pit Silos — The pit silo may be of any desired length depending upon the amount of material to be ensiled, but shall be about 5 m wide at the top and 3 m at bottom and about 2 m deep. It may be constructed partly underground and partly above. It shall be situated on a gentle well-drained slope and walls shall slope outwards to some extent. Efficient drainage may be effected by means of a layer of stones with inset drain pipe placed lengthwise. The pit after filling shall be covered in such a manner that it is air-tight, water-tight, and heavy enough to assist in the compression of the mass. A layer of 15 cm earth may be sufficient enough to seal the contents of the pits. A shed may be provided over the pit for protection against sun and rain.

7.16 Paddocks

7.16.1 The paddock, which is provided for free exercise of the animals, may be attached to relevant housing sheds. Suitable trees for shade and windbreak shall be provided where climatic conditions are extreme.

7.16.2 Space per Animal — The following space per animal shall be provided for various categories of animals:

<i>Category of Animal</i>	<i>Space Required, m²</i>
Calf	5
Young stock	10
Cow	14
Buffalo	15
Down calver	20
Bull	25

7.16.3 Fencing — A wall of bricks or stone slab or railings may constitute a fence to confine the animals. The effective height of the fence shall be 1.0 m for calf; 1.2 m for cow, buffalo and young stock and 1.5 m for bull.

NOTE — Cows like that of Haryana breed should be provided with 1.5 m high fence.

7.16.3.1 Railings — The railing may be 25 mm nominal bore medium steel tube or 5 mm diameter galvanized steel wire for calves and 32 mm nominal bore medium steel tube for adults. The post to support railing may be either steel pipe of 65 mm diameter or angle iron, stone pillars, timber post of suitable sizes placed 2 m apart. The posts shall project at least 50 mm from the top rail and shall be properly embedded in a firm foundation. The rail may pass through the holes cutting the post or the rail may be riveted or U-bolted to the posts. The arrangement of the rails to the posts shall be as given in Table 1.

TABLE 1 HEIGHT OF RAILINGS FOR DIFFERENT CATEGORIES OF ANIMALS

Sl. No.	TYPE OF ANIMAL	HEIGHT FROM GROUND TO THE CENTRE OF EACH RAIL OF THE FENCE, cm			
		First Rail	Second Rail	Third Rail	Fourth Rail
(1)	(2)	(3)	(4)	(5)	(6)
i)	Calf	30	60	100	—
ii)	Cow, buffalo and young stock	40	80	120	—
iii)	Bull	40	80	120	150

7.16.3.2 Gate and shutters — The gates may have one or two shutters. The sheds to accommodate small number of animals may be provided with a gate having a single shutter of at least 1.5 m wide. To permit easy movement of vehicles and large number of animals, the gate may have two shutters each 1.5 m wide. The shutter frames shall be made of 35-mm nominal bore steel tube or angle iron or timber and shall be

provided with closely fitted vertical braces so as not to allow the head of the animal to pass through the gaps. The pillars for fixing the gate may be made from steel pipe or steel sections on which the gate shutters shall be hinged.

7.16.4 Manger and Water-Trough

7.16.4.1 Manger and water-trough may be constructed with reinforced cement concrete, brick with cement mortar or stone slabs with cement joining. These may be of one- or two-way use. A 3-m wide well paved platform shall be provided sloping away from the trough to withstand heavy treading of animals, and permit easy washing and cleaning.

7.16.4.2 The manger length at the rate of 0.6 m and water-trough length at the rate of 15 cm shall be provided for adult and half of it for young stock in one way feeding system. In two-way feeding system, these shall be halved. All the corners shall be well rounded off. The dimensions of manger shall be as given in Table 2.

TABLE 2 DIMENSIONS OF MANGER

Sl. No.	PARTICULARS	DIMENSIONS	
		Young Stock	Adult
(1)	(2)	(3)	(4)
		cm	cm
i)	Height of manger wall	75	75
ii)	Thickness of curb:		
	a) Reinforced cement concrete	6	6
	b) Brick laid in cement mortar	10	10
	c) Stone slab laid in cement mortar	6	6
	d) Wood plank	2	3
iii)	Inner width at manger floor	40	60
iv)	Height of fore-curb	60	60
v)	Depth of trough floor	30	40

7.16.4.3 Ties shall be provided for securing animals at the time of cleaning and shall be embedded 1.5 m apart into the curb side or may protrude along its top.

7.16.4.4 A ball valve shall be provided in a box in one of the corners of the water-trough. The trough shall have a small pipe outlet for draining out water. This may be mid-way of the length or near each end, if length is long. Each outlet shall have a removable plug.

7.16.4.5 Curb rails to prevent animals from entering into the manger or from throwing the feed out, may be provided. The curb rails for calves,

young stocks and adults may be 30, 40 and 50 cm respectively above and outward of the curb. The rail of 15 mm mild steel pipe shall be supported at 3 m intervals by suitable bent posts of 30 × 30 mm angle iron for calf and young stock and 40 × 40 mm for adults. For one way, a feed-saver should run along the outer curb, 20 cm above and 20 cm inwards of it.

8. DAIRY SECTION

8.0 Since from a herd of this size substantial quantity of milk is likely to be produced, suitable arrangements for hygienic handling, processing and disposal of milk shall be made. Some of these farms may act as agency for milk collection and in that case more accommodation and equipment may be provided within the dairy for bulk handling of milk. The building requirements shall be as described in **8.1** to **8.2.2**.

8.1 Milk Receiving Room — There shall be a room of 3 × 4 m in or near the milking animals shed for collecting, recording and testing of milk. The door and the windows shall be made fly-proof. The flooring of the room shall be of impervious and wear resistant. A suitable platform or a slab shall be provided for testing apparatus. A non-staining dado up to a height of 1.8 m shall be provided on inner side of the room. The milk may be received in the room through a funnel which shall be provided with a movable lid operated by foot paddle.

8.2 Bulk Milk Room and Ancillaries

8.2.1 Bulk milk room shall be near the road by which milk shall be despatched from the farm. There may be verandah on both sides. The floor area shall be related to the amount of equipment to be accommodated and to the amount of milk produced per day. The floor area of the milk room shall be at least 4 × 5 m. The height shall be at least 2.5 m throughout. The milk may be stored in cans which shall be placed in insulated tank filled to the neck of the cans with refrigerating water. The temperature of storage of milk should remain below 4.5°C in order to inhibit growth of bacteria and to prevent spoilage of milk.

8.2.2 The internal arrangement of the room shall be as follows:

- a) Batch cooler in the centre;
- b) Receiving counter at the back side verandah and testing table at the rear end of the room;
- c) Issue counter in front of the room;
- d) The boiler, if electrically operated, may be placed at one corner of utensil wash-up room, and in case of fuel operated, it may be placed at one end of the back side verandah; and

- e) An office room, compressor room, utensil wash-up room shall be arranged in one row by the side of bulk milk room.

9. CULTIVATION SECTION

9.0 To ensure proper performance of cattle and for economy of feeds it is essential that the farm produces its requirements of fodder and feed to the extent possible. The structural requirements shall be as prescribed in **9.1** to **9.2.2**.

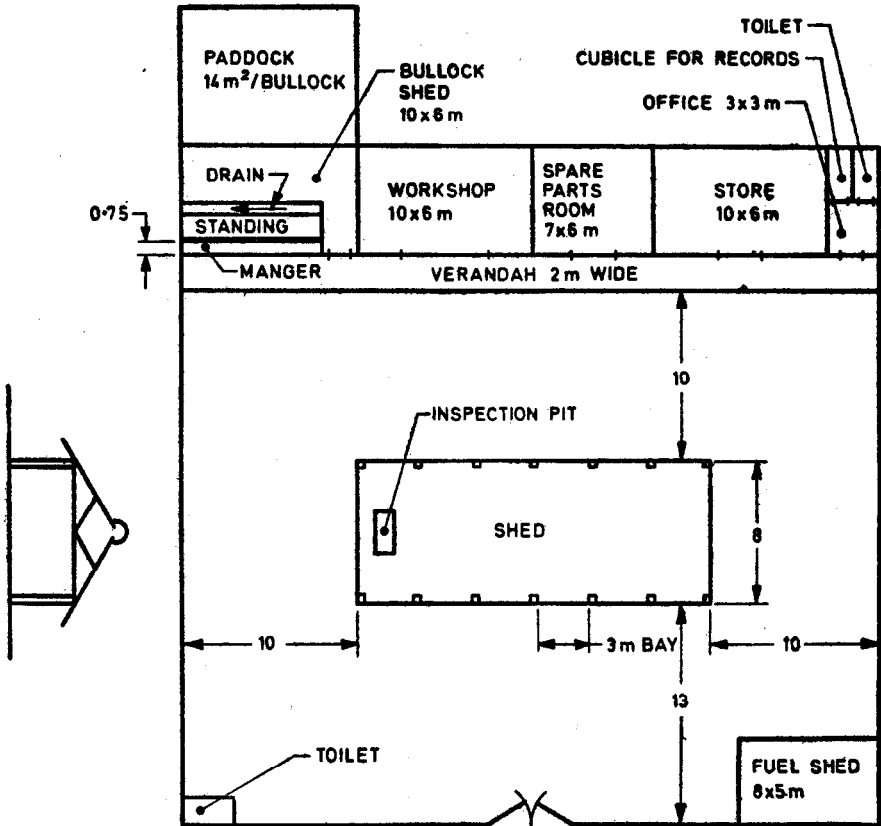
9.1 Implements and Workshop Shed

9.1.1 The shed shall be located in the centre of the compound so as to have ample moving space around the shed. The shed shall provide bays with minimum width of 3 m between the pillars for easy movement of vehicles. One of these bays shall be provided with an inspection pit. The length of the shed shall depend upon the number of vehicles on the farm. The width of the shed may preferably be 8 m. The eaves shall project out about a metre. There shall be a 10 m wide open space on the three sides and 13 m on the front side of the shed for easy turning and movement of vehicles. There shall be a 8 × 5 m fuel shed at one corner of the compound for accommodating petrol, oil and lubricant and a toilet at suitable place.

9.1.2 At one side of the compound, there shall be a shed having different rooms with 2 m wide verandah (*see* Fig. 3). Two office rooms each of 4 × 3 m for officials and their records, and toilet shall be provided. Adjacent to this, a store of 10 × 6 m shall be provided for storing seeds and fertilizers. Next in the series of rooms, shall be a 7 × 6 m spare parts and miscellaneous store room and 10 × 6 m workshop with a hatch window in the partition wall. The bullock shed shall be located at rear end with a paddock attached to it for exercise at the rate of 14 m² per bullock. All the rooms shall open in the verandah.

9.2 Disposal of Manure — Manure from cattle sheds shall be removed at least twice a day. The manure may be loaded in a trailer or cart and hauled away to the compost pits.

9.2.1 Compost Pits — As there is daily some unused hay left out, the better utilization of it may be done by composting. The number of compost pits shall vary according to the number of animals as also the area of cultivation. Each compost pit may be 4 × 2 × 1 m or 5 × 2.5 × 1 m. These compost pits shall be located conveniently for utilization of decomposed manure directly. After filling and adding starters to the pits, they should be covered with a layer of mud. The contents of the pits should be worked in order to mix them properly so that uniform decomposition takes place. Thus compost shall be ready in about 6 months.



All dimensions in metres.

FIG. 3 IMPLEMENTS AND WORKSHOP SHED

9.2.2 Liquid Manure Disposal—Mixture of sloppy dung and urine known as slurry may directly be disposed of into the field by gravity, if slope permits or by collecting and pumping in the field.

10. ADMINISTRATION SECTION

10.1 This section controlling the activities of the dairy farm shall consist of administration building and staff quarters.

11. OTHER REQUIREMENTS

11.1 The constructional details of floors, walls, doors and gates, pillars and roofs are given in Appendix A.

11.2 Mangers in the Shed— The manger shall be of continuous type. These shall be constructed with either reinforced cement concrete or brick laid in cement mortar or stone slabs. All the corners of the manger shall be rounded off and finished smooth. Mild steel rings shall be fixed at the bottom of the manger just adjacent to the floor of the standing for tethering animals. These may also be fixed on the curb of the manger or recessed into curb wall in case the curb is made of reinforced cement concrete (see Fig. 4). The dimensions of the manger for milking animals, dry animals and young stock shall be as given in Table 3.

TABLE 3 DIMENSIONS OF MANGER

Sl No.	PARTICULARS	REINFORCED CEMENT CONCRETE	BRICK LAID IN CEMENT MORTAR	STONE SLABS LAID IN CEMENT MORTAR
(1)	(2)	(3) cm	(4) cm	(5) cm
i)	Height of manger wall, <i>Min</i>	75	75	75
ii)	Height of fore-curb, <i>Max</i> :			
	a) For adults	50	50	50
	b) For calves	30	30	30
iii)	Thickness of fore-curb, <i>Min</i>	6	10	6
iv)	Inner width of manger, <i>Min</i> :			
	a) For adults	60	60	60
	b) For calves	40	40	40
v)	Depth of manger, <i>Min</i> :			
	a) For adults	40	40	40
	b) For calves	15	15	15

NOTE — Where feeding from both the sides is desired, the height of the curb on both sides of the manger shall be equivalent to (ii) and the inner width shall be double of (iv).

11.3 Lighting and Ventilation

11.3.1 Roof Lights — For cattle sheds, roof lights may be provided with the use of translucent material evenly distributed over full length of the shed.

11.3.2 Artificial Lighting — Fluorescent lighting shall be used in preference to incandescent lighting. The intensity of the artificial lighting shall be 50 to 200 lux [see IS : 3646 (Part II)-1966*] at floor level in all rooms and sheds. Overhead electric light sources shall be at least 2 m above floor level and shall be so placed as to give a good distribution of light

*Code of practice for interior illumination : Part II Schedule for values of illumination and glare index.

without glare. Switches shall be grouped in convenient positions near entrances and all switch covers shall be properly protected.

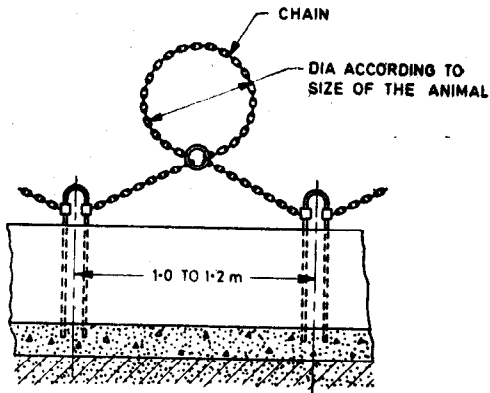


FIG. 4 TYING ARRANGEMENT

11.3.3 Ventilation — Adequate air inlets from side walls, and outlets at, or as near as possible to, the highest part of the roof shall be provided. The milk room shall be well ventilated and direction of prevailing summer wind shall be taken into account (see IS : 3103-1965*). Adequate openings shall be provided for the proper functioning of the compressors of refrigeration plants. Roof vent pipes may be used to advantage in machine rooms and in those spaces where the layout precludes through ventilation.

11.4 Water and Steam Supply

11.4.1 Water Supply — An adequate supply of wholesome water free from liability to pollution shall be provided at conveniently accessible points.

11.4.2 Steam Supply — Electrically or fuel operated boiler may be used for generating steam for dairy equipment washing. Electric boiler may be installed in the milk room.

11.5 Drainage — An adequate drainage system should be planned to include all farm dairy buildings and to deal with rain-water, surface water, cleansing water, urine, etc. The width of the drains may vary from 30 to 40 cm. A slope of 1 in 100 shall be provided to the drains. The drain may be trapezoidal or circular. The depth of trapezoidal drain shall be 6 cm towards the standing and 7.5 cm towards outside and depth of circular drain shall be 10 cm in the centre. The site surrounding the building be free from depression.

*Code of practice for industrial ventilation.

APPENDIX A

(Clause 11.1)

CONSTRUCTIONAL DETAILS

A-1. FLOORS

A-1.1 Cement Concrete Flooring — Floors in dairy buildings shall be non-slip, non-porous; and resistant to abrasion, impact, corrosion and acid attack. The floor shall not crack or flake or dust and shall be durable. For health and comfort of both persons and animals, suitable damp-proofing treatment should be provided (see IS: 1609-1966* and IS: 3067-1966†). The detailed method of laying cement concrete floor finish, size of panels, methods of curing and protection against dampness shall conform to the provisions given in IS: 2571-1963‡.

A-1.1.1 Skirtings — Where required, floor finishes may be continued for a distance of at least 15 cm up to the wall to form a skirting with a 8 cm radius cove at the junction of the floor and the wall.

A-1.2 Brick-on-Edge Flooring — The sub-base for this type of flooring shall be of stone or brick aggregates which shall be hand-packed, watered and well-rammed. A layer of 10 cm of lime concrete shall be spread over the sub-base, well-rammed and shall be allowed to set for 7 days. The bricks shall be well burnt and of good quality (see IS: 3583-1966§) and shall be well soaked in water before laying. Bricks shall be laid on 12 mm thick cement or lime mortar bed and each brick shall be properly bedded on edge and set home by gentle tapping with handle of trowel or wooden mallet. Its inside faces shall be buttered with mortar before the next brick is laid and pressed against it. On completion of a portion of flooring the vertical joints shall be fully filled with the mortar from the top. The surface of the flooring during the laying shall be frequently checked with a straight edge at least 2 m long so as to obtain a true surface with the required slope. The surface of the flooring shall be kept constantly moist for minimum period of 7 days. In the case of fat lime mortar, curing shall commence two days after the laying of the flooring and shall continue for 7 days. The bricks may be laid in rows having the joints parallel and at right angles to the walls or in herringbone pattern.

A-1.3 Stone-Slab Flooring — The stone slabs shall be hard, sound, dense and shall conform to IS: 3622-1966||. Apart from sand stone

*Code of practice for laying damp-proof treatment using bitumen felts (*first revision*).

†Code of practice for general design details and preparatory work for damp-proofing and waterproofing of buildings.

‡Code of practice for laying *in situ* cement concrete flooring.

§Specification for paving bricks.

||Specification for sand stone slabs for use in flooring.

any other good quality stone slabs may be used according to the availability of the material. The sub-base shall be of stone or brick aggregates which shall be hand-packed, watered and well-rammed. A layer of 10 cm of lime concrete shall be spread over the sub-base, well-rammed and shall be allowed to set for 7 days. The lime concrete bed shall be cleaned, wetted and mopped. The bedding for the slabs shall be with cement mortar 1 : 5 (1 cement : 5 coarse sand) or with lime mortar 1 : 1 : 1 (1 lime putty : 1 *SURKHI* : 1 coarse sand). The average thickness of the bedding mortar under the slabs shall be 20 mm and the thickness at any place under the slabs shall not be less than 12 mm. The mortar shall be spread under the area of each slab. The stone slab shall be washed before laying. It shall be laid on top, pressed. The thickness at any place under the slabs shall not be less than 12 mm and grouted, so that all hollow space underneath gets filled and surplus mortar works up through the joints. The top of the slab shall be tapped with a wooden mallet and brought level and close to the adjoining slab with thickness of joint not exceeding 5 mm. After laying each slab surplus mortar on the surface of slab shall be cleaned and joints finished flush. Subsequent slabs shall be laid in the same manner. The joints shall be raked out uniformly to a depth of 12 mm when the mortar is still green and pointed with cement mortar. The pointing shall be cured for a minimum period of 7 days. The surface of the flooring as laid shall be true to a level and shall be of the desired slope. Slight unevenness at the meeting edges of slabs shall be removed by fine chiselling.

A-1.4 Ramps — Ramps should be constructed in such a way that the slope does not exceed 1 in 8 and the surface should be rough enough to provide adequate grip for the hooves.

A-2. WALLS

A-2.1 Material — The walls shall be constructed from either good quality brick or hollow concrete blocks.

A-2.2 Construction of Walls — Brick walls shall be built in accordance with IS : 2212-1962* and hollow concrete block walls shall be built in accordance with IS : 2572-1963†.

A-2.3 Wall Finishes — Walls should be finished smooth with cement plaster or lime plaster in accordance with IS : 1661-1960‡ or IS : 2394-1965§, respectively.

*Code of practice for brickwork.

†Code of practice for construction of hollow concrete block masonry.

‡Code of practice for cement and cement-lime plaster finishes on walls and ceilings.

§Code of practice for application of lime plaster finish.

A-3. DOORS AND GATES

A-3.1 Doors — Farm buildings may be classified as residential, offices, laboratories, godowns, cattle sheds and enclosures. These shall be provided with doors or gates as required for access to rooms, godowns, sheds and enclosures.

A-3.1.1 Openings for Rooms — Openings for rooms shall be fitted with single hung or double-hung shutters which may have fly-proof net or glass or wood panels. Fly-proof shutters shall be self-closing. Timber shutters and steel doors shall conform to IS:1003 (Part I)-1966* and IS : 1038-1968† respectively.

A-3.1.2 Openings for Godowns — Both internal and external doors in godowns shall have top-hung sliding shutters with angle iron frame and galvanized steel sheet face and be close to the walls and floor as not to permit passage for vermin. The doors may be 2.5 m high and 2 m wide and may have one or two sliding shutters. Alternatively, the opening may be provided with rolling shutter.

A-3.1.3 Openings for Calving Boxes and Sick Lines Rooms — The door 2 × 1 m shall generally have a single shutter of angle iron frame and galvanized steel sheet face, split in lower and upper halves which may be secured or kept open independent of each other. Better aeration may be provided by substituting expanded metal sheet in the upper half of the shutter.

A-4. PILLARS

A-4.1 Pillars may be built either of stone slabs or bricks laid in cement mortar or cast iron pipes or timber post. Each of them shall be placed at intervals of every two or three standings depending upon the width of each standing. The approximate size of pillars for different material may be as given below:

<i>Material</i>	<i>Size of Pillar</i>
Brick	40 × 30 cm
Timber:	
a) Square pillar	10 × 10 cm
b) Round pole	15 cm dia
Stone slab	10 × 10 cm or 8 × 15 cm
Iron pipes	10 cm dia

*Specification for timber panelled and glazed shutters: Part I Door shutters (first revision).

†Specification for steel doors, windows and ventilators (first revision).

A-5. ROOFS

A-5.1 Type — The roof may be either of gable or flat on double-row milking sheds or lean-to on the single-row milking shed. The pitch of the lean-to type roof may be ranged from 22 to 30° depending upon the material used.

A-5.2 Material — The roof material may be corrugated asbestos cement sheets (*see* IS : 459-1962*), galvanized steel sheets (*see* IS : 277-1969†) or tiles (*see* IS : 654-1962‡). These may be supported by wooden or steel trusses. The metal roof structures shall be well cleaned and painted [*see* IS : 1477 (Part I)-1959§ and IS : 1477 (Part II)-1959||]. The roofing material shall be fixed in accordance with IS : 3007 (Part I)-1964¶ and IS : 3007 (Part II)-1965** or IS : 2858-1964††.

A-5.3 Eaves Projection — Eaves shall project out at least 75 cm away from the pillars or walls. In regions where extreme climatic conditions prevail, the eaves may project out 100 to 150 cm in order to afford protection to animals from hot and cold winds.

A-5.4 Ceiling — Milking shed, receiving rooms, milk rooms and utensil wash-up rooms shall have dust-proof ceilings finished in light coloured paint. The material used for ceiling should not deform under damp conditions and should allow dust-proof construction.

*Specification for unreinforced corrugated asbestos cement sheets (*revised*).

†Specification for galvanized steel sheets (plain and corrugated) (*second revision*).

‡Specification for clay roofing tiles, mangalore pattern (*revised*).

§Code of practice for finishing of iron and steel/ferrous metal in buildings: Painting and allied finishes: Part I Operations and workmanship.

||Code of practice for finishing of iron and steel/ferrous metal in buildings: Painting and allied finishes: Part II Schedules and equipment.

¶Code of practice for laying of asbestos cement sheets: Part I Corrugated sheets.

**Code of practice for laying of asbestos cement sheets: Part II Semi-corrugated sheets.

††Code of practice for roofing with mangalore tiles.

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