

Establishments: design, facilities and equipment

- Establishments should be located, designed and constructed so that contamination of meat is minimized to the greatest extent practicable.
- Facilities and equipment should be designed, constructed and maintained so that contamination of meat is minimized to the greatest extent practicable.
- Establishments, facilities and equipment should be designed to allow personnel to carry out their activities in a hygienic manner.
- Facilities and equipment that are in direct contact with edible parts of animals and meat should be designed and constructed so that they can be effectively cleaned and monitored for their hygiene status.
- Suitable equipment should be available for control of temperature, humidity and other factors as appropriate to the particular processing system for meat.
- Water should be potable except where water of a different standard can be used without leading to contamination of meat.

Design and construction of lairages

Lairages should be designed and constructed so that:

- animals can be held without overcrowding or injury, and are not exposed to climatic stress;
- there are appropriate layout and facilities for cleaning and/or drying of animals;
- ante-mortem examination is facilitated;
- floors are paved or slatted and allow good drainage;
- there is an adequate supply and reticulation of clean water for drinking and cleaning, and facilities are provided for feeding where necessary;
- there is a physical separation between lairages and areas of an abattoir where edible material may be present;
- “suspect” animals can be segregated and examined in separate areas. These areas should include facilities that are capable of secure holding of “suspect” animals pending slaughter under supervision, and should have separate and contained drainage; and
- there is an adjacent area with adequate facilities for cleaning and sanitation of transport vehicles and crates, unless there are facilities within close distance that are approved by the competent authority.



These facilities should be:

- constructed so that all parts, gut contents and faeces from condemned animals can be held under secure containment as appropriate to the circumstances; and
- constructed and equipped so as to facilitate effective cleaning and sanitation.

Design and construction of slaughter areas

Where these facilities exist they should be:

- easily accessed from pens containing "suspect" or injured animals;
- constructed with suitable facilities for hygienic storage of parts derived from "suspect" or injured animals; and
- constructed and equipped so as to facilitate effective cleaning and sanitizing.

Design and construction of areas where bodies of animals are dressed or meat may otherwise be present

Rooms and other areas in which bodies of animals are dressed or meat may be present should be designed and constructed so that:

- cross-contamination during operations is minimized to the greatest extent practicable;
- effective cleaning, sanitation and maintenance can be carried out during and between periods of operation;
- floors in areas where water is present slope sufficiently to grilled or otherwise protected outlets so as to ensure continual drainage;
- exterior doors do not open directly into the area;
- chutes separately conveying different parts of animals are fitted with examination and cleaning hatches where these are necessary for sanitation;
- separate rooms are used for skin-on dressing of pigs or other animals, when other classes of animals are being dressed at the same time;
- separate rooms are used for:
 - emptying and cleansing of alimentary tracts, and further preparation of clean alimentary tracts, unless such separation is deemed unnecessary;
 - handling of meat and inedible parts of animals after they have been so designated, unless these products are otherwise separated by time or distance;
 - storage of inedible animal parts such as hides, horns, hooves, feathers and inedible fats;
- there is adequate natural or artificial lighting for hygienic process control;
- there are appropriate facilities for the preparation and storage of edible fats;
- access and harbouring of pests are effectively restricted; and
- adequate facilities are provided for secure storage of chemicals (e.g. cleaning materials, lubricants, branding inks) and other hazardous substances so as to prevent accidental contamination of meat.



INTRODUCTION

This section is concerned with the nature of the physical environment in which the slaughter and processing of meat animals take place and its contribution to the risk of contamination of meat. Recommendations cover all stages of the process, from intake of live animals, through slaughter, to meat cutting and packing. Most establishments for slaughtering/processing meat animals will be permanent, and careful planning is necessary to ensure that the design and fabric of the buildings, facilities and equipment are conducive to minimizing contamination risk. This planning includes the choice of location (in an area free from airborne contaminants, prevalence of pests and likelihood of flooding), the layout and materials used and the equipment installed. It also concerns the provision of suitable services, e.g. water supply, service roads and the physical means of transporting meat hygienically.

An abattoir is a food factory and the essential elements in general food hygiene apply. In the context of this section, this relates to product flow, materials used in construction, facilities for separation and storage of edible and inedible products, and cleaning. The slaughter animal is a reservoir of micro-organisms present on the coat and in the gut, whereas meat from a healthy animal is generally considered to be intrinsically sterile. This gives rise to the concept of “dirty” and “clean” areas of the plant and the objective is to separate them as best possible. However, there will always be a “grey” area where edible meat is exposed in the presence of dirty components, and here minimal risk is achieved through best practice; these risks cannot be designed out.

In many developing countries lack of appropriate slaughtering facilities and unsatisfactory slaughtering techniques may cause unnecessary losses in meat as well as in valuable by-products, and may be a major constraint to improving animal production. Animals are slaughtered in places that are frequently polluted with blood, intestinal contents and dirty effluents, and which are not protected against insects, rodents and dogs. Meat produced under such conditions will quickly deteriorate because of the bacterial load and could cause food poisoning. In the absence of inspection, meat from sick or parasite-

infested animals may well be a vector for spreading diseases affecting human beings as well as animals. Furthermore, meat quality is adversely affected by careless handling under unsanitary conditions in the meat market or shops. In addition, by-products are not properly utilized and, instead of being an asset, are considered a nuisance.

The establishment of slaughter facilities of a sufficiently high standard – but which are still simple and inexpensive – would improve the situation. When establishing slaughterhouses, each country or even each locality must adopt a solution based essentially on specific local conditions.

FAO (1988) has provided designs for small-scale modular slaughterhouses. Each module is small in size and deals with a specific activity. There are also a number of options available within the different modules (such as construction materials and methods of treatment of by-products). Each module has its own bill of quantities and can be costed separately.

The central module is the slaughter floor, which is technically equipped for killing cattle, sheep, goats and pigs. Other modules can be added to this slaughter floor for operations such as by-product utilization, meat preservation, processing and butchering.

Projects addressing all links in the production chain are more successful than those that focus on a single activity. Designs therefore include a meat market, in order to facilitate the integration of production, processing and marketing.

This section includes operational procedures for the facilities, but these may have to be modified to accommodate local conditions and customs. A case in point is the level of slaughter numbers. Depending on the number of staff and the hours worked, the throughput of animals per day can be varied from that given.

Slaughterhouses are a key element in the meat production and distribution chain, but it is essential to provide adequately trained staff to improve slaughter hygiene and meat quality, reduce raw material losses, increase utilization of by-products, and thereby increase profitability and financial returns to livestock producers.

Provision can be made in the basic design for slaughter of all species, namely, cattle (or

buffalo), sheep, goats and pigs; however, because of space limitations, concurrent slaughter of different species is not possible. The abattoir capacity will depend on the mix of animals being slaughtered. Daily throughputs of approximately five large stock (e.g. cattle) or 50 small stock (sheep, goats or pigs) or a combination thereof, represent a practical maximum for small-scale modular slaughterhouses.

GENERAL PRINCIPLES

- There should be provision of an area for the containment of animals prior to slaughter (a designated “lairage”).
- There must be physical separation of areas for holding items designated as “dirty” (live animals, inedible by-products) and as “clean” (edible meat).
- Workrooms, structures and equipment should be designed and constructed to allow effective cleaning and monitoring of hygiene status.
- Facilities for personnel should include changing rooms, toilets with hand-washing

and drying facilities, showers and a separate room for eating and drinking.

- Suitable conditions must be provided for the preparation and storage of meat.
- A maintenance programme must be followed to ensure that facilities and equipment are up to standard.

Lairages

The lairage provides temporary housing for animals prior to slaughter and its design should take account of the following three needs: animal welfare; maintaining cleanliness; and separation of sick or “suspect” animals. It must be designed and constructed to allow the following physical activities:

Animal activities	Human activities
Eating	Ante-mortem inspection
Drinking	Droving and sorting
Lying and resting	Cleaning
Comfort movement	

Key elements in lairage design are:

- sufficient light for satisfactory ante-mortem inspection;
- floors that drain easily and do not compromise the cleanliness of animals’ coats;
- no sharp objects, corners of walls, etc. that could injure animals;
- isolation pen available for containment of sick or “suspect” animals, with separate drainage;
- physical separation of lairage (“dirty” area) from the area where edible products are produced (“clean” area).

The welfare of animals in the lairage has important consequences for carcass hygiene because stressed animals shed more bacteria, including pathogens.

STUNNING AND BLEEDING AREA

- There must be provision to constrain an animal sufficiently to allow best practice stunning (Section 7). The design must allow rapid shackling and bleeding of the stunned animal in order to meet welfare criteria.
- The bleeding area should have a contained drainage area for blood or blood should be collected in a receptacle; floors should be kept as clean as possible.

PHOTO 10.1
GOOD PRACTICE:
stainless steel
apron wash with
knife sterilizer



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PHOTO 10.2

GOOD PRACTICE:
cattle stunning pen with raised grid to keep stunned animals off the floor and reduce coat contamination

- This area should be physically separated from the dressing area to minimize the risk of cross-contamination of exposed meat.

Dressing area

The dressing area is used for the skinning, evisceration and final carcass-preparation stages for cattle and sheep, and for the scalding, dehairing, evisceration and polishing stages for pigs. This is an area where exposed meat is



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PHOTO 10.4

Avoid: *cracked tiles: they can provide a refuge for micro-organisms*

PHOTO 10.3

A simple receptacle for catching the blood of cattle



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produced, so contamination from the exterior must be prevented: exterior doors should not open directly to the area and there should be measures to prevent access by insect and vertebrate pests.

Key elements in the design of this area are:

- Walls and surfaces must be smooth and impermeable to facilitate cleaning.
- Floors must be inclined sufficiently to allow continual drainage to covered drains.
- The layout must prevent cross-contamination – processing routes of inedible “dirty” products (skins, inedible by-products) should not cross the line carrying dressed carcasses.
- The angles between walls and floor, and between adjoining walls, where dirt could accumulate, should be covered.
- Structures and equipment that directly contact edible meat must be designed to allow thorough cleaning and disinfecting.
- Separate rooms must be available for the simultaneous dressing of pigs and ruminant species.
- There must be a separate room for the emptying and cleansing of alimentary tracts if



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PHOTO 10.5
**A scald tank
and associated
dehairer for
pigs**

these are prepared as an added-value product.

- Separate containers for inedible by-products must be provided and these must be stored in a separate room.

Refrigeration

The importance of good refrigeration facilities cannot be overemphasized. If meat is not preserved by any other means soon after slaughter, temperature control is vitally important in controlling the survival and growth of both spoilage and pathogenic organisms.

Adequate facilities must be provided for the chilling (or freezing) and storage of carcasses and meat. Storage should be in accordance with written specifications and the temperature of the ambient air and meat should be monitored.

Walk-in chillers should have good artificial lighting to allow safe movement of products

and to facilitate identity checks and other specific activities.

Cutting rooms

The result of boning and cutting operations is exposure of numerous cut surfaces of meat that are liable to become contaminated by micro-organisms. It is imperative, therefore, that all tables and surfaces, all cutting equipment including knives, and the hands and clothing of operatives be cleaned and kept clean. To this end, adequate washing and sterilization (for knives and tools) facilities must be available.

Design features that are important in a cutting room are:

- controlled temperature to minimize the growth of micro-organisms;
- cutting surfaces in a material that can be thoroughly cleaned and that does not harbour remnants of meat tissue or fluids;
- a separate storage facility for packaging material and separation of the butchery and wrapping area from the packaging area.

Equipment

Modern equipment for the meat industry is designed to accommodate the need to be cleaned and sterilized; much is manufactured from stainless steel or other non-rusting metal alloys. Water from wash stations used for equipment and from sterilizers should duct directly to drains.

Separate and clearly identified equipment must be used for inedible and condemned parts or tissues of the animal.

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