SLAUGHTER HOUSE
(Design, facilities and equipment)

INTRODUCTION

Most establishments for slaughtering/processing meat animals will have to 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. 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 need and availability of resources. 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. 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.
- 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 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 coved.
- 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 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.

Reference:

FAO/ WHO. 2004. Draft code of hygienic practice for meat. In *Report of the 10th Session of the Codex Committee on Meat Hygiene*. Alinorm 04/27/16. Rome

---- X ----