Training Manual for Meat Handlers/Butchers
Training manual for meat handlers / butchers

Duration of the course: - One month
Eligibility: - Meat handler / butcher with minimum 10th pass
Prepared by
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Hyderabad
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Chapter 1. Training Requirements of Meat Workers

Food safety is the practice of making sure that people have the healthy food they need for an active and healthy lifestyle. A food borne illness is caused by consumption of food contaminated with microorganisms such as bacteria. The other risk associated with food safety is chemical contaminants comprising environmental chemicals, veterinary drug residues, heavy metals and other residues, which are unintentionally or accidentally introduced into the food supply during farming, processing, shipping or packing.

Meat and meat products have been implicated in many cases of food borne illness. Pathogenic microorganisms are found in the digestive tract of healthy animals. These microorganisms are excreted in the faeces and can be found on the hides and fleeces of the live animal. Bacterial contamination of the fleece/hide can be transferred onto previously sterile meat surfaces during slaughter and dressing and may result in illness. Many chemicals and drugs are used in prevention and control of animal diseases and also for enhancing production and growth in animal husbandry. Some of these have potential to end up as a residue in meat.

The potential for food to become contaminated with microorganisms or chemical substances starts from the time it is harvested and continues right through until the time it is eaten. Hence, the quality and safety of animal foods depends on the efforts of everyone involved in the complex chain of animal production, processing, transport and consumption. Maintaining the quality and safety of food throughout the food chain requires both operating procedures to ensure the wholesomeness of food and monitoring procedures to ensure operations are carried out as intended. Hence, all the stakeholders in meat production - farmers, live animal traders, processor, retailers and consumers must be informed / trained about the details of safe handling of meat.
a. Animal traders

The transport animals from farm/market to should avoid injury and suffering, and ensure the safety and welfare of the animals. Only by ensuring that the animals are managed in a responsible manner, the demands for guaranteed, wholesome, environmental and animal welfare friendly meat products could be met. The animal traders could contribute to food safety by handling and transport animals in the stress less manner. The avoidance of stress in the period immediately prior to slaughter is important for economic reasons of meat quality as well as for animal welfare reasons. Poor welfare of meat animals during transport may lead to the conditions like abnormal meat colour, pale soft exudative (PSE) pork, dark firm dry (DFD) meat in pork, beef and lamb, poor shelf life, bruising, torn skin and broken bones in poultry.

Information about the following will be helpful to animal traders to ensure safety and welfare of animals during transit

- Loading and unloading of animals
- Stocking density in the transport vehicle
- Bedding material
- Rest and feeding during transport
- Treatment of ill animals during transit

b. Meat processor

People, who process, pack and transport meat and meat products must make sure that meat is handled appropriately and kept at proper temperatures. Storage facilities must be kept clean. Grocers and those who prepare and serve meat products at restaurants are responsible for using proper food safety procedures.

It is the meat processing industry's responsibility to meet consumer expectations that their products are safe, and meet all legal requirements. Food processors must have knowledge on modern quality management systems such as Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Points (HACCP) and Quality Assurance Standards to ensure the quality and safety of the products they produce.

Training meat processors on the following key areas will ensure welfare of the animal, in addition to quality and safety of the products they produce.

- Laitage design- floor space, ventilation, drainage, bedding material
• Feeding and watering during pre-slaughter phase, duration of holding and fasting before slaughter
• Pre-slaughter handling
• Importance of proper slaughter and dressing
• Animal welfare
• Microbes and food safety
• Personal and working environment hygiene
• Procedure for sterilizing knife, utensils and equipment
• Temperature control - Critical storage temperatures (chilled and frozen), thawing, monitoring temperature, signs of food spoilage.
• GMP/HACCP/Quality standards
• Byproducts utilization and waste disposal

c. Abattoir and meat processing worker

Abattoir workers handle many hundreds of animals each year and because of this some may become complacent about the risks associated with handling animals. Cattle, irrespective of age or size, have the potential to cause serious harm. Employee in the slaughtering work is more likely to be injured than the average person at work. Some kinds of accidents such as slips and falls or knife injuries are very common. These risks are foreseeable and provision should be put in place to manage them. Identifying hazards, risks and planning & setting performance standards will definitely reduce the numbers of accidents. All employees, especially abattoir and meat processing workers, need to receive training to ensure competence in health and safety aspects of their job. To safeguard the health of the meat industry workers and avoid zoonotic diseases, routine vaccinations against communicable disease should be administered.

d. Meat traders/Retail outlets

In India meat is mostly marketed in the form of fresh, hot carcass meat through retail shops. Meat traders should be given adequate training for safe and hygienic handling of meat especially on the following aspects

• Basic infrastructure: proper flooring, water supply, lighting, drainage, cutting board, files and dust proof enclosures and other basic requirements
• Microbes and food safety
• Transport and handling of carcass/meat
- Personal hygiene and hygienic practices
- Procedure for sterilizing knife, utensils and equipment
- Keeping working area clean and hygienic
- Solid and liquid waste disposal
Chapter 2. An Overview of Indian Meat Sector

Food animals are those animals that are considered for human consumption. They are mainly from among those that consume food such as hay, straw, roots or grain, e.g. cattle, buffalo, sheep, goat and pigs. Among the marine animals the fishes with scales and fins are widely considered wholesome. In addition, poultry has become a major meat producing species.

Food animals technically are those permitted by the law and defined under the law or those, which are not defined under the law but consumed by the local people as an age-old tradition. There is also a geographical and religious aspect in food animals. Horseflesh is consumed in Belgium, Holland, Denmark and Germany. Dog flesh is consumed in northeastern states of India, Muslims do not eat pork, or Hindus do not eat beef like wise.

Meat is normally regarded as the edible part (muscle and the organs) of food animals. Meat consumption practices are based on Geographical disposition, availability of animals, religious practices, and rituals and customs of the population. Conventional food animal of one community may not be conventional for the other. The non-conventional meat consumption patterns are as here under:

1. Horse flesh consumption (Hippophagia) - Russia, Denmark, Belgium, Holland and Germany
2. Dog flesh consumption (Canophagia) - Korea and some parts of North-Eastern states of India
3. Flesh of Hippopotamus, Rhinos, Ostrich and Elephants - Tribal African people
4. Flesh of Seal, Caribou and polar bear- Eskimos and Canadians
5. Flesh of whales- Norway and Japan
6. Frogs and Scorpions consumption- China, Japan and U.S.A.
7. Flesh of Crocodile and Emu - Australia
8. Monkeys of various species - Asians of tropical and sub-tropical regions and Africans, etc.

Livestock plays a pivotal role in the rural agrarian economy of India. Millions of small and marginal farmers and landless labourers are solely dependent on animal production for earning their livelihood. Animals represent a dependent protein bank for human in the form of milk and meat. Meat foods play a very imperative role in human health by providing all essential
nutrients needed for growth and maintenance. Buffalo, sheep, goat, pig and poultry are most important meat producing animals. India produces about 6.3 million tons of meat annually from all species comprising buffalo meat (1.5 million tons), beef (1.28 million tons), chicken (2.20 million tons), duck meat (0.07 million tons), goat meat (0.53 million tons), sheep meat (0.24 million tons), and pig meat (0.50 million tons). The contribution of meat from buffalo is about 23.33%, Cattle 17.34%, sheep 4.61%, Goat 9.36%, pig 5.31%, poultry 36.68% and other species 3.37%.

Meat for domestic requirement is met through 3,600 licensed slaughterhouses owned by local bodies and about 26,000 unregistered locations. Traders/individual butchers buy their animals from weekly livestock markets and supply/bring them to the slaughterhouse, which cater to the wet markets. The carcass and edible byproducts are sold fresh without chilling to consumer during day time through the retail shops located in the residential areas. In case of chicken, live birds are slaughtered in front of consumer and marketed.

There are about 55 modern integrated abattoirs are owned and operated by meat exporters. These export oriented meat processing plants involved mostly in slaughter and processing of buffalo and few in sheep and goat and poultry. These plants have fully mechanized slaughter line, in-house quality laboratory, byproduct rendering plant and effluent treatment units. Quality adherence standards are well adhered in these plants. Currently India is exporting meat to about 64 countries. In 2013-14, India exported buffalo meat valued Rs. 26,457 crores.

I. Potentials of Indian Meat Sector:

The demand for meat and meat products in the country is increasing due to current rapid urbanization, increasing income level, change in life style and increase in the health awareness. The per capita per day availability is only about 10 g as against the per capita requirement of 25-30 g meat per day (ICMR). The gap between requirement and consumption is indicative of an urgent need for increasing meat production in the country to meet the ever increasing internal demand of our huge population. Besides, there is scope for export of meat, which fetch valuable foreign exchange.

Naturally reared animals: The livestock in India is reared on green pastures and agricultural crop residues. There is no practice of using hormones, antibiotics or any other chemicals to promote growth and fattening of livestock. The Indian Buffalo meat is 93% chemically lean. India is fortunately free from most of the trade related diseases like Rinderpest, Contagious
Bovine Pleuropneumonia (CBPP), etc. India has also not reported Bovine Spongiform Encephalopathy (BSE).

Very low slaughter rate: It is estimated that about 8% cattle, 10% buffaloes, 48% sheep, 38% goats and 89% of pigs are slaughtered each year. When compared to the world average in slaughter rates, there is a large potential for improvement of productivity of meat from different species.

II. Bottlenecks in Indian meat sector

The major constraints for the meat industry are lack of scientific approach to rearing of meat animals, unorganized nature of meat production and marketing, socio-economic taboos associated with meat consumption, inadequate infrastructure facilities and poor post-harvest management.

Unorganized domestic meat sector: The Indian meat sector could be described largely unorganized as the main stakeholders are resource poor and lack of awareness among the persons involved in this sector. Infrastructure for meat animal marketing, slaughter and processing is inadequate and exploitation by middlemen compounds the prospects of this sector and reduces the realization value of the farmers produce. Most of the slaughterhouses of local bodies lack basic facilities for hygienic slaughter and utilization of byproducts profitably. Though byproducts are being collected by some private agencies for processing to value added products, but waste such as blood and rumen contents are getting accumulated in the premises and result in odour and pollution problems affecting image of the meat sector. Most of the shop meant for retail sale of meat has little or no basic facilities for different operations to be performed hygienically and in aesthetic manner where the present-day modern quality conscious consumer could buy meat willingly.

Poor meat yield and quality: Despite of having the largest livestock resource, the present meat production of India is around 6.3 million tones as compared to world's 272 million tones. Poor exploitation of vast genetic base, indiscriminate and inbreeding, lack of grazing land, inadequate feeding resource and slaughter of immature animals lead to poor meat yield. Further, the age of the animal has significant effect on carcass composition and meat quality. Meat produced in India is largely byproduct of livestock especially beef and buffalo utilizing spent animals at the end of their productive life, although few species like sheep, goat, pigs and poultry are primarily reared for meat production. Meat from such aged animal is usually dark, tough and fibrous.
Now-a-days, consumers are demanding quality meat with more emphasis on tenderness, which is often not obtained from the aged and spent animals.

Traditional meat eating habit: Indian consumers prefer to buy fresh hot meat. They have the opinion that the child cold meat is old one. The acceptance of pre-packed, chilled or frozen meat concept is taking long time even in metros and big towns.

Animal welfare issues: Least importance is paid in handling, loading, transporting and slaughtering of food animals. Consequence to ill treatment of animal led to banning of leather goods from India in the year 2000. Little or no infrastructural facilities available for providing rest/feeding during transit of animals. Further stunning is not at all practiced prior to slaughter of animals.

III. Interventions to overcome the constraints in meat sector development:

There is urgent need to take advantage of liberalized world trade to benefit the Indian meat industry by harmonization of standards, incentive to farmer for quality livestock production, stringent quality control measures, develop long-term strategy for exports, regular monitoring for chemical residues and microbial quality in compliance to sanitary and phytosanitary (SPS) measures.

Improved animal husbandry practices: Though many of our breeds are known for good growth rate and productivity, their low performance in field condition is due to poor exploitation of genetic potential, little stress on selection of animals used for breeding and frequent intermixing takes place among breeds. Farmers should be encouraged to grow animals till they attain their full growth. Efforts to identify and utilize the crop residues and agro industrial by-products as feed resource to tackle the shortage in conventional feed sources. Feed compounding mills capable of incorporating crop residues, tree leaves and natural vegetation in the feed mixtures should be set up in the rural areas. Educating farmers on breeding, feeding and health care management (medication and vaccination), modern husbandry practices together with knowledge on market-oriented production systems will help in producing good quality meat, which can fetch better price.

Conservation and sustainable supply of meat animals through backward and forward linkage: The increasing export of frozen buffalo meat confirms the scope for increasing meat production through systematic rearing of male buffalo calves for meat production. It has almost 3-4 fold cost advantage over goat or chicken meat. In India, every year, about 10 million male
calves are removed from the buffalo production system due to intentional killing by the farmers to save dam's milk due to non-remunerative cost of raising male animals. These calves could be salvaged for meat production, which will not only improve the economic condition of the farmers but also increase meat production. Intensive feeding of male buffalo calves of 6 - 8 months on high protein/high energy diet, put on a weight of 120 kg in 4 months. Meat from such animals is tender, lean, and juicy. Most animals originate from small herd farmers with average 1 - 5 animals. For the meat sector to grow, there is a need to meaningfully integrate these small herd farmers into community farming. Backward integration should be established with farmers for raising buffaloes by providing health, feeding and extension management services at their doorsteps. The meat plant should buy back them at remunerative prices.

Establishing organized production and marketing structures: Setting up the meat production on organized framework can help significantly enhance the meat production to meet the increasing domestic and export demands. There is a need for improving slaughterhouses not only for producing hygienic meat and edible offal but also for producing hide and skins without 'flat' cuts. It should be made mandatory for each local body to include place for slaughterhouse in the master plan. Further, financial assistant should be provided to local bodies for improvement/modernization of existing slaughterhouses with basic facilities. Similarly, private entrepreneurs need to be facilitated to take up slaughter and meat production activities for domestic and export market. Promotion of rural slaughterhouse at the animal production area will bring more remuneration without much interference of intermediaries.

Reduction of post-harvest loss: Lack post-harvest processing and storage structure is rampant especially in meat production and processing. This is resulting in wastage of valuable animal meat and byproducts. Due to lack of proper cold storage facilities meat is forced to sell on the day of production, many times at lower price at the end of the day. Providing post-harvest processing structures and storage facility can help in strengthening the marketing chains and will reduce post-harvest losses.

Promotion of processed meats: A very large proportion of meat animals particularly buffaloes, sheep and goat are spent (aged/old) animals whose meat is generally tough and less palatable but more suitable for processing to products both on economic and quality considerations. With the rapid growth in poultry industry availability of layer and broiler hens as culls has also increased which could be beneficially utilized for products processing to the benefit of producer and
consumer. Thus, organized development of processed meat sector is important to realize full benefits from meat animal, and contribute for sustained meat production. The growth of processed meat sector assures the farmers a regular off take of their produce at reasonable prices and provides a variety to the consumer. This is more so in poultry sector, when the market prices fall due to excess supply. Poultry could be processed and stored to be released into market at an appropriate time and farmer's returns could be protected to sustain his operations. In addition, employment potential would be substantial.

Establishment of disease free zones: Effective disease surveillance mechanisms and establishment of disease or pest free zones for export marketing is need of the hour. India is fortunately free from most of the trade related diseases listed at List 'A' of the Office International des Epizooties (OIE), namely, Rinderpest, Contagious Bovine Pleuropneumonia (CBPP), etc. India has also not reported Bovine Spongiform Encephalopathy (BSE). However, Foot and Mouth Disease (FMD) is still prevalent in an endemic form in some States of India. Similarly, the presence of parasitic sarcocysts is a problem in meat export. Regionalization is one of the ways to address this challenge. Regionalization entails creation of disease-free zones within geographical boundaries based on homogeneity of production in an exporting country.

Animal identification and traceability (from the farm to the fork): International trade for food products is rapidly changing and tariff barriers are no more major element for market access. Non-Tariff Barriers (NTB) have emerged during recent years as a major tool for international trade for agriculture food products. Among NTB, Sanitary and Phytosanitary Standards (SPS) and traceability protocols are playing a significant role when international trade of animal food products is involved. Animal identification programs which can provide animal origin and age verification are becoming a potential requirement for future access to high value export markets.

Byproducts utilization and waste disposal: In the integrated meat export plants large scale modern rendering plants and effluent treatment plants have been established and to a great extent byproducts are effectively utilized and effluents are treated along with sanitary disposal of waste resulting good management of environment in the plants. Facilities for bio-gas production using soft tissues for meeting energy requirements have also been established in some meat plants. However, in the slaughterhouses regulated by local bodies, byproducts are being underutilized due to lack of processing facilities. Organized facilities for small scale processing of some of the byproducts such as fat rendering, casings processing, pet food preparation, etc. will not only
generate revenue and employment but also prevent the environmental pollution. Further, local bodies should be supported to establish facilities for proper disposal of waste in order to maintain sanitary conditions of slaughterhouses.

Animal welfare facilities: The handling, loading and transport of animals have great effect on the welfare of animals. Lack of infrastructural facilities for providing rest/feeding during transit lead to compromise in animal welfare during transport. Hence, provision for feeding and watering arrangements should be made compulsory at livestock markets and related places and surveillance to ensure compliance. Loading, unloading and handling devices to be introduced to reduce the suffering of animals.
Chapter 3: Regulations Pertaining to Meat Sector

The importance of livestock production system as an integral part of the farming systems is increasingly felt realizing the need for diversification of crop based agriculture to sustain rural income and livelihood. Sustainable animal production largely depends on feed supplies and costs, production efficiency and utilization of products. Modern technologies and policies need to support each one of these aspects of animal production to achieve maximum gain under a range of situations. Effective utilization of produce is important and depends on hygienic production, cost efficient processing technologies, creating demand for the product, innovative marketing approach, utilization and proper disposal of byproducts and waste and providing a positive image.

Effective utilization of livestock resource including slaughter of animals is essential for sustaining livestock production particularly when input costs and their availability are an important consideration in animal production. Many times meat exports are criticized on the assumption that productive animals are slaughtered. However, the economics do not favour slaughter of productive buffaloes for export. The productive buffalo is 2-4 times costlier to unproductive buffaloes without any extra returns when slaughtered for meat. Thus, neither a farmer would sell a productive buffalo at lower prices nor a meat exporter would like to buy productive buffalo at higher prices and incur losses. The data on buffalo population, milk production and buffalo meat export indicate that along with buffalo meat export, buffalo population and buffalo milk production also increased.

Rules and regulations pertaining to slaughter and utilization of livestock:

Slaughter of animals is a State subject and State legislatures have exclusive power to legislate as per Entry 15 of List II in the Seventh Schedule of the Constitution which reads as under:

Preservation, protection and improvement of stock and prevention of animal diseases, veterinary training and practice.

Directive Principles:

States have to apply Directive Principles which are fundamental in the governance of the country while making laws. Relevant articles concerned with this subject are:

ARTICLE 48: "Organisation of Agriculture & Animal Husbandry. The State shall endeavour to organize agriculture and animal husbandry on modern and scientific lines and shall, in
particular, take steps for preserving and improving the breeds and prohibiting the slaughter, of cows and calves and other milk and draught cattle"

ARTICLE 51 A(g) FUNDAMENTAL DUTIES "It shall be the duty of every citizen of to protect and improve the natural environment including forest, lakes, rivers and wild life, and to have compassion for living creatures."

ARTICLE 47: "Duty of the State to raise the level of nutrition and the standards of living and to improve public health-

The State shall regard the raising of the level of nutrition and the standard of living of its primary duties and, in particular, the State shall endeavour to bring about prohibition of the consumption except for medicinal purposes of intoxicating drinks and of drugs which are injurious to health.

Slaughter of animals and hygienic meat production satisfies all the directives under the above Articles. Organization of agriculture and animal husbandry on scientific and modern lines, raising of level of nutrition, standard of living, and protection and improvement of environment could be achieved through better utilization of livestock resources to compliment food security, nutrition and livelihood including meat consumption as meat comes under protective foods and rich in nutrients. Thus, slaughter of animals is not against Constitution and it is in the interest of the people at large.

**State Animal Preservation Acts**

Slaughter of animals is regulated as per State Animal Preservation Acts and Rules made there under in different States. Cow slaughter is banned largely in the country except in West Bengal and Assam where slaughter of cows is restricted to animals over 14 years of age and unfit for work or breeding, or the animal is permanently incapacitated from work or breeding due to age, infertility, deformity or any incurable disease. The States of Arunanchal Pradesh, Meghalaya, Mizoram, Nagaland and Tripura and Union Territory of Lakshadweep islands do not have any legislation on slaughter cows. In case of Kerala, the Panchayat act permits slaughter of cows over 10 years of age. Bull and bullock slaughter is largely permitted with restrictions on age from 14 years onwards and incapacitated for work or breeding. Slaughter of bull and bullock is also banned in the States of Delhi, Himachal Pradesh, Jammu and Kashmir, and Rajasthan. Some States have made laws restricting slaughter of buffalo calves and productive buffaloes.
Buffalo calves sacrifice is not permitted in the States of Bihar and Andhra Pradesh. (Tables 1& 2)

Sheep and goat: In practice, generally no restrictions are followed in the slaughter of sheep and goat. Very young and immature animals are not allowed for slaughter. The government of Andhra Pradesh prohibited slaughter of the following categories:

a. Ewes below 2½ years when they possess six permanent incisors, all in wear.
b. Female goats below two years when they possess four permanent incisors, all in wear
c. Male goats, and sheep (castrated or entire) below 1½ year when they possess two permanent incisors and the sixth permanent molars are also erupted.

The Uttar Pradesh sheep (Slaughter and consumption of Mutton) order 1965 prohibits the slaughter of a female sheep below the age of three years and male sheep below the age of one year on any day of the weak other than the “Bakrid” day and the following two days. Also, slaughter of any sheep on, any Tuesday or Friday other than the “Bakrid” day and the two following days is prohibited. In Maharashtra and few other states young sheep below the live weight of 8 to 10 kg are slaughtered resulting in loss of meat production and skin production which need to be prohibited.

Table 1: Status of legislation on cow slaughter

States/Union Territories enacted legislation for banning cow slaughter and restricted slaughter of bull/bullock

States:
1. Andhra Pradesh
2. Manipur
3. Bihar
4. Goa
5. Gujarat*
6. Haryana
7. Himachal Pradesh*
8. Jammu&Kashmir*
9. Karnataka
10. Madhya Pradesh
11. Maharashtra
12. Orissa
13. Punjab
14. Rajasthan
15. Sikkim
16. Tamil Nadu
17. Uttar Pradesh*

Union Territories:
1. Andaman & Nicobar Islands
2. National Capital Territory of Delhi *
3. Chandigarh
4. Dadra and Nagar Haveli
5. Daman-Diu
6. Pondicherry

* Total ban on slaughter of cow and progeny.
b. States/Union Territories where Cow slaughter is not banned but restricted or no legislation made:

9. Lakshadweep

Cow slaughter is permitted with/without restriction in these States/UTs:

**Table 2: Status of legislation on slaughter of buffaloes**

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<tr>
<th>Status of Slaughter</th>
<th>Buffalo calves</th>
<th>Adult buffaloes</th>
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<tr>
<td><strong>Banned</strong></td>
<td></td>
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<tr>
<td>Andhra Pradesh; Bihar</td>
<td></td>
<td>Jammu &amp; Kashmir</td>
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<tr>
<td>Jammu &amp; Kashmir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Karnataka, Madhya Pradesh</td>
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<td></td>
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<tr>
<td><strong>Not banned, But Restrictions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assam, Gujarat, Goa</td>
<td></td>
<td>Andhra Pradesh, Assam</td>
</tr>
<tr>
<td>Maharashtra, Dadra &amp; Nagar</td>
<td></td>
<td>Gujarat, Goa, Karnataka</td>
</tr>
<tr>
<td>Haveli, West Bengal</td>
<td></td>
<td>Maharashtra, Madhya Pradesh</td>
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<tr>
<td><strong>Imposed</strong></td>
<td></td>
<td>Sikki, Bihar, West Bengal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dadra &amp; Nagar Haveli</td>
</tr>
</tbody>
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**No restrictions**

|                  |                |                  |
| Delhi, Himachal Pradesh |                | Delhi, Himachal Pradesh |
| Haryana, Punjab, Orissa |                | Haryana, Punjab, Orissa |
| Pondicherry, Sikkim, Tamil Nadu | | Pondicherry, Tamil Nadu |
| Rajasthan, Kerala |                | Rajasthan, Kerala, Uttar |

**Imposed**

|                  |                |                  |
| Uttar Pradesh, Arunachal Pradesh |                | Manipur, Mizoram, Tripura, Nagaland, Meghalaya, Andaman & Nicobar Island, Chandigarh, Damans & Diu |
| Pradesh, Manipur, Mizoram, Tripura, Nagaland |                | Nagaland, Meghalaya, Andaman & Nicobar Island, Chandigarh, Damans & Diu |
| Meghalaya, Andaman & Nicobar Island, Chandigarh, Damans & Diu | | |
Food Safety and Standards Act, 2006

In India, multiple regulations for food have been enacted at different points of time to supplement each other. This incremental approach has led to incoherence and inconsistency in the food sector regulatory scenario. The result is that the food sector in India is governed by a number of statutes for different commodities rather than a single comprehensive enactment. Each ministry has prescribed its own set of rules and standards under relevant acts and orders often creating a confusing and sometimes contradictory environment for the industry. The multiplicity of ministries and administering authorities at both central and state levels has resulted in a complex regulatory system that is not well integrated adding an additional burden on the food industry. In general, this regulatory system resulted in a lack of comprehensive, integrated food law under single regulatory authority that ensures public health, safety and also specifies quality norms for meeting the globally recognized standards.

The Food Safety and Standards Act, 2006 is a new statute that integrates eight different existing food laws which includes Meat Food Products Order, 1973. It is a major transformation that ensures to bring a paradigm shift in the food regulatory scenario of the country. The Food Safety and Standards Authority of India (FSSAI) is an autonomous statutory authority set up under the Food Safety and Standards Act, 2006 for laying down science based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import, to ensure availability of safe and wholesome food for human consumption. Restaurants, curry points, mss and street side food sellers which were not covered under MFPO or any other acts will come under the inspection of the New Food Safety and Standards Act, 2006 and Rules 2010. The act in the chapter 3 schedule IV, Part I proposes essential measures that need to be followed even by the petty food manufacturer or operator for ensuring the food safety. The measures include from location to type of construction, ceiling, flooring, water facilities, machinery, utensils to be used, waste disposal, pest control and personal hygiene of the food handlers, etc.
Food Safety and Standards Act, 2006

- Vegetable Oil Products (Control) Order, 1947
- Prevention of Food Adulteration Act, 1954
- Essential Commodities Act, 1985
- Meat Food Products Order, 1973
- Edible Oils Packaging (Regulation) Order, 1998
- Solvent-Extracted Oil, De-Oiled Meal and Edible Flour (Control) Order, 1987
Chapter 4. Meat Animal Transport, Handling and Welfare

The quality of meat and meat products produced by the processing plants is largely determined by the quality of the animal supplied. The livestock marketing process involves spring, loading on to trucks, transportation, weighing, driving etc. During this process animals are exposed to various kinds of stress and the severity of the effect depends on the climate, equipment used, personnel as many other factors. Improper handling and transport could reduce a good quality animal to a product of poor quality. The most commonly recognized consequence of poor pre-slaughter handling on lean meat quality are bruising and hemorrhage, skin blemish and broken bone particularly in poultry.

Animal welfare in the farm

The production of carcasses of high hygienic standards demands sound husbandry methods, which pay close attention to animal health as well as cleanliness in the final stages of fattening in the farm.

The points to be given considered by farmers producing livestock for meat purpose:

1. Housing structure and layout: Defects in design, layout, cubicle size, drainage, water troughs, floor, ventilation etc. should be attended.

2. Bedding: Adequate bedding is essential. Frequent removal of slurry is necessary.

3. Housing density: There should not be over crowding of animals

4. Grooming / clipping: Where practicable the flanks and bellies should be clipped before the stocks are housed.

5. Management: Close attention must be paid to management to ensure that the animals don't become dirty. Animals that do not adapt to cubicles should be removed to bedded pens.

6. Internal parasitism: Adequate nutrition and if necessary, anthelmintic treatment should be provided especially in case of sheep. If cattle / buffalo or sheep are feeding on root or crop residues the infiel they should be transferred to clean grazing or housing before being dispatched for slaughter.

7. Vaccine and drug Injection: Careless and unhygienic use of hypodermic syringe is responsible for unnecessary pain to the animals. Besides causing damage to carcasses and consequent partial condemnation due to production of abscesses and necrosis at the site of injection. Therefore, site of injection should be carefully selected, so that an area associated with more expensive cut must be avoided.
8. Transport and abattoir lairage: The same clean conditions must apply during transportation and while availing slaughter. Unroofed vehicles should not be used for transportation during inclement weather conditions.

The basic requirements for welfare and housing of livestock include:
1. Readily accessible fresh water and nutritionally adequate feed as required
2. Adequate ventilation and suitable environmental temperature
3. Adequate freedom of movement
4. Sufficient light for satisfactory inspection
5. Rapid diagnosis and treatment of injury & diseases
6. Flooring that causes either harm or undue stress and injury
7. Avoidance of unnecessary mutilation
8. Internal surfaces and fitting of building and pens should have no sharp edges or projections

Transport

In India, food animals are moved from place of production to the market and abattoir by driving on hoof and road by trucks. The transport process includes loading, unloading and penning in a new and unfamiliar environment. Vibration, noise, orientation, loading, ventilation, temperature, stocking density, location in vehicle, lack of food and water, breaks during the journey and mixing are the important factors determine the level of stress on animals.

Loading and unloading appears to be the most stressful component of the transport chain. Lack of proper loading and unloading facility, poor design of handling facilities, ignorant and abusive stockman ship and poor road driving techniques during transportation lead to more stress and injury to the animals. High loading density results in low dressed carcass weight due to higher trimming of bruised (injured) tissue from the carcass. The number of times that animals are handled or restrained immediately prior to slaughter should be minimized.
Indian Laws as they apply to Animal welfare and Transport: Under Section 11 of the PCA, it is illegal to transport any animal in a manner that will cause him or her unnecessary suffering. This includes carrying chickens upside down, or stuffed into small cages loaded onto trucks, carrying pigs on cycles, etc. The Transport of Animals Rules 1978 establishes specific conditions for the transport of animals by foot, road, rail and air.

By foot

- It is illegal to make newborn animals, diseased, blind, emaciated, lame, or fatigued animals and animals that have given birth up to 72 hours prior to the time of travel on foot.
- Animals can only be transported in the company of their on-farm social groups, which are to be established at least one week prior to the journey.
- Arrangements must be made to provide food and water to the animals.
- It is illegal to use a whip or a stick in order to make the animals move faster.
- It is also illegal to smear chillies or any other substances on the animals to cause them pain or to break their tails.
- If one animal is tied to another by a single rope, a minimum of two feet should be provided between the animals and the animals should be of similar strength and physical condition.
Animals who have not been given shoes cannot be made to walk on hard cement, bitumen-coated or metal led roads, steep gradients or hilly and rocky terrain, regardless of weather conditions.

No animal shall be transported on foot in a manner that violates any of the distance, time, rest interval and temperature restrictions specified for such animals in the table below:

<table>
<thead>
<tr>
<th>Species</th>
<th>Maximum distance covered per day/hour</th>
<th>Maximum number of hours of walking in one day</th>
<th>Period of rest (interval)</th>
<th>Temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow</td>
<td>30 km/day 4 km/hour</td>
<td>8 hours</td>
<td>Every 2 hours for water; 4 hours for food</td>
<td>12°C to 30°C</td>
</tr>
<tr>
<td>Buffalo</td>
<td>25 km/day 3 km/hour</td>
<td>8 hours</td>
<td>Every 2 hours for water; 4 hours for food</td>
<td>12°C to 30°C</td>
</tr>
<tr>
<td>Cow, Buffalo, Calf</td>
<td>16 km/day 2.5 km/hour</td>
<td>6 hours</td>
<td>Every 1 hour for water; 3 hours for food</td>
<td>15°C to 25°C</td>
</tr>
<tr>
<td>Goat, Sheep</td>
<td>30 km/day 4 km/hour</td>
<td>6 hours</td>
<td>Every 1 hour for water; 4 hours for food</td>
<td>12°C to 30°C</td>
</tr>
<tr>
<td>Kid, Lamb</td>
<td>16 km/day 2.5 km/hour</td>
<td>6 hours</td>
<td>Every 1 hour for water; 3 hours for food</td>
<td>15°C to 25°C</td>
</tr>
<tr>
<td>Pig</td>
<td>15 km/day 2 km/hour</td>
<td>8 hours</td>
<td>Every 1 hour for water; 3 hours for food</td>
<td>12°C to 25°C</td>
</tr>
</tbody>
</table>

Note: Every animal shall be given a break of 20 minutes after being given water and a break of one hour after being given food.

By Road
- Only four adult cattle or six calves may be carried per small truck. In any case, each cow should be given 2 square meters and an attendant should be able to move freely between the cattle.
- Only 40 sheep or goats may be carried per truck, and an attendant should be able to move freely between the animals.
The minimum space for poultry within cages is 1' x 1' x 1' (feet) for chickens and 2' x 2' x 2' (feet) for hens and cocks.

- All trucks carrying animals must be fitted with a ramp.
- Animals must be accompanied by an attendant.
- Food and water must be provided during long journeys.
- Animals must be accompanied by a veterinary certificate verifying that the animals are free from disease.

The vehicle must travel at a measured, uniform speed to avoid discomfort to the animals.

**Vehicle design:** Specially designed vehicle with pneumatic suspension is more suitable for animal transport. The transporting vehicle should have sufficient bedding on the floor to reduce faecal soiling of the skin. Improperly ventilated trucks or hot climate conditions can result in extreme discomfort for animals. Heat builds up rapidly in a stationary vehicle, hence vehicles should be kept moving and rest stops should be kept in a minimum. Vehicle should have provisions for protecting animals from inclement weather (sun light as well as rain).

The stocking density is important for animal welfare during transportation and becomes critical at high stocking densities. Most deaths due to transport in hot conditions occur because of high stocking density. Attempts to reduce transport cost by overloading of trucks are offset by reduced carcass weight, downgrading of carcass owing to bruising and increased risk of serious injury or death during travel.
Effect of transport on meat yield and quality: The loss of live weight and carcass yield during transportation of animals is of both welfare and economic concern. Animals lose weight as a consequence of excretion, evaporation and respiratory exchange. The excretory shrinkage results from elimination of body waste, while the tissue shrinkage is due to respiratory activities and catabolic activities of the body. Carcass shrinkage (loss of weight) due to rough handling or long hours in transport causes additional losses. Under normal marketing conditions the weight of the muscle is not affected even though animal usually lose 2 to 5% of their live weight in the marketing process due to loss of gastro intestinal tract contents.

When animals are fasted or exercised, muscle glycogen is used for energy. If adequate feed and rest are not provided, glycogen deficiency may exist when slaughter occurs. When animals exposed to long term pre-slaughter stress and upon onset of rigor mortis, pH decline does not proceed at a normal rate and the ultimate pH is higher than normal (above 6), resulting in less desirable darker coloured meat with firm texture. Dark Firm Dry beef (DFD). Additionally due to high pH, the meat will spoil more rapidly. Rough ante mortem handling and exposure to high environmental temperature frequently results in a condition called - Pale Soft exudative (PSE) Pork. It is a direct result of rapid fall of muscle pH immediately after death. The meat of affected animal becomes watery, assumes a pale, soft unattractive colour and lack flavour.

Precautions to be observed for transportation:

1. Separate adult from young and males from females.
2. Keep the animals off feed and water few hours before loading.
3. Provide adequate protection from extremes of weather.
4. Proper resting and feeding during long journey.
5. Do not over-crowd the animals.
6. Animals should be handled and transported gently and quietly from farm till it reaches slaughtering point.
7. Loading ramps should be provided at the farm and efficient unloading facilities at the meat plant.
8. Stock should be kept in their original social groups as far as possible and there should be no mixing within the last 24-48 hours period before slaughter.

Pre-slaughter handling at lairage: Pre-slaughter handling can also have a bearing on the hygienic quality of the carcass. Holding animals in lairages without adequate litter and/or drainage can result in faecal soiling of the skin. In addition, animal should be held in lairages for approximately 24 hours before slaughter. The lairages and facilities should be designed to facilitate adequate watering, washing and disinfections of animals. Excessively dirty animals should be washed and allowed sufficient time to dry before slaughter. Detaining the animals at lairages for a long period will encourage cross-contamination with salmonella.

Measures to reduce stress at lairage

1. Premises that slaughter animals should have suitable facilities where animals can be held on arrival.
2. Aggressive animals should be isolated in the lairage as should females in oestrus.
3. Careful selection of stock for slaughter is important so that the period of time animals spend in the lairage is the optimum for the particular species, sex and time of year.

4. Animals should be handled calmly, quietly and firmly, with care to avoid unnecessary excitement or distress. The use of sticks, vocalization and electric goads should be avoided.

5. The essential design and operational features of a lairage are given below.
   - The design of the passageways and pens should be appropriate to the species of animal being handled.
   - All structures and equipment should be well maintained, so that injury to animals is avoided.
   - The holding facility should be designed to facilitate ease of handling, and all floors should be non-slip.
   - The lairage should have suitable pens, equipment and procedures for the isolation and treatment of sick, injured or at-risk animals without causing further distress.
   - Isolation pens should be kept well maintained and ready for their intended use.
   - There should be no mixing of species, unfamiliar animals, adult and young animals, horned/hornless cattle, adult male pigs and adult male cattle.
   - Holding facilities should provide a suitable environment with adequate ventilation and space to allow animals to rest, drink and where applicable consume food.
   - All animals should have sufficient room to stand up, lie down (simultaneously) and turn around.
   - Lairage facilities should provide protection from extreme conditions if appropriate for the species/breed of animal being held.
   - The lairage should have drainage facilities for faeces and urine and the design should allow cleaning to be performed between batches of animals.
   - Noise from machinery, people and equipment should be kept to a minimum.
   - Animals must never be hit prodded or handled in such a way as to cause them unnecessary excitement, pain or suffering when moving them within the lairage.
   - Pressure must never be applied to any sensitive areas, e.g. genitals, and the appropriate use of benign handling aids, such as pig boards, moving gates, bags and fleppers, should be encouraged where possible.
- Animals must not be kicked or their tails twisted or broken and they must not be lifted or dragged by their heads, horns, feet, tail, fleece or any other part of their body, or in any way that may cause them unnecessary excitement, pain or suffering.
- Electric goads or prodders should only be available as a last resort (when human safety may otherwise be compromised) and must only be used on the muscles of the hindquarters of adult cattle and adult pigs if they are refusing to move forwards and the way ahead is clear.

Animal Welfare

Only by ensuring that the animals from farm until slaughter are managed in a responsible manner with respect to husbandry and welfare, the demands for guaranteed, wholesome, environmental and animal welfare friendly meat products could be met. The animal traders could contribute to food safety by handling and transport animals in the stress less manner. The poor understanding of animal welfare activity among the personnel involved in animal handling, transportation and slaughter evoked concerns to look into the problem of stress. Measurements of injuries, bruises, mortality, morbidity and carcass quality can also be used as indicators of welfare during handling and transport. Improving animal welfare is with the right thing to do and it is economically advantageous, we can get better quality meat and products by reducing the stress to the animals. The welfare of each animal should be considered until the point at which it loses consciousness immediately prior to death. People who regularly handle, transport and stun animals in slaughter plants often become numb and desensitized to animal suffering. Hence, they should be continuously monitored and periodical meeting and training is also essential.

The goal of animal welfare is the effort to ensure the "freedoms" for all animals:

- Freedom from thirst, hunger and malnutrition by ready access to fresh water and a diet to maintain full health and vigor
- Freedom from discomfort-by providing a suitable environment including shelter and a comfortable resting area
- Freedom from pain, injury and disease by prevention or rapid diagnosis and treatment
- Freedom to express normal behaviour by providing sufficient space, proper facilities and company of the animal's own kind
- Freedom from fear and distress; by ensuring conditions which avoid mental suffering.
Stunning and animal welfare on meat quality: Humane killing, in addition to its ethical implications, results in better quality meat. Effective stunning methods are available to induce instantaneous insensibility. Stunning must be done in a way that complies with the humane slaughter act. In conventional slaughter methods in most developed countries, it is normal practice to render the animal insensible by stunning, except in Jewish and Muslim methods and then to kill it by bleeding. Stunning has two purposes: to induce an immediate state of insensibility and to produce sufficient immobility to facilitate the sticking process to initiate bleeding.
Chapter 5. Components of Modern abattoir.

Abattoir is a place where animals are slaughtered or sacrificed for food. Laitage, stunning area, bleeding area, edible and inedible offal rooms, facilities for workers, veterinary lab, chiller, deboning and meat processing hall, packing area, freezing area, meat dispatch area, rendering plant and effluent treatment plant are the essential components of a modern abattoir.

Laitage: The laitage is the place where animals are provided rest before slaughter. The laitage of the slaughterhouse shall be adequate in size for the number of animals to be laired. The space provided in the pen of such laitage shall not be less than 3.3 sq. m. per large animal (cattle/buffalo) and 0.7 mts per small animal (sheep/goat). Place sufficient for three days' supply of cattle and two day supply of sheep. Tubular fencing is sufficient. Laitage must have watering, feeding and animal inspection facilities. An isolation pen is the place for accommodating sick or suspect animals. The pen should have crush for inspection.

V - race: It is the pathway that connects laitage with the slaughter hall. Length of the V race can be up to 36 m. The Pathway is of tapering with 50 cm wide at the floor, 80 cm wide at the top. Catwalks must be provided alongside the V - race to enable handlers to control stock movement, check identification etc.
Stunning area: No person shall slaughter any animals in a slaughter house in the sight of any other animals awaiting slaughter. It is general impression that strange surroundings, smells and noises cause most stresses. V-shaped restrainer is necessary for easy and safe stunning.

Bleeding area: Majority of blood flow takes 5-6 minutes. The bleeding trough has two points for the reception of blood. One at the actual point of sticking where the greater volume of blood will be handled and there after a longer gradual slope collects “drip” blood. The overhead-bleeding rail should be about 6 feet above the floor. Subsequently, flaying, evisceration, inspection, stations must have platforms at suitable positions and heights for operatives and inspectors to work efficiently without unnecessary stooping and labour.

The slaughter hall should have the following provisions:

- Changing and locker room for workers
- Room for cleaning stomach and intestine
- Room for storing fat, hides, horns and hooves
- Room for storing detained meat
- Veterinary lab
- Adequate ventilation and light. Lighting requirement at inspection point, work rooms and other areas are 540 lux, 220 lux and 110 lux respectively.
- Cold and hot water supply under pressure - Required for efficient cleaning of premises and equipment
- Hand and equipment disinfecting facility
- Protection against pests
- Section for manure
- Stunning boxes facility must be provided for cattle/buffalo. Bleeding trough must be at least 1.5 wide for cattle/buffalo and 1.1-1.2 m wide for sheep/goat.

**Rail dressing system:** Carcass is conveyed on rail for dressing. Each step is done by different persons. Required height of overhead rail for cattle is 2.7 m and required height of dressing rail is 2.3 m. Effective use of manpower, safer to operatives, hygienic dressing (carcass won’t touch floor) and enhances efficiency and speed of operation are some of the advantages of line dressing.
Main types of rail dressing systems used across the world are:

- **Gravity rail system**: Carcass moved on rail by gravitational force. Used in smaller capacity operation (Cattle: 10-40 cattle/hr).

- **Intermittent powered system**: Carcass moved by using power and timer device (Cattle: 40-120 cattle/hr).

- **Continuous powered system**: Carcass will be in continuous motion (40-120 cattle/hr). Man power required for online slaughter involving 60-75 cattle/hr. 9 meat inspectors,
32 operatives and 1 veterinarian. For slaughtering capacity of 150 sheep/hr. 17 operatives will be required.

Inedible offal room: Should be located adjacent to flaying point and should have chute like provision to drop the offal into the room. Workers entry should be from outside. The room may be utilized to handle stomach and intestines.

Skin store: Utilized to store salted skin till dispatch. Should have chute like provision to drop the skins into the room. Should have workers entry from outside.

Edible Offal room: Should be located adjacent to slaughter hall and offal may be delivered through chute like provision to avoid contamination. Should have workers entry from outside.

Veterinary office cum Laboratory: For disease diagnosis and maintain over all hygienic standards. The lab should have quality analytical facilities to screen total bacterial load, Salmonella, E.coli, Anthrax, Staphylococcus aureus, Yeast and moulds and tests to detect imperfect bleeding, jaundice etc.

Facilities for personnel: Wash basin (foot or leg operated type), showers, separate lockers, toilet rooms, first aid room etc. should be provided to keep up personal hygiene. Workers of clean and unclean units (abattoir, edible, inedible, dispatch) should have specific work wear (head gear, overcoat, apron, gum boot, face mask, etc.). At any point of time the workers of different section should not mingle each other. All workers should have closely trimmed nails, hair and should not
wear any ornaments including rings, watch, etc. All the entry points into the plant should have
air and plastic curtains (to prevent entry of dust), fly killers and foot dip filled with disinfec-
tant solutions. Signs boards for various personal hygiene measures like 'No spitting', 'No smoking',
'Wash hands before enter' etc., should be displayed prominently at relevant places. Each
component of slaughterhouse should have sufficient number of wash basin (foot or leg operated,
type) and knives sterilizers. Personnel works in abattoir are more prone various types of injuries,
hence facilities for wound dressing and other first aid procedures in food premises is very
essential.

Chiller: It is an extremely essential unit for storing and ageing the carcass. The temperature
requirement in chiller rooms is $7^\circ$ C for carcasses and $3^\circ$ C for offal. Carcasses must be
hung in cold rooms for 12 hours. Space between the carcasses should be $0.3 - 0.4$ m.

Freezing rooms: The packaged meat is frozen at a temperature of $-30$ to $-40^\circ$ C and should
reach a temperature of $-20^\circ$ C. The frozen meat after final packing is stored in cold store
maintained at a temperature of $-20^\circ$ C till dispatch.

Rendering plant: Waste materials such as bone, fascia, fatty tissues, condemned parts/carcass,
unutilized organs are sent to a rendering plant for the production of meat cum bone meal and,
tallow.

Manure bay: To store stomach and intestinal content. Should be protected from pest and
vermin. May be located nearby effluent treatment plant.

Effluent treatment plant: During the process of slaughter and dressing lot of waste is generated
in slaughterhouses. Efficient management of waste management will protect public health and
will also improve the acceptability of the meat production activities among the adjacent
residential population. Every service abattoir should have an effluent treatment plant of
appropriate capacity for treatment of liquid waste. For small and medium sized abattoirs, land
based effluent treatment may serve the purpose. Whereas, for larger capacity slaughterhouses,
effluent treatment plants are obligatory.

List of equipment required

List of equipment required for a slaughterhouse and their brief description are as follows.

1. Restrainer: Restrainer is used to restrict the movement of the animal for stunning. The
restrainer will have narrow leg space at bottom and broader body space at the top. The trap door
should permit only one animal and it should not see the other animal being stunned or
slaughtered.
2. **Stunning tongs:** Electrical type stunning set will be commonly used for small ruminants.

3. **Sticking platform / Bleeding trough:** Used to receive the animal from the restrainer in stunned condition. The platform will be used to slit the throat of the animals for bleeding and collection of blood of the animal. Bleeding trough must be at least 1.1-1.2 m wide for sheep/goat.

4. **Overhead rail system:** Used for carrying the animal in inverted position with the head facing downwards, till all the dressing operations are complete.

5. **Chutes:** Suitable for gravity conveying of disposable parts of the animals at different stages of dressing.

6. **Hand wash basin:** For cleaning the hands of the personnel involved in slaughter and dressing of animals. It should be of foot/leg operated type to avoid cross contamination.

7. **Knife Sterilizer:** For sterilizing knives used in slaughter and dressing of the animals. The hot water temperature should be above 82°C.

8. **Gambrels with Hooks:** Required for hanging the animal on both rear legs, during the dressing operation on over-head rail system. Gambrel will be provided with galvanized hook with roller for free movement on rail network. Periodical sterilization of hooks is must to prevent contamination.

9. **Air Curtain:** The air curtain should be installed at the entrance of the slaughter hall for preventing aerosol contamination.

10. **Fly Catchers / Insecticidors:** They are units with ultra violet lamps to destroy flies in the slaughter hall. The unit should be hanging type from the roof and placed at relevant places to control flies menace.

11. **Hose reel with gun:** The hose reel with gun will be used for cleaning of the floor, walls and also the equipment after slaughtering is completed.

12. **Knife Sharpener:** The knife sharpener is electrically operated one and its grinding stone is periodically used for sharpening of the knives in the slaughterhouse.

13. **Weighing balances:** Required for weighing live animals and carcasses.

**Chapter 6. Ante-Mortem Inspection of Food Animals**

Inspection of meat animals plays a major role in production of safe and wholesome meat for human consumption thereby protecting the consumers, butchers and personnel involved in meat industry. Inspection of the live animal by veterinarian prior to slaughter is ante mortem
inspection and inspection of carcasses after slaughter of animals is postmortem inspection. It is necessary to conduct both ante mortem and postmortem inspections since one cannot substitute the other.

Ante-mortem inspection is the examination of food animals by veterinarian in holding pens (lairage) within 24 hours prior to slaughter with the object of providing wholesome meat to the consumers by deciding their fitness for slaughter. The main aims of ante mortem inspection are to protect consumers from zoonotic or meat-borne diseases, protection of the slaughter personnel from diseases and protection of animal health. The animals are carefully observed for evidence of disease or abnormal conditions, while at rest in pens. The lot in which any animal shows symptoms of disease is subjected to further and detailed individual inspection. The temperature is recorded and the individual animals are segregated when necessary from the lot for further observation and subsequent action.

If an animal is suspected to be affected with a disease or condition which may cause in condemnation in whole or in part, a metal tag with a word SUSPECT is attached to the ear and is kept apart, slaughtered separately, and subjected to special examination keeping the observation in view. The animals showing symptoms of tetanus, rabies, milk fever, railroad sickness and hog cholera are condemned on ante-mortem inspection and disposed. The slaughter of animals fatigued by journey is postponed and they are given sufficient rest.

Certain abnormalities like posture, movement and behaviour can be detected during ante mortem inspection only. It improves the efficiency of the operation by screening out a number of animals that would be unfit for consumption.

The following abnormalities may be detected during the process of ante mortem inspection.

1) Abnormalities in breathing
2) Abnormalities in behaviour
3) Abnormalities in gait
4) Abnormalities in posture
5) Abnormal discharges or protrusions from body openings
6) Abnormal colour
7) Abnormalities in appearance (conformation)
8) Abnormal odour

The outcomes of ante mortem inspection are
1) Passed for Slaughter
2) Passed for slaughter subject to a second ante mortem inspection
3) Passed for slaughter under special conditions
4) Condemned
5) Emergency slaughter

Principles of ante-mortem inspection

The basic principle in conducting ante-mortem inspection is to segregate of normal, healthy animals from the diseased or abnormal animals. The abnormal or diseased animals can be grouped under three categories:

1. "Category - A": UNFIT - Totally unfit or transitory or allowed for treatment - unfit for slaughter.
2. "Category - B": Animals with localized conditions (e.g., light fracture, a tumour or a lesion).
3. "Category - C": Conditions not advanced to a point of rendering the animal unfit but which might influence the disposition of carcass on post-mortem inspection.

Important diseases and abnormalities encountered during ante-mortem inspection

The following diseases may be observed while examining cattle in lairages.

Viral diseases: Rabies, foot and mouth disease, rinderpest.

Bacterial diseases: Tuberculosis, actinobacillosis, actinoqyrosis, anthrax, black quarter, tetanus, haemorrhagic septicaemia, mastitis, septic metritis.

Parasitic Diseases: Ticks, mites and other ectoparasites.

Fungal diseases: Ringworm, mange.

Other conditions: Diseases or conditions involving the central nervous system. E.g. circling disease and poisoning.

The following diseases may be observed while examining calves in lairages:

- Immaturity, calf diphtheria, ringworm, cowpox, white scours.

The following diseases may be observed while examining sheep in lairages:

- Sheep scour, Foot and mouth disease, Caseous lymphadenitis, Pneumonia, Enteritis, Emaciation, Gid, etc.

The following diseases may be observed while examining pigs in lairages.
Salmonellosis, Swine fever, Foot and mouth disease, Rabies, Actinomycosis of udder, hernia, tumour, tuberculosis of lumbar vertebrae.
Chapter 7. Stunning, Slaughtering and Dressing of Meat Animals

Slaughter is the process whereby healthy, live animals are humanely stunned, bled, dehided, dehaired and eviscerated. During this process, edible (meat, fat and by products like liver and hearts), inedible (skin, blood, intestine, etc.) and waste products are produced. The edible materials should be handled and processed separately from inedible ones. Slaughtering methods are based on obtaining the optimum quality and quantity of meat. Humane killing, in addition to its ethical implications, results in better quality meat. Regulations may vary from one country or region to another, but in all cases the objective is to assure sanitation for the food market and safety for the workers. Slaughter includes two processes: stunning followed by bleeding/sticking.

Preparing livestock for slaughter: At the time of slaughter, animals should be healthy and physiologically normal. Slaughter animals should be adequately rested, particularly if they have travelled for some times over long distances. Animals should be watered during holding and can be fed, if required. The holding period allows for injured and victimized animals to be identified and for sick animals to be quarantined. When ready for slaughter, animals should be driven to the stunning area in a quiet and orderly manner without undue fuss and noise. Animals should never be beaten nor have their tails twisted. Animals should be led in single file into the stunning area where they can be held in appropriate restraining device(s) before stunning.

Stunning

It is desirable to render an animal unconscious before it is slaughtered in order to eliminate pain, discomfort and stress from the procedure. Most developed and many developing countries have legislation that requires pre-slaughter stunning, with the exception of authorized ritual slaughter like Kosher and Halal. Stunning has two purposes: to induce an immediate state
of insensibility and to produce sufficient immobility to facilitate the sticking process to initiate bleeding. Whatever the stunning method, the animal should be rendered unconscious for long enough, so that bleeding results in enough loss of blood to cause death from lack of oxygen to the brain (cerebral anoxia). The percussion and electrical stunning are the most common methods of stunning.

Stunning methods: It is desirable to keep the animal live, but stunned, in order to eliminate the blood. Therefore, bleeding can be achieved when the heart and respiratory functions are still working.

Percussion stunning-Captive bolt: This method works on the principle of a gun and fires a blank cartridge and it propels a short bolt (metal rod) from the barrel. The bolt penetrates the skull bone and produces concussion by damaging the brain or increasing intracranial pressure, causing bruising of the brain. It is suitable for use on cattle, pigs, sheep as well as goats. There are two variations of the gun. One has a handle and trigger. The other comprises hand-held barrel, which is tapped against the skull, which sets of the cartridge explosion. Another type of bolt has a flat, mushroom end. Unconsciousness is achieved through percussion by strong blow to the skull. The brain is not penetrated and as the animal is not killed, it is a method that is acceptable in many countries for Halal slaughter. When in use, the captive bolt is positioned on the correct spot on the animal’s head. Captive bolt stunners must be cleaned and serviced, following the manufacturers’ recommendations, to maintain maximum hitting power and to prevent misfiring and partial firing. Pneumatic-powered captive bolt stunners must be operated at the air pressure recommended by the manufacturer.
Percussion stunners and point of application for percussive stunning

Electrical stunning: Electrical stunning induces electroplectic shock or epileptic state in the brain. This state should last for long enough for bleeding to be carried out so that the animal dies from cerebral anoxia. This method of stunning is well suited for pigs, sheep, goats and poultry. A low voltage alternating electric current is applied by means of two electrodes, which are placed on either side of the brain using tongs. Since the brain of animals is small, the electrodes should be accurately and firmly placed high up on the sides of the head in sheep, goats and pigs. For market weight pigs, a minimum of 1.25 amperes is required. A minimum of 1.00 amp is required for sheep and goats.

Electrodes must be cleaned frequently to ensure that a good electrical connection occurs between stunner and animal. If head-only stunning is used, the tongs must be placed on both sides of the head so that the current passes through the brain. The strength of the current is a combination of amperage and voltage appropriate for the species. The equipment should be fitted with a meter to measure the correct current. Approximate current/time guides for different species are as follows:

Table 1. Recommended current and time characteristics for electrical stunning

<table>
<thead>
<tr>
<th>Species</th>
<th>M/Amps</th>
<th>Amps</th>
<th>Volts</th>
<th>Time (sec.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig (bacon/porker)</td>
<td>Min. 125</td>
<td>Min. 1.25</td>
<td>Max. 125</td>
<td>Max. 10 (until EPS*)</td>
</tr>
<tr>
<td>Sheep/goat</td>
<td>100-125</td>
<td>1.0-1.25</td>
<td>75-125</td>
<td>Max. 10 (until EPS*)</td>
</tr>
</tbody>
</table>


### Table

<table>
<thead>
<tr>
<th>Poultry</th>
<th>1.5-2 kg Broiler</th>
<th>2.0</th>
<th>50-70</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey</td>
<td>200</td>
<td>2.0</td>
<td>90</td>
<td>10</td>
</tr>
<tr>
<td>Ostrich</td>
<td>150-200</td>
<td>1.5-2.0</td>
<td>90</td>
<td>10-15</td>
</tr>
</tbody>
</table>

**Religious or ritual slaughter:** The Jewish (Kosher) and Muslim (Halal) religions forbid the consumption of meat which was killed by any method other than bleeding. Stunning is not generally allowed. Because animals are fully conscious at the time of stunning, ritual slaughter may be less humane than sticking after stunning. To reduce the suffering operators must be highly skilled so that a successful gash cut severing all the veins and arteries is made quickly at the first attempt. This results in sudden and massive loss of blood with loss of consciousness and death. However, many authorities consider that religious slaughter can be very unsatisfactory and that the animal may not be rendered unconscious and suffer considerable discomfort and pain in the slaughter process. Besides this, Jhatka (Sikh) method in which the head of animal is severed in a single stroke. Many Muslim authorities permit electric stunning of cattle, sheep and poultry, because the animals subjected to this stunning method would recover if no bleeding was carried out.

**Sticking and Bleeding:** Bleeding is the part of the slaughter process where the main blood vessels of the neck are severed in order to allow blood to drain from the carcass, resulting in the death of the animal from cerebral anoxia. It is desirable to keep the animal live, but stunned, in order to eliminate the blood. Therefore, bleeding can be achieved when the heart and respiratory functions are still working. The bleeding knife should continuously be sharpened. A blunt knife will prolong the incision and the cut ends of the blood vessels will be damaged. This may cause premature clotting and blockage of the vessels, delaying bleeding out and prolonging the onset of unconsciousness and insensitivity. Incisions should be swift and precise.

Accidental cutting of the oesophagus often results in contamination of the neck, head and blood with ruminal contents. Bilateral severance is the easiest technique to perform and produces satisfactory bleeding. When both carotid arteries are severed, the animal loses consciousness in less than 10 second and bleeding of animal carcasses should last for 5 minutes. The efficiency of bleeding had a most important bearing on the subsequent keeping quality of the carcass.
Flow diagram for slaughter and dressing of food animals

Pre-slaughter care

↓

Stunning

↓

Sticking

↓

Skinning or Scalding & Dehairing / defeathering

Unclean

↓

Evisceration

↓

Washing

↓

Chilling

↓

Cutting and Deboning

↓

Freezing/ Delivery

↓

Packaging

Clean

Dressing of Meat Animals

The main purpose of dressing is to segregate edible and inedible parts of the carcass in such a way, so that the contamination of the edible parts is strictly avoided. Once the animal has been bled, the hide or skin and visera are detached from the carcass and it is then trimmed. The head, feet and tail are left attached to the pig carcass, whereas head and hide are removed from cattle/buffalo/sheep/goat carcass. In case of the sheep, legs are cut from the knuckle down the front legs, then skin is removed, starting from the neck up to the root of the tail and the hind legs are cut. After bleeding, pig carcasses are scalded in tanks with hot water at 60 or 65°C to facilitate the hair removal and then internal organs are removed. Scalding in water at around 60°C for about six minutes loosens the hair in the follicle. Too low a temperature will not
loosened the hair and too high temperature will cook the skin and it will be difficult to remove the hairs.

Dressing on rail

In this system of dressing, the carcass is conveyed by gravity or power along an overhead rail. The process of dressing is divided up into various stages, each undertaken by a separate operator as the carcass reaches him. Although most plants use the traditional one-man-one-job approach, a more modern method is to allow one operative to follow the carcass through several operations. Several systems of line dressing are in operation, the type depending mainly on the level of throughput, equipment design and species, being most complicated in cattle.

In gravity rail system, the carcasses suspended from a spreader and single wheel trolley or runner, are gravitated to each station and stopped by a manually operated stop on the overhead rail. This system is used for lower slaughter rate. It is probably the most compact and economical of the systems. Being the simplest in design, there is less chance of serious breakdown with consequent loss of production. The intermittent powered system involves the mechanical moving of the carcass suspended on a spreader (gambrel) and trolley, along a level rail at intervals by means of a variable timing device. The continuous powered system is used for higher rates of kill, 40-120 cattle / hour and more sophisticated equipment is associated with this slaughter line. In line dressing, since carcasses are conveyed to each dressing station, there is no need for operatives to be idle while carcasses are being hoisted or positioned.

In the automated dressing line, a series of mechanical devices stun the animal, remove the pelt, eviscerate the carcass and process the head. The line system is safer for operatives. This
system is hygienic as carcasses do not touch the floor and is more conveniently carried out. An efficient line system enhances the value of the carcass because of superior workmanship. However, the line system demands a high standard of engineering maintenance and when breakdown does occur, production ceases completely.

Bunging: The bunging is the process where the anus is cut free and pulled from the carcass and enclosed in a plastic bag and tied. It must start with a clean (sanitized) knife/equipment. Employees should make one incision to separate the bung. Employees should use proper procedures for cleaning equipment and hands/gloves, etc. to prevent contamination between animals. Bunging should be conducted in manner to ensure proper sanitary dressing and it is recommended that the bung be bagged to prevent contamination during the evisceration process. If contamination occurs during the bunging process then the carcass should be identified and handled appropriately to remove the contamination. These are important steps and must be done properly to reduce the potential of contaminating the carcass.

Decapitation: The head is detached by cutting through the neck muscles and the occipital joint. Legs are removed at the carpal (foreleg) and tarsal (hind leg) joints. The esophagus is clipped or tied.

Plaing: Following bleeding, carcasses of cattle, buffalo, sheep and goat are subjected to series of operation to remove the skin. The outer side of the hide must never touch the skinned surface of the carcass. Operators must not touch the skinned surface with the hand that was in contact with the skin.
Evisceration: Care must be taken in all operations not to puncture the viscera. All viscera must be identified with the carcass until the veterinary inspection has been passed. Once the animal has been skinned, the viscera are detached from the carcass and it is then trimmed. Carcasses are washed with high pressure spraying. However, in case of pigs, the head, feet and tail are left attached to the carcass. After bleeding, pig carcasses are scalded in tanks with water at 60 or 65°C heated by steam. During dressing, the main purpose is to segregate edible and inedible parts of the carcass in such a way so that the contamination of the edible parts is strictly restricted. The eviscerated carcass is split down the back bone into two. After thorough washing the carcass are chilled at 0-5°C for 12-24 hours.

Carcass washing: The primary object of carcass washing is to remove visible soiling and blood stains and to improve appearance after chilling. Washing is no substitute for good hygienic practices during slaughter and dressing since it is likely to spread bacteria rather than reduce total numbers. Stains of gut contents must be cut off. Wiping cloths must not be used. Carcass spraying will remove visible dirt and blood stains. Water must be clean. Soiled carcasses should be sprayed immediately after dressing before the soiling material dries, thus minimizing the time for bacterial growth. Under factory conditions bacteria will double in number every 20 or 30 minutes. In addition to removing stains from the skinned surface, particular attention should be paid to the internal surface, the sticking wound and the pelvic region. A wet surface favours bacterial growth so only the minimum amount of water should be used and chilling should start immediately. If the cooler is well designed and operating efficiently the carcass surface will quickly dry out, inhibiting bacterial growth.
Post mortem examination:

Veterinary inspection of carcasses and offal can only be carried out by qualified personnel. Where signs of disease or damage are found the entire carcass and offal may be condemned and must not enter the food chain, but more often the veterinarian will require that certain parts, for instance those where abscesses are present, be removed and destroyed.

Chilling of carcasses

Carcasses should go into the cooler as soon as possible and should be as dry as possible. The object of refrigeration is to retard bacterial growth and extend the shelf-life. Chilling meat post-mortem from 40°C down to 0°C and keeping it cold will give a shelf-life of up to three weeks, provided high standards of hygiene were observed during slaughter and dressing. They must hang on rails and never touch the floor. The rate of cooling at the deepest point will vary according to many factors including the efficiency of the cooler, the load, carcass size and fatness: As a general guide a deep muscle temperature of 6–7°C should be achieved in 28 to 36 hours for beef, 12 to 16 hours for pigs and 24 to 30 hours for sheep carcasses. Failure to bring down the internal temperature quickly will result in rapid multiplication of bacteria deep in the meat resulting in off-odours and bone-taint.
Chapter 8. Post Mortem Inspection of Carcasses of Food Animals

Post-mortem inspection may be defined as the systematic examination of dressed carcases, their organs including blood in a hygienic manner immediately after slaughter in the presence of adequate amount of light by a meat inspector with the object of providing wholesome meat to the consumers.

A routine post-mortem inspection should be carried out as soon as possible after carcass dressing is completed. The important subsidiary aspects of post-mortem examination are checking the efficiency of slaughter and carcass dressing technique and diagnosis of disease condition for disease control purposes.

Post-mortem inspection procedure

Post-mortem inspection must always be carried out in a systematic and hygienic manner. Care being taken to avoid contamination especially of septic nature. Post-mortem inspection utilizes many body senses, including sight, smell and touch. Incision into organs and lymph nodes will allow more detailed inspection of these parts. First, a general visual inspection of the carcass, offal and, where appropriate, blood should be made to detect bruising, oedema, arthritis, condition of peritoneum and pleura and any swelling or abnormality.

The procedures generally include the following steps:

a. Gross visual examination
b. Palpation of tissue and organs
c. Making incisions wherever necessary
d. Use of inspector's sense of smell and taste
e. Laboratory test

Incision must be made in such a way that it has to show a clean, undistorted surface. A knife contaminated in anyway must be discarded for sterilization and a clean knife used. Careless incision of abscesses can cause contamination of carcass requiring unnecessary trimming and even local condemnation. The head, viscera and blood of carcass must remain identifiable with carcass from which they are derived until inspection is completed.

Post-mortem inspection regulations of most countries stipulate that prior to the completion of post-mortem examination no serous membrane, no evidence of disease and no mark of identification or any other part shall be modified or removed from carcass.
Before the day of slaughter commences, the inspector must ensure that the premises, equipment, facilities are hygienic and in good working order and meat operatives are properly clothed and adequate in number. It is the duty of the meat inspector to arrange for stamping of carcass passed or condemned to ensure the proper disposal of condemned carcass, organs or portions to inedible sections. Care should be taken to avoid contamination of carcass during dressing either from hide or fleece or inefficient evisceration technique. It is important to make sure that the carcasses are kept separate during dressing and before adequate cooling has occurred. Beef carcasses which are still hot if allowed to touch each other will show scalded mark especially on the outside of the round and the chest which require trimming. The final decision as to the fitness of carcass and offal for human consumption rests with the veterinary inspector who must have the authority to stop the slaughter and dressing operations on grounds of lack of hygiene and lack of consideration of animal welfare.

Conditions or diseases warranting total condemnation of carcass and organs.

1. Pneumonia
2. Pericarditis
3. Pyaemia
4. Septicaemia
5. Emaciation
6. Generalized oedema
7. Metritis
8. Tumours

Inspection of abdomen

Mesenteric lymph node must be longitudinally incised and inspected to eliminate tuberculosis. Rapid examination of lungs, heart, liver, spleen, stomach and intestines are carried out and if healthy stamp.

Examination of dressed carcass

Every carcass should be examined for

a. State of nutrition
b. Evidence of bruises or discoloration
c. Localized or generalized oedema
d. Efficiency of bleeding
e. Swelling deformities or other abnormalities of bone or musculature
f. Age and sex of the animal from which the carcass were derived

any abnormal odour
h. Condition of pleura and peritoneum
i. Any other evidence of abnormality

Postmortem inspection

Palpation and incision of parts may be indicated wherever necessary. The superficial inguinal, external and internal iliac, prepectoral and renal lymph nodes should be observed and if necessary palpate and incise. When a systemic or generalized disease is suspected the main carcass lymph nodes must be examined. The thoracic and abdominal cavities should be inspected for inflammation, abscesses, or tuberculosis. The diaphragm should be lifted for tuberculous lesions, which may be hidden between the diaphragm and thoracic wall. Retropharyngeal and submaxillary lymph nodes should be examined to rule out tuberculosis. Triceps brachii muscle; diaphragm and masseter muscle should be incised for the evidence of Cysticercus bovis. Incisions of the internal and external masseters should be made parallel to the lower jaw to rule out C. bovis. Shoulder muscles and other active muscles should be incised for the evidence of sarcocysts.

![Image](image_url)

Final judgment of a postmortem inspection of a carcass or its parts is based on the evidence produced by:

1. Observation
Palpation
Incision
Smell
Ante mortem signs
Results of any lab test

The meat inspector inspecting the carcases and organs should have a good eye sight (ability to differentiate colours) and the sense of smell, which is defective and seriously limit his judgment in many instances.

Influences of Post-mortem inspection:

Routine postmortem inspection must be carried out with care in a hygienic manner avoiding unnecessary cuts always bearing in mind the value of food. Postmortem examination determines the character and extends of disease, lesions differentiating between localized and generalized conditions, acute, sub-acute and chronic condition. In acute active spreading lesions are regarded very critically but a healing one less so. The general disposition of carcase with organs, the state of nutrition, any ante-mortem report and the result of lab test are all taken into consideration in making the final judgment. The colour of blood, its coagulation property and the possible presence of foreign bodies are first determined. Responsibility to consumer must be regarded as the uppermost in the minds of the meat inspector and at the same time there must be no unnecessary wasting of valuable meat.

Decisions to be taken after post mortem inspection

1. Approved for human consumption
2. Totally condemned for human consumption
3. Partially condemned for human consumption
4. Conditionally approved for human consumption
Chapter 9: Conversion of Muscle to Meat

The conversion of muscle to meat is a complex process in which all mechanisms responsible for the development of meat qualities are very likely interdependent. The conversion of muscle into meat as a whole and the postmortem development of eating quality is very intriguing subject and far from being understood. Actually, the various regulatory processes, which prevent living meat from decomposing, cease to function after slaughter.

The end of muscle metabolism: The most significant process that occurs after slaughter is the circulatory failure, which causes the oxidation of muscle glycogen to cease and glycolysis to proceed. Changes in key properties of the meat are outlined below.

In life:

\[ \text{Glycogen} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{ATP (energy)} \]

After death:

\[ \text{Glycogen} \rightarrow \text{CH}_3\text{CH}_2\text{COOH} \]

The accumulation of lactic acid due to lack of oxygen after the failure of circulatory system leads to the fall in the pH from 7 to 5.5 (Fig 1), and at the same time the energy rich ATP reserve is depleted. The drop in pH is a desirable feature as a low pH slows down growth of micro-organisms and enhances flavour, juiciness and colour of the meat to give an attractive saleable product. As the above equations show, the more glycogen in the muscles, the more lactic acid formed. Consequently, animals are held at rest at the works before slaughter to make sure that they are not stressed prior to slaughter, as stress causes them to burn up their glycogen reserves. Meat from stressed animals has a high pH, causing it to be dark in colour, firm in texture and dry in taste (known as DFD meat). But sometimes, if carcasses have an accelerated pH decline (as with severe PSE) due to the rapid production and consumption of ATP, the accumulation of lactic acid is more rapid and rigor onset is much faster (less than 1 hr. to 4 hr.).
Unfortunately, the meat temperature is often still high, which facilitates higher than normal denaturation of protein.

![Diagram](image)

**Fig 1 Changes in pH post-mortem**

**Rigor mortis:** The contractile system of muscles is another factor that contributes to meat tenderness. The contraction makes the Z discs closer to each other and increases density of filaments, therefore reduces chewing ability. After slaughter, but before the rigor mortis, it is still able for filaments to slide over each other. However, after rigor mortis, the two types of filaments become fixed. Because of some reason by which the rigor mortis comes right at the time of contractile state, the meat will be very tough.
Actually it results from not enough ATP to operate the calcium pump, so the calcium concentration in sarcoplasm begins to rise, and muscle relaxation fails to start. Additionally, the stored oxygen supply is reduced, and the anaerobic metabolism starts to maintain the homeostasis. This process needs energy from ATP. All of those start the major energy reserve through glycogen catabolism because the reaction using creatine phosphate in postmortem muscle lasts shortly. Glycogen must first be degraded by glycogen phosphorylase to form glucose-1 phosphate. The whole process produces three ATP with glycogen as starting material. Due to lack of oxygen, enzyme lactate dehydrogenase catalyzes the reduction of pyruvate to lactic acid by NADH. This process also regenerates NAD+ for glycolysis step in ATP formation. However, the built-up lactic acid inactivates the enzymes relating to glycolysis and slows down the process of ATP regeneration. That is why there is still not enough ATP for muscle relaxation, and rigor mortis is maintained. On the other hand, lactic acid makes the pH gradually fall and the rigor mortis is rapidly developed, which decreases meat tenderness. The timing of stages of rigor mortis varies between species. Poultry is often in rigor within 1-2 hours, pork within 4-6 hours, beef and lamb within 7-15 hours after exsanguination.

Resolution of rigor: The last stage of conversion of muscle to meat is ageing or the ‘resolution of rigor’. This greatly improves the eating quality in terms of cooked meat tenderness. After slaughter, shortening of the muscle protein fibre causes the meat to become tough, a process that is accentuated by freezing immediately after slaughter. To produce meat of maximum tenderness the carcass is allowed to hang for at least 24 hours before freezing. Meat tenderness attained during ageing is due to endogenous proteolytic enzyme activity, and the extent and rate at which meat tenderizes depending on muscle, species, genetics, nutritional status, management before slaughter and slaughter process. In cold-stored meat, beef can take weeks to achieve acceptable
tenderness. In addition, carcasses are electrically stimulated; as chemists at the Meat Industry Research Institute in Hamilton have found that this increases the rate of post mortem glycolysis and thus helps to prevent cold induced toughening.
Chapter 10. Meat Fabrication and Fresh Meat Quality

Fabrication refers to creating the various cuts from the carcass to produce particular types of products. Primal or wholesale cuts are made first. Their names usually identify where the meat comes from on the animal such as loin, the shoulder etc. Retail cuts tell what part of the primal cut the meat comes from, for example rib roast or round steak. Often primal cuts are boned before cutting into retail cuts, in order to produce boneless items. The cuttings of cartasses of meat are based on their division into reasonably large wholesale or primal cuts convenient for the butchers to handle. Different standard cuts are made in sheep and goat viz. leg, loin, rack, breast and fore shank, neck and shoulder. The shape and size of primal cuts depend to some extent on the anatomy of the animal, but they also have regard to the suitability of the primal cuts for cooking. There are marked differences in the sub primal and retail cuts depending on region or country. In India, the retailer cut the wholesale cuts and consumers use to prefer the choice cuts as per their needs and experience. Though some standard cuts are there, retailers do not follow as such and make cuts as per their convenience.

Carcass processing and meat ageing

Although muscle is increasingly liable to suffer microbial spoilage in direct proportion to the time and temperature of holding postmortem, hygienic abattoir operation will generally ensure satisfactory storage for a few days at lower temperature. In the absence of microbial spoilage, the holding of unprocessed meat above the freezing point is known as conditioning or ageing and it has long been associated with an increase in tenderness and flavour. During the
first 24-36 hrs post mortem, the dominant circumstance is glycolysis. Of the protein in muscle, it has been generally accepted that the collagen and elastin of connective tissue do not denature during conditioning. During postmortem conditioning, the proteins of the myofibril and of the sarcoplasm denature in varying degree. Immediately after death and before the onset of rigor mortis, muscles are pliable and tender when cooked. With the onset of rigor mortis, the muscle becomes inextensible and is tough when cooked. As conditioning proceeds, the muscle becomes pliable once more (and increasingly tender on cooking).

**Muscle as meat**

The conversion of muscle to meat is a complex phenomenon involving many biochemical and physical changes. Muscle does not cease to function at the time an animal dies. However, metabolic function is markedly altered due to cessation of blood supply and oxygen. The pyruvate that is generated as an end product of glycolysis is converted to lactic acid which accumulates in the muscle. The major physical change that occurs in postmortem muscle is the development of rigor mortis. However, the time for completion of rigor mortis depends on animal, species and even muscle. In case of beef it is 18 to 24 hours, 5 to 12 hours in lambs and less than 3 hours for poultry.

**Meat quality determinants**

Meat quality can be defined in terms of safety, technological traits, sensory traits (tenderness, flavor, colour etc.), dietetic traits (fat composition and content etc.). All of the sensory traits except colour, are contributing factors to the palatability of meat and meat products. Tenderness and flavor is rated by consumers as the most important elements of eating quality, while colour is the most important attribute at point of purchase.

Colour is the first attribute of meat to be evaluated by the consumers and it is of utmost importance especially for fresh meat at the retail level. Surface discoloration may be considered unwholesomeness and therefore, discriminated against by the consumers. The content of myoglobin and hence the colour of meat depends on animal species and age, the physiological function of the muscle, the nutritional status of the animal and the dietary regime.

Flavour of meat is usually perceived during consumption. The influence of sex on meat flavor is well known. Boar odour is a problem associated with non-castrated male pigs. It is generally assumed that many flavor compounds from the diet can be absorbed and deposited in
the adipose tissue of the animal. Muscles that are involved in locomotion are generally of high flavor intensity than muscles whose primary function is to support the carcass.

Tenderness of meat may be simply defined as the ease of teeth to cut meat fibres during mastication. Meat tenderness or toughness is determined by the connective tissue and the muscle fibres components. Connective tissue is a fibrous structure composed primarily of collagen fibrils. The specific influence of both connective tissues depends on the thickness i.e. the amount of collagen present as well as the type of cross-linking between collagen fibrils. Muscles in mature animals have higher contents of collagen cross-links than the same muscles from young animals. Another major contributor to toughness, muscle fibres also play a great role in regulating meat tenderness. The myofibrill assembly undergoes pronounced changes during ageing like disruption of the structure and longitudinal fragmentation. Therefore, the enhanced meat tenderness during ageing has been attributed mostly to myofibrils and not to the collagen fibrils.

Juiciness refers to mouth feel of the moisture released from food during mastication. It is indicative of the moisture content in meat, which is critically affected by the water holding capacity as well as the hydration ability of meat. Myofibrillar proteins are believed to be largely responsible for water immobilization in meat. Juiciness is associated with higher levels of intramuscular (marbling) fat.
Chapter 11. Chilling and freezing of meat and meat products

Hygienic requirements demand that carcass sides be cooled as soon as possible after weighing. In our country no carcass chilling is followed and sold as hot meat immediately after slaughter. However, in developed countries, cutting up of meat is generally carried out after the carcass has been cooled for 18 hours or more. In India, the chilling practice is mostly followed by export houses.

Chilling: Carcasses of freshly slaughtered animals have surfaces that are warm and wet and thus provide a perfect substrate for the growth of pathogenic and spoilage organisms. Chilling immediately post-slaughter reduces the surface temperature to a value below the minimum growth temperature for many pathogens. The combination of low temperature and surface drying inhibits the growth of spoilage bacteria. The shelf life of chilled cuts is maximized by aggressive sanitation programme throughout the harvest, chilling, cutting and packaging operation. Meat should be transported in properly insulated and refrigerated vehicles. Solid carbon dioxide is sometimes used, either as solid blocks or crushed and provides a temperature of 0-10°C.

Freezing: Meat contains about 68-75% of water and on cooling below the freezing point of tissue fluid (-1.5°C), water in the fluid will be converted into ice. The advantages of temperatures below the freezing point were in prolonging the useful storage life of meat and in discouraging microbial and chemical changes. Fast freezing produces minute intracellular ice crystals and thus diminishes drip on thawing. The rate of freezing is dependent not only on the bulk of the meat and its thermal properties (e.g., specific heat and thermal conductivity), but also on the temperature of the refrigerating environment, on the method of applying the refrigeration and, with smaller cuts of meat, on the nature of the wrapping material used. A temperature of -20°C has been suggested as ideal storage conditions for frozen meat to completely prevent quality changes. At these low temperatures, enzyme reactions, oxidative rancidity and ice recrystallization are likely to be minimal and thus few deteriorative changes will occur during storage.

Freezing methods: Different methods of freezing meat and meat products commercially includes: plate freezing, blast freezing, liquid immersion and cryogenic freezing.

Plate freezing: Plate freezers consist of a series of hollow, refrigerated plates and the space between plates is controlled by hydraulic or pneumatic ram. In operation, trays containing the products or the 'flat surface' of meat products are placed directly in between plates and slight
pressure is applied to ensure good contact between the plates and the material being frozen. Plate freezer temperature usually ranges from -10 to -30°C. This method is generally limited to thin pieces of meat and meat products such as steaks, chops, fillets and patties.

**Blast freezing:** In blast freezing, forced is the medium and freezing depends on convection. Blast freezing involves blowing very cold air (-20 to -40°C) over the meat in a refrigerated tunnel. The product is usually placed on trays mounted on trolleys, which must be correctly positioned to maintain correct airflow. Blast freezers are widely used for meat and meat products of all type and suits for freezing whole sides, primal cuts and irregular shaped products. Plate frozen meat samples scored higher for texture, juiciness and aroma than blast and still air frozen samples.
Chapter 12. Good manufacturing Practices at Modern Slaughterhouse

Hygiene and sanitation are synonymous of quality, which is everybody’s job in an organization. Hygienic abattoir with all the basic facilities is a prerequisite for clean meat production. All the employees engaged in slaughtering of food animals should be knowledgeable of do’s and don’ts with food, good personal hygiene and habits. It is the meat processing industry’s responsibility to meet consumer expectations that their products are safe, and meet all legal requirements. Food processors rely on modern quality management systems to ensure the quality and safety of the products they produce. The three key systems in use are:

- **Good Manufacturing Practices (GMP):** These entail the processing conditions and procedures that have been proven to deliver consistent quality and safety based on long experience.

- **Hazard Analysis Critical Control Points (HACCP):** While traditional safety assurance programmes focused on identifying problems in the finished product, HACCP, a proactive technique, focuses on identifying potential problems and controlling them during the design and the production process itself.

- **Quality Assurance Standards:** Adherence to standards established by the International Standards Organization (ISO 9000) and the Food Safety and Standard Acts 2011 ensures that food processing, catering and other food-related industries conform to prescribed and well-documented procedures.

Good manufacturing practices are practices and procedures that are followed by the food processors to ensure the safety of foods for human consumption. GMP takes into account personnel, equipment, process or operation and the environment of food production. The following are brief description about various Good Manufacturing Practices (GMP) involved in slaughter and dressing of food animals.

**Rest and fasting:** The animals intended for slaughter are rested for minimum period of 12 to 24 hours. Ample drinking water during rest should be provided as it lowers the bacterial load in intestines, and facilitates defecating procedure. Animals awaiting slaughter should be fasted for 12-24 hours. Fasting improves appearance of the carcass and helps in dressing.

**Ante mortem inspection:** Ante mortem inspection of food animals is carried out by a qualified veterinarian with the object of providing wholesome meat to the consumers by deciding their fitness for slaughter. The live animal examination should be done within 24 hours prior to
slaughter to detect communicable disease like Anthrax, Foot and Mouth disease, sheep pox, swine fever etc. Diseases like Tetanus, Rabies are detected only in ante mortem examination. It should be carried out in adequate lighting in the lairage.

Clean animal for slaughter: Animals presented for slaughter should be sufficiently clean so that they do not compromise hygienic slaughter and dressing. Clipping or shearing of sheep prior to slaughter is widely practiced in many countries, the entire fleece being removed in countries where the wool market is good, and in other countries, merely the belly being clipped to reduce the potential for fleece contamination of the carcass during skinning. Identity of all animals (either individually, or as lots, e.g. poultry) has to be maintained until the time of packing and dispatch.

Stunning: Stunning must be done in a way that complies with the humane slaughter act. Stunning has two purposes: to induce an immediate state of insensibility and to produce sufficient immobility to facilitate the sticking process to initiate bleeding.

Sticking and bleeding: In the slaughter of animals, bleeding is usually carried out by an incision in the jugular furrow close to the head, severing both carotid arteries and jugular veins and blood drains, causing death through exsanguinations. Bleeding should be complete, and continued to a minimum period of 6 minutes. The efficiency of bleeding had a most important bearing on the subsequent keeping quality of the carcass.

Dressing of meat animals: Following bleeding, carcasses are dressed and excess fat, viscera and offal are separated from the bones and the edible tissue. The slaughtering knife should be cleaned and sterilized between each carcass at 82°C.

Deheading: The head as well as front and rear feet are removed after completion of bleeding. Prior to hide removal, care is taken to tie the esophagus and bung to prevent fecal contamination later in the process. Tonsils should be removed cleanly as they are heavily contaminated with pathogenic bacteria.

Dehiding: Improper dehiding of the carcass, leading to heavy contamination of the meat surfaces by frequent contact with the personnel, polluted floors and dirty tools and equipment. The contact between feed and dirt particles of the hide and meat surface should be prevented. After the initial cut through the skin, the knife should be sterilize in water at 82°C and all other cuts from the inside out should be made. No hair or skin pieces should be left on the skinned carcass.
Evisceration: It involves opening of pelvic, abdominal and thoracic cavities and removing the internal organs. Improper evisceration through accidental opening of stomachs and tripe, leading to contamination spreading to internal and external surfaces of the carcass. Hence, adequate precaution should be taken to segregate edible and inedible parts of the carcass in such a way that the contamination of the edible parts is strictly restricted. Carcass should not have contact with floors, walls or stands. Identify/correlate viscera with the related carcasses should be maintained.

Post mortem inspection: The carcass and internal organs should be inspected for safety. The internal organs are removed and inspected for internal parasites and signs of disease. Lymph nodes are examined for signs of systemic disease. If any pathological condition is detected, part of or carcass as a whole should be condemned and sent for destruction.

Carcass trimming: A usual part of the slaughter process, effective in removing physical debris and bacteria associated with it. Final trim remains a required CCP to meet the zero fecal tolerance requirements.

Carcass washing and decontamination: Then the carcass is washed with pressurized potable water to remove bone dust and other material from trimmed carcasses and also reduce the body temperature. A warm carcass wash be used (32.22-48.88°C) which will more effectively remove debris from the carcass. Decontaminants like chlorinated water, lactic acid, etc. also employed to minimize the microbial load.

Chilling: Carcasses of freshly slaughtered animals have surfaces that are warm and wet and thus provide a perfect substrate for the growth of pathogenic and spoilage organisms. Chilling immediately post-slaughter reduces the surface temperature to a value below the minimum growth temperature for many pathogens. The combination of low temperature and surface drying inhibits the growth of spoilage bacteria. Hence, carcass sides should be cooled as soon as possible after weighing. Important issues are the velocity of air over the carcasses, the uniform airflow throughout the chill room, temperature and relative humidity. Meat fabrication is generally carried out after the carcass has been cooled for 18 hours or more in chilling rooms at the temperature of 0 to 5°C and 85-95% relative humidity to attain 5.8–6 pH to prevent the growth of microorganisms and reduce meat deterioration. Chilled meat has shelf life of 2-3 days. Hot boning is the removal of muscles from carcasses immediately after slaughter. In our country,
except export units, no carcass chilling is followed and sold as hot meat immediately after slaughter.

Deboning and de-glandling: The lymph glands located inside muscle usually harbours some microbes. Hence these lymph glands should be removed. The chilled carcass is further deboned and de-glanded to prepare required cuts and packed for marketing. If the meat is desired to be stored for longer time quick freezing is always a desirable process to retain the natural quality of meat and to avoid deterioration due to delay in process. The so made product is stored at -22°C in the cold store.

Cleaning and sanitation in slaughter house: The temperature of water used for cleaning purpose should be fixed at 55°C and for disinfection is 80°C. After production is completed, the cleaning and disinfection should begin with proper detergents, disinfectants, surfactants with sufficient pressure of water i.e. 4 bar PSI and with 55°C and 80°C water along with sufficient time for drying. The disposal of dirt, dung, debris should be well organized and in a systematic, ecofriendly manner. The transportation trucks need to be allocated in a designated washing area along with disinfection and fumigation.

Periodical medical examination and vaccination of workers: To safe guard the health of the meat industry workers and avoid zoonotic diseases, routine medical examination and appropriate vaccinations against communicable diseases should be administered and they should be provided with proper meat dressing equipment like metal gloves, knives, knife holders, aprons, head caps.

Byproducts utilization and waste disposal: The major offense of an abattoir is pollution of water, offensive smell, inviting birds etc. Solution to all the above referred pollution problems lies with the advancement in the technology and design of integrated meat complexes on scientific lines. The main challenge of the industry is utilization of the by-products of animal and better technology is to be developed for organic biodegradation system for the slaughter house water.
Chapter 13. Importance of Personal and Environmental Hygiene in Meat Processing

Safe, clean, wholesome food - is indispensable to the health and welfare of the consumer that - food is a perishable commodity susceptible to contamination and adulteration and that basic sanitary and hygienic conditions are deemed to be necessary for the production and distribution of food. Meat and meat products are highly perishable among food items and can transmit diseases from animals to human-beings. Hence the establishment, in which meat is being handled, processed, manufactured, stored, distributed and the persons handling them should conform to the sanitary and hygienic requirement and food safety measures.

Personal Hygiene:

Food handlers shall maintain high standards of personal cleanliness at all times. They should avoid habits that are potentially hazardous when associated with handling food products, and might lead to food contamination through the transfer of bacteria from the employee to product during its preparation. The following are some of the important personal hygiene measures to be implemented mandatorily in meat and meat products processing units

- Persons suffering from infectious diseases shall not be permitted to work. Any cuts or wounds shall remain covered at all time and the person should not be allowed to come in direct contact with food. Arrangements shall be made to get the food handlers / employees of the establishment medically examined once in a year.

- Food handlers shall maintain a high degree of personal cleanliness. They shall be provided with adequate and suitable clean protective clothing, head covering, face mask, gloves and foot wear.

- All food handlers shall keep their finger nails trimmed, clean and wash their hands with soap, or detergent and water before commencing work immediately after handling raw food or any contaminated material and every time after using toilet.

- Food handlers shall always wash their hands with soap and clean potable water, disinfect their hands at the beginning of food handling activities, where this could result in contamination of other food items or after using the toilet.

- Food handlers shall refrain from eating, smoking, spitting, chewing, sneezing or coughing over any food in food preparation and food service areas.
• All food handlers should avoid wearing, false nails or other items or loose jewelry that might fall into food and also avoid touching their face or hair.
• The food handlers should avoid habits like scratching nose, running finger through hair, rubbing eyes, ears and mouth, scratching beard, scratching parts of bodies, etc.
• Generally visitors should be discouraged from entering the food handling areas. Proper care has to be taken to ensure that food safety & hygiene is not getting compromised due to visitors in the floor area.

Sanitary and hygienic requirements for meat processing environment:

It shall be the responsibility of the food business operator to ensure the place where meat food is manufactured, processed or handled complies with the requirements adherence to necessary sanitary and hygienic requirements. The following are some of the basic requirements for ensuring safety of the food manufactured in any premise.

Location and surroundings: The premises shall be located in a sanitary place and free from filthy surroundings and shall maintain overall hygienic environment. It shall be clean, adequately lighted and ventilated and have adequate space for manufacturing and storage to maintain overall hygienic environment.

Layout and design: The layout of the food establishment shall be such that food preparation / manufacturing processes are not amenable to cross-contamination from other pre and post manufacturing operations like goods receiving, pre-processing, (viz. packaging, washing / portioning of ready-to-eat food etc.). Floors, ceilings and walls must be maintained in a sound condition. They should be smooth and easy to clean with no flaking paint or plaster. Windows, doors and drains other openings shall be fitted with net or screen to make the premise insect free.

Equipment and utensils: Equipment and containers that come in contact with food and used for food handling, storage, preparation, processing, packaging and serving shall be made of corrosion free materials which do not impart any toxicity to the food material. Equipment and machinery shall be of such design which will permit easy cleaning. No vessel, container or other equipment, the use of which is likely to cause metallic contamination injurious to health shall be employed in the preparation, packing or storage of food. Appropriate facilities for the cleaning and disinfecting of equipment and instruments and wherever possible cleaning in place (CIP) system shall be adopted. Equipment and containers for waste, by-products and inedible or
dangerous substances, shall be specifically identifiable and suitably constructed. Stainless steel /aluminum / glass are suitable for cooking and storing shall be used.

Facilities:

a. **Water**: Only potable water, with appropriate facilities for its storage and distribution shall be used as an ingredient in processing and cooking. Water used for food handling, washing, should be of such quality that it does not introduce any hazard or contamination to render the finished food article unsafe. Non potable water pipes shall be clearly distinguished from those in use for potable water.

b. **Adequate facilities for cleaning, disinfecting of utensils and equipment shall be provided.**

c. **Drainage and waste disposal**: Food waste and other waste materials shall be removed periodically from the place where food is being handled or cooked or manufactured to avoid building up. A refuse bin of adequate size with a proper cover preferably one which need not be touched for opening shall be provided in the premises for collection of waste material. This shall be emptied and washed daily with a disinfectant and dried before next use. Adequate drainage, waste disposal systems and facilities shall be provided and they shall be designed and constructed in such manner so that the risk of contaminating food or the potable water supply is eliminated.

d. **Personnel facilities and toilets**: Personnel facilities shall include wash basins, lavatories, changing rooms, rest and refreshments rooms and such facilities shall be suitably located so that they do not open directly into food processing, handling or storage areas.

e. **Light and ventilation**: Natural or artificial lighting and ventilation shall be provided to the food establishment, to enable the employees/workers to operate in a hygienic manner. Lighting fixtures must wherever appropriate, be protected to ensure that food is not contaminated by breakages of electrical fittings.

Sanitation and maintenance practices:

a. **Cleaning and maintenance**: A cleaning and sanitation programme shall be drawn up and observed and the record thereof shall be properly maintained, which shall indicate specific areas to be cleaned, cleaning frequency and cleaning procedure to be followed, including equipment and materials to be used for cleaning. Equipment used in
manufacturing will be cleaned and sterilized at set frequencies. Cleaning chemicals shall be handled and used carefully in accordance with the instructions of the manufacturer.

b. Pest control systems: Building shall be kept in good repair to prevent pest access and to eliminate potential breeding sites. Holes, drains and other places where pests are likely to gain access shall be kept in sealed condition or fitted with mesh / grills / claddings or any other suitable means as required and animals, birds and pets shall not be allowed to enter into the food establishment areas/ premises. Treatment with permissible chemical, physical or biological agents, within the appropriate limits, shall be carried out without posing a threat to the safety or suitability of food.

c. Clothing: Staff handling exposed or wrapped fresh meat or working in rooms and areas in which such meat is handled, packaged or transported must in particular wear clean and easily cleanable headgear, footwear and light-coloured working clothes and, where necessary, clean neck shields or other protective clothing.

d. Hand washing: Water facilities should be readily available to wash hands during working days. The temperature of the water must be optimum (Too hot and too cold, water is to be avoided). Water must be supplied with a non-hand-operated outlet. This may be controlled by foot, knee or magic eye. Bactericidal soap must be available, with disposable paper towels provided.

e. Medical certification: Persons likely to contaminate meat are prohibited from working on it and handling it. When recruited, any person working on or handling fresh meat shall be required to prove, by a medical certificate that there is no impediment to such employment. Regular examination of fecal samples to attempt to identify salmonella carriers is advised. Workers who are suffering or who have recently suffered from bouts of gastroenteritis are excluded from duties where they are handling exposed fresh meat. Workers with septic lesions must cover such sores with appropriate waterproof dressings.
Chapter 14. Packaging Methods and Requirements

Meat needs to be packaged to prevent contamination, color deterioration, loss of moisture, odor pickup, oxidative rancidity etc. It also helps in easier transport, display of necessary information and to convince consumers. Material to be used for packaging depends upon quality attributes of the products. Packaging material for fresh meat should be barrier to water vapor, light and odor.

Table: Different packaging requirements and the material used

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Packaging requirement</th>
<th>Packaging material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Packaging fresh and frozen meat</td>
<td>Low density polyethylene</td>
</tr>
<tr>
<td>2</td>
<td>Giblet packing</td>
<td>Low density polyethylene</td>
</tr>
<tr>
<td>3</td>
<td>Wrapping meat chunks and deboned meat</td>
<td>Low density polyethylene</td>
</tr>
<tr>
<td>4</td>
<td>Vacuum packaging</td>
<td>Laminates</td>
</tr>
<tr>
<td>5</td>
<td>Shrink film packaging</td>
<td>Polyvinyl chloride</td>
</tr>
<tr>
<td>6</td>
<td>Tray packaging</td>
<td>Polystyrene</td>
</tr>
<tr>
<td>7</td>
<td>Retort pouches</td>
<td>3 ply laminates</td>
</tr>
<tr>
<td>8</td>
<td>Storage of meat pickles</td>
<td>Glass or pet bottles</td>
</tr>
<tr>
<td>9</td>
<td>Making films, trays, crates used to store meat</td>
<td>High density polyethylene</td>
</tr>
</tbody>
</table>

Packaging of fresh meat

Fresh meat is highly perishable and a biologically active item. The quality of fresh meat is affected by the growth of micro-organisms, enzyme activity and by oxidation. The microbiological activity continues even after refrigeration and packaging, though at a reduced rate. The factors that make fresh meat unsaleable are changes in colour, odour, taste and texture. The pigments present in fresh meat are hemoglobin and myoglobin. Myoglobin is responsible for the characteristic colour of fresh meat when it is first cut. In presence of oxygen, there is formation of oxymyoglobin, which imparts a bright red colour to the meat. In the absence of oxygen, oxymyoglobin gets reconverted to myoglobin. An undesirable brown colour is formed due to metamyoglobin when meat gets exposed to air for a few days. Yet another form of discoloration on the surface of the meat, which is dark reddish-brown colour is due to loss of
moisture. Dehydration of meat on the surface results in concentration of the pigments. Further concentration of pigments occurs, when the interior moisture containing dissolved pigments migrates to the surface and evaporates. Another factor, which accelerates desiccation and oxidation of meat, is ultraviolet light. Undesirable flavours, odours and textures can occur due to the action of enzymes, molds, bacteria and oxygen if they are not properly controlled. During the storage of fresh meat, the flavour / odour may get affected due to the pick-up of foreign odours or as a result of oxidative rancidity. Hence, to prevent moisture loss, offer the product to the consumers in most desirable colour-red bloom, prevent further bacterial contamination, arrest pick up of foreign flavour and odour by meat, control oxygen transfer and prevent dehydration, packaging meat with materials having good water vapour barrier is essential. Fresh meat should be stored at 0°C and 85 to 90% RH.

Packaging of frozen meat

Major portion of exports of meat from India is in frozen form. Preservation of meat by freezing, offers the greatest advantages of increase in shelf-life, inhibition of bacterial growth and preservation of fresh texture and flavour. If frozen meat is not properly packed there is continuous dehydration from the surface resulting in freezer burn. This condition affects the surface texture and colour. Meat fat is also prone to the development of oxidative rancidity if a good oxygen barrier is not used. Hence, frozen meat needs protection against dehydration and loss of surface texture, moisture loss, temperature fluctuations, rancidification pick up of odours / flavours and expansion and contractions which occur during freezing and thawing.

A suitable packaging material must, therefore, have a very low moisture vapour and oxygen transmission rate. The material should also be durable at freezer temperature, have very high wet strength and be impermeable to odour and flavours. Packaging Materials Plastics are amongst the most commonly used materials for packaging of frozen meat. Generally, low density polyethylene (150 - 200 gauge) is used for this purpose as it provides adequate clarity and is stable at low temperatures and is available at low cost. Polyester or Nylon / PE laminates and heat shrinkable low density polyethylene and PVC / PVDC co-polymer films also provide functional properties, besides giving neat appearance to the frozen meat cuts. Shrink packaging also allows convenient handling of the product. Frozen meat may be in the form of chunks, minced or various cuts. The unit packs consist of 1, 2, 4 or 8 lbs in LDPE bags of 250 - 350 gauge. After placing the meat in the bags, the bag is folded and then the packed product is blast
frozen at -40°C for a period of 4 to 12 hrs. depending upon the size and shape of the package. After freezing, unit packages are packed and stored in corrugated boxes made of either paper or plastic, which are either waxed internally, or on both the surfaces. These boxes are stored at -20°C and the expected shelf-life for the product is around one year.

**Frozen storage life of fresh meat from different species**

<table>
<thead>
<tr>
<th>Species</th>
<th>Deep Freezer (-18°C)</th>
<th>IBR* (-18°C)</th>
<th>Average</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>12</td>
<td>1.8</td>
<td>10.2</td>
<td>2.8-19.4</td>
</tr>
<tr>
<td>Pork</td>
<td>8</td>
<td>12</td>
<td>17.4</td>
<td>2.8-23.3</td>
</tr>
<tr>
<td>Lamb</td>
<td>12</td>
<td>24</td>
<td>7.8</td>
<td>2.8-24.3</td>
</tr>
<tr>
<td>Chicken</td>
<td>10</td>
<td>1.8</td>
<td>13.6</td>
<td>6.0-23.3</td>
</tr>
</tbody>
</table>

*International Institute of Refrigeration (Source: James, 2000)

**Packaging techniques used in meat industry:**

**Tray with over wrap packaging**

In this method fresh meat cuts are placed in a tray and then covered with transparent film to give aesthetic look to the product. Polystyrene foam trays with a covering of transparent low density polyethylene is the commonly used for meat packaging.

**Shrink film packaging**

Used for uneven primal cuts of meat. Cuts are covered with heat shrinkable material like polyvinyl chloride, polypropylene, rubber hydrochloride etc. and hot air is blown to make it contour tight. Hot air tunnels are used for efficient and rapid packaging purpose.

**Vacuum packaging**

Meat is packed without air inside the package. Processed meat products can be stored up to a month at refrigeration temperature. Packaging material used for vacuum packaging must be impermeable to gases and moisture and must have good mechanical strength. Some of the laminates used for vacuum packaging are: Polyester/ polyethylene, Polyamide/ polyethylene, PVDC/ polyester, PVDC/ PE etc.

**Modified atmosphere packaging (MAP)**

Meat is stored in artificial (modified) atmosphere. Commonly used gases for MAP are carbon dioxide (CO₂), oxygen (O₂), and nitrogen (N₂). 70% oxygen and 30% CO₂ are routinely
used for packaging fresh meat whereas cooked, cured and processed meat products are stored with 30 % CO₂ and 70 % N₂.

Canning and Retort pouch packaging

Canning is a technology in which the meat products are placed in hermetically sealed cans and thermally processed to make them commercially sterile. Canned products can be stored up to two years. Similar process can be done in composite film/foil/film laminates also. Commonly used retort pouches have an outer layer of plastic film made of polyamide or polypropylene, middle layer of aluminum foil and inner layer of polyethylene or polypropylene.

Active food packaging

It is a packaging, which changes the condition of packaging to extend shelf life or improve safety or sensory properties while maintaining quality of foods. Some of the functions of active food packaging material include scavenging of oxygen, moisture regulation, odor/taint removal, carbon dioxide scavenger/emitter, antimicrobial activity etc.

Meat products package labelling Information

Any meat processor/entrepreneur willing for distribution and marketing of their products must consider the following points:

1. Packages containing meat products must be marked with red color square with a red circle/dot in the centre.
2. Name of the product, type of meat used and all important ingredients must be mentioned.
3. Date of manufacturing, storage requirements and best before date must be provided.
4. Net weight, price, name of the firm should be included. It is always better to provide cooking instructions and composition especially calorific values for the benefit of consumers.
Chapter 15. Collection and Utilization of Animal Byproducts

When meat animal is slaughtered and processed only one third is meat and the rest comprise byproducts and waste, which need to be adequately processed and disposed in order to recover useful products of human utility and economic significance and meet the environmental regulations.

Collection

During the processing of carcass, byproducts are separated depending on the purpose and sale-ability of items such as edible and non-edible byproducts. They are categorized into three categories:

Category I: Animal byproducts are not fit for human consumption. The products include all body parts including hide and skin of animals killed for disease, specified risk materials and animals with traces of banned materials.

Category II: Animal byproducts are not for animal consumption. The products include manure and digestive tract content. Products contaminated with vet drugs. Animal byproducts other than Category I and III.

Category III: Animal byproducts are not for human consumption. The products include parts of animals that were rejected for human consumption. Hides and skins, hooves and horns, pig bristles and feathers that could be a source of communicable disease.

Utilization

Edible byproducts

These products are also called as variety meats or specialty meats. They are generally internal organs such as hearts, tongues, livers etc. or external organs such as feet, tail, ear etc. Yield varies based on the size and condition of the animal. Edible byproducts except blood are largely recovered and utilized.

Table-1 Edible byproducts and its uses

<table>
<thead>
<tr>
<th>By-product</th>
<th>Main Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood</td>
<td>Pharmaceuticals, Blood protein isolate, food</td>
</tr>
<tr>
<td>Liver</td>
<td>Liver meal, Variety Meat, Liver tonics</td>
</tr>
<tr>
<td>Heart</td>
<td>Food, Variety meat, Haggis</td>
</tr>
<tr>
<td>By-product</td>
<td>Main Use</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Blood</td>
<td>Leather finishing agent, Animal feed; Blood Meal</td>
</tr>
<tr>
<td>Bone</td>
<td>Glue, Gelatin</td>
</tr>
<tr>
<td>Hide</td>
<td>Leather, Gelatin</td>
</tr>
<tr>
<td>Intestine</td>
<td>Casing, Suturing Material</td>
</tr>
<tr>
<td>Foot and Hoof</td>
<td>Neat’s Foot oil, protein hydrolysate</td>
</tr>
<tr>
<td>Bile</td>
<td>Detergent</td>
</tr>
<tr>
<td>Fat</td>
<td>Soap, Grease</td>
</tr>
<tr>
<td>Feathers</td>
<td>Feather meal, Protein hydrolysate</td>
</tr>
<tr>
<td>Ruminal contents</td>
<td>Biogas</td>
</tr>
</tbody>
</table>

**Non-edible byproducts**

Blood, spleen, lungs, trachea, gastrointestinal content, feathers are the most common items in the non-edible byproducts. Some of the uses of non-edible byproducts are given in Table-2.
Animal glands and their uses

There are large numbers of glands present in an animal involved in synthesis and secretion of enzymes, hormones, pigments and vitamins. These enzymes are involved in the metabolic process in living cell and hence their availability in its natural form is very useful in the medicinal and industrial products. The collection of animal glands from slaughtered animals is very important in terms of cost and availability. Important animal glands and its uses in pharmaceutical industry are given in Table-3.

<table>
<thead>
<tr>
<th>Gland/Tissue</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adrenal Cortex</td>
<td>Cortisone</td>
</tr>
<tr>
<td>Adrenal Medulla</td>
<td>Adrenaline, Noradrenaline</td>
</tr>
<tr>
<td>Gall Bladder</td>
<td>Bile, Bile Salt, Pigment</td>
</tr>
<tr>
<td>Duodenum</td>
<td>Enterogastrine, Secretin</td>
</tr>
<tr>
<td>Brain</td>
<td>Steroid, Cholesterol, Lecithin, Cephalin</td>
</tr>
<tr>
<td>Intestine</td>
<td>Heparin</td>
</tr>
<tr>
<td>Lungs</td>
<td>Heparin</td>
</tr>
<tr>
<td>Liver</td>
<td>Vit. B12, Heparin, Catalase</td>
</tr>
<tr>
<td>Ovaries</td>
<td>Progesterone, Relaxin</td>
</tr>
<tr>
<td>Pancreas</td>
<td>Insulin, Glucagon, Lipase, LH</td>
</tr>
<tr>
<td>Parathyroid</td>
<td>Parathormone</td>
</tr>
<tr>
<td>Thyroid</td>
<td>Thyroxin</td>
</tr>
<tr>
<td>Pituitary</td>
<td>GH, TSH, ACTH, Lactogenic Hormones</td>
</tr>
<tr>
<td>Seminal Vesicles</td>
<td>Prostaglandins</td>
</tr>
<tr>
<td>Testes</td>
<td>Hyaluronidase</td>
</tr>
<tr>
<td>Stomach</td>
<td>Pepsin, Rennin</td>
</tr>
</tbody>
</table>

Integrated meat export plants have large scale modern rendering plants and to a great extent byproducts are effectively utilized. Facilities for bio-gas production using soft tissues for meeting energy requirements have also been established in some meat plants. However, in the
slaughterhouses regulated by local bodies, byproducts are being underutilized due to lack of processing facilities. Organized facilities for small scale processing of some of the byproducts such as fat rendering, casings processing, pet food preparation, etc. will not only generate revenue and employment but also prevent the environmental pollution.
Chapter 16. Occupational Hazards in Meat Processing Plants

Slaughtering and carving up animals is inherently risky work and is aggravated by ever increasing line speed, inadequate training, close-quarters cutting with sharp knives and long hours of working with few breaks in larger plants. Workers can also be cut by their own knives during the butchering and cutting processes. Workers can be injured by falling on slippery floors and exposure to extreme heat or cold. Prolonged exposure to cold temperatures stress joints and exacerbate existing conditions such as arthritis and cardiovascular illnesses. Exposure to hazardous gas such as hydrogen sulfide, methane and carbon dioxide released from decomposing animal waste and ammonia from refrigerated units is also reported. Workers handle or work in close proximity to diseased animals and their infectious tissues and organs are prone to risk of zoonotic diseases like leptospirosis, Q fever, brucellosis, anthrax, erysipelas, salmonellosis, tetanus, tuberculosis, toxoplasmosis, etc. Pathogens can infect workers from open abrasions or through inhalation.

Preventive measures

The hazards are preventable with economically feasible health and safety precautions and practices. Efforts to improve worker and workplace safety in the industry will continue to bear fruit. To reduce the extensive injuries and health hazards, we need to optimize the line speed, establish new ergonomics standards, devise stricter injury reporting, reduce underreporting of injuries and honour workers' rights to organize.

Personal protective equipment:

a. Providing workers with appropriate protective clothing, gloves and masks for workers in intestine and stomach cleaning operations;

b. Provide respiratory protection and impermeable clothing for use during disinfection of pens and lairage areas;

c. Respiratory gear to guard against inhalation of the poison,

Machine guarding and engineering control:

a. The line speed should be optimized based on health and safety considerations.

b. Designing appropriate pen / lairage / livestock yards such that the animals can be calmly moved into the facility, and which allows for escape routes for the workers;

c. Conducting stunning of cattle in a controlled setting (e.g. stun-box).
Ergonomics: Designing of equipment and devices that suits the worker, their movements and cognitive abilities.

Work environment and good housekeeping:

a. Designing a proper slaughterhouse floor that is slip proof and maintained to prevent slips and falls when wet.

b. Avoiding dust and aerosol generating activities (e.g., use of compressed air or high pressure water for cleaning) and where they cannot be avoided providing proper ventilation of enclosed or semi-enclosed areas to reduce or eliminate exposure to dust and aerosols.

c. Ensuring physical segregation of work and welfare facilities to maintain worker personal hygiene.

Administrative control

Measures against zoonosis: Designing holding areas for detained animals and high-risk materials to avoid direct contact with workers and ensuring that all waste materials, including those from rejected animals, are removed daily.

Information dissemination and training regarding workplace hazards

Newly employed workers may not have been aware of the risks. Make sure employees get the adequate training in their language. Training workers in proper live animal handling methods including the use of structures and equipment for handling and restraining animals. Providing workers with training in the proper use of cutting equipment (including the proper use of machine safety devices) and personal protective equipment such as metallic gloves and leather aprons for cutting activities are highly recommendations for accident prevention from equipment use. Ensuring that ritual slaughter is carried out by individuals who have received the correct training and have subsequently been approved to slaughter animals.

Safety and health inspection systems

a. Adequate precautions should be taken when handling and storing detergents and disinfectants. Chemicals should not be stored or transported with food or beverages, and should be secured in a locked and clearly identified area.

b. Prevent seasonal and other temporary workers from working with chemicals until they have been fully trained.
c. Labelling of hazardous chemicals and train workers how to detect those chemicals in case of a leak.
Chapter 17. Slaughterhouse Cleaning and Disinfection

To ensure food safety, effective cleaning and disinfection of slaughterhouses, equipment and surfaces in food processing plants must be ensured. The very purpose of cleaning and disinfection is to remove meat food residues and significantly reduce the living spoilage and pathogenic microorganisms. First gross debris must be removed, then clean the premises with detergents (soaps), followed by rinsing with clean water, apply disinfectant and finally dry the cleaned and disinfected the areas. In the cleaning process, the most important are biofilms. Certain microorganisms secrete polysaccharides which combine with hard water salts to form biofilms that are very difficult to remove from slaughterhouse areas. The most important factors that affect the cleaning process are time, temperature, detergent concentration, and mechanical action of the cleaning substances.

Hot water and steam are very effective for disinfection of slaughterhouse and premises. Hot water kills all vegetative microorganisms and some spores, there shall be no chemical residues remain; it will not be corrosive, and it reaches hard to reach areas and cleanses. Chemical methods include halogen (chlorine, iodine), and surfactant or non-oxidizing agents (quaternary ammonium compounds). The chemicals used should be non-toxic to humans and it should have wide antimicrobial activity, it should kill them than inhibit and it should not taint the food. Never mix acids and alkalis and avoid exothermic reactions and accidents. Hypochlorite never be mixed with acids (chlorine gas), and nitrogenous materials (which may form explosives).

Cleaning equipment surfaces in processing plants is difficult because of crevices that remain moist. Remnants of foods attached to surfaces enhance the survival of bacteria therefore it is important to clean with potable water before disinfection. Some pathogens may survive alkaline cleaning products but may become sensitive to disinfectants. Cleaning surfaces and destruction of pathogens may be achieved by alkaline detergents, ozone, hydrogen peroxide vapor, encapsulated lysozyme, chlorinated compounds, peroxy acetic acids, and QACs. Biofilms can be removed by disinfectants, acidic, neutral and alkaline electrolyzed water, alkaline based cleaning compounds, chlorinated compounds, peroxyacetic acids, nisin, and hydrogen peroxide, etc.
Subject: Slaughter of animals not permissible under the FSS Act and Regulations.

Your kind attention is invited towards Regulation 25 of the FSS Act 2006, wherein definitions of animal, carcass, and meat are given.

"As per sub-regulation (23) (a) "animal" means an animal belonging to any of the species specified below:

(i) Ovine;
(ii) Caprine;
(iii) Bovine;
(iv) Equine;

and includes poultry and fish.

The slaughtering of animals of any other species other than the one listed above is not permissible under the FSS Act and Regulations.

In view of the above, you are requested to kindly strengthen the vigil and ensure the compliance of the provisions of FSS Act, 2006.

Yours sincerely,

[Signature]

Director (Enforcement)

All the Food Safety Commissioners
packaging from any damage during transport to the dairy establishment, and they shall have been stored there under hygienic conditions in a room intended for that purpose;

(c) the rooms for storing the packaging material shall be free from vermin and from dust which could constitute an unacceptable risk of contamination of the product and shall be separated from rooms containing substances which might contaminate the products. Packaging shall not be placed directly on the floor;

(d) packaging shall be assembled under hygienic conditions before being brought into the room, except in the case of automatic assembly or packaging, provided that there is no risk of contamination of the products;

(e) packaging shall be done without delay. It shall be handled by separate group of staff having experience in handling and product wrapping and

(f) immediately after packaging, the dairy products shall be placed in the designated rooms provided for storage under required temperature.

3. Bottling or filling of containers with heat-treated milk and milk product shall be carried out hygienically.

4. Wrapping or packaging may not be re-used for dairy products, except where the containers are of a type which may be re-used after thorough cleaning and disinfecting.

5. Sealing shall be carried out in the establishment in which the last heat treatment of milk or liquid milk-based products have been carried out, immediately after filling, by means of a sealing device which ensures that the milk is protected from any adverse effects of external origin on its characteristic. The sealing device shall be so designed that once the container has been opened, the evidence of opening remains clear and easy to check.

PART IV

(See Regulation 2.1.2 (1)(5))

Specific Hygienic and Sanitary Practices to be followed by Food Business Operators engaged in manufacture, processing, storing and selling of Meat and Meat Products

A. Slaughter House

Food Business Operator which slaughters large animals and small animals including sheep and goat or poultry birds within the premises of his factory for production of meat/meat products for supply/sale/distribution to the public shall comply with the following requirements:

1. General Requirements:

1.1 No Objection Certificate to be obtained from local Authority before grant of license.

2. Location of Premises:

Such establishments / Slaughter Houses should be linked to a meat market located away from Vegetable, fish or other food markets and shall be free from undesirable odour, smoke, dust or other contaminants. The premises shall be located at elevated level in a sanitary place.

3. Premise requirements:

3.1 The slaughter house shall have a reception area/animal holding yard/cutting yard, lairage, slaughter hall, side halls for hide collection, paunch collection, offals collection, and separation, holding room for suspected/condemned carcass, by-product harvesting, refrigeration room/cold room etc.

3.2 Every such establishment / Slaughter House shall make separate provision in the slaughter hall for the slaughter of different species which are proposed to be slaughtered (like large animal viz: Cattle and Buffalo, Pigs and small animals like Sheep & Goat) and for different methods of slaughter (like Halal, Jewish and Jhatka). After every type of operation the slaughter house shall be cleaned, washed wiped/dried and sanitized thoroughly.

3.3 The slaughter house shall have separation between clean and dirty sections and shall be so organized that from the introduction of a live animal into the slaughter house up to the emergence of meat and offal classed as fit for human consumption there shall be a continuous forward movement without any possibility of reversal, intersection or overlapping between the live animal meat, and between meat and bye products or waste.
3.4. The reception area/animal holding yard/resting yard shall have facilities for watering and examining animals before they are sent to holding pens/lairage. Animals suspected of contagious or infectious diseases shall be segregated and kept in separate isolation pens which shall also be provided with arrangements for watering and feeding. After confirmation for any notifiable disease, the designated Veterinary Authority shall notify the disease as per the existing procedures. The resting yard must have overhead protective shelter. (This is not mandatory for registration category)

3.5. The lairage shall be adequate in size for the number of animals to be laired.

3.6. Separate space shall be provided for stunning (Wherever applicable), for collection of blood and for dressing of carcasses. The slaughtering of an animal shall not be done in the sight of other animals. The dressing of the carcass shall not be done on the floor. Suitable hoists will be provided to hang the carcass before it is eviscerated.

3.7. All the floors in lairage, slaughter halls, work rooms, hanging rooms shall be of impervious and non-slippery material.

3.8. The internal walls will be paved with impervious glazed tiles up to 1 meter height in case of poultry and small ruminant animals and 5 meter height in case of large ruminant animals. The walls and floors should be epoxy coated so as to avoid accumulation/absorption of dust, blood/meat particles, microbial/fungal growth.

3.9. Ceiling or roof shall be so constructed and finished so as to minimise condensation, mould development, flaking and accumulation of dirt.

3.10. Suitable and sufficient accommodation shall be provided for segregation, storage and disposal of condemned meat.

3.11. The establishments/Slaughter Houses shall be so constructed and maintained as to permit hygienic production.

3.12. Windows, doors and other openings suited to screening shall be fly proof. All doors shall have strong springs so that they may close automatically.

3.13. All operations in connection with the preparation or packing of meat/meat food products shall be carried out under hygienic conditions. No portion of the establishments/Slaughter Houses premises shall ever be used for living or sleeping purposes unless it is separated from the factory by a wall.

3.14. There shall be efficient drainage and plumbing systems and all drains and gutters shall be properly and permanently installed. There shall be provision for the disposal of refuse.

3.15. The drainage system for blood shall either be underground with facility for easy cleaning or a portable receptacle with lid. All drainages will have traps and screens so as to prevent entry of scavengers like rats, mice, vermin etc.

3.16. The rooms and compartments where edible products are handled shall be separate and distinct from the rooms and compartments for inedible products.

3.17. Suitable and separate space shall be provided for the storage of hides and skins. This room shall have a separate exit.

3.18. A constant and sufficient supply of clean potable cold water with pressure hose pipes and supply of hot water should be made available in the slaughter hall during working hours.

3.19. Suitable and sufficient facilities shall be provided for persons working in the slaughter house for changing their clothes and cleaning their footwear, and cleaning their hands before entering rooms used for the preparation and storage of meat.

3.20. Provision for latrines, toilets and change rooms will be made. Sufficient number of latrines, urinals, washbasins and bathrooms for each sex shall be provided.

3.21. Suitable and sufficient facilities shall be provided in convenient places within the slaughter house for the sterilisation of knives and sharpener (mushafa) and other equipment used in the slaughter house. The knives and sharpener (mushafa) shall be of stainless steel only.

3.22. Whenever cooking is done on open fire, chimneys shall be provided for removal of smoke and soot.

3.23. Whenever the diseased meat is not used up for the preparation of meat food products and some portion has to be stored without further immediate processing, such storage shall be in a room maintained at 0°C to 2°C.
3.24 All slaughter house refuse and waste materials will be suitably processed to prepare animal bye products or dumped in pits that are suitably covered so as to prevent its access to scavengers. For large slaughter houses, a suitable provision of Effluent Treatment Plant will be made.

3.25 In case of small slaughter houses, waste material should be composted which can be used for manure purpose and in case of large slaughter houses, waste material should be rendered (cooked) in a rendering plant to produce meat, bone meal and inedible fats.

3.26 Suitable and sufficient facilities shall be provided for the isolation of meat requiring further examination by the authorised veterinary officer in a suitable laboratory (within the premises of the slaughter house).

3.27 Consistent with the size of the factory and volume and variety of meat food products manufactured, a laboratory shall be provided, equipped and staffed with qualified (chemist/analyst and Veterinary Microbiologist) and trained personnel. The licensing authority shall accord approval of the laboratory after inspection.

3.28 The Chemist/analyst shall have passed graduation with Chemistry as one subject and the Veterinary Microbiologist shall be a qualified veterinarian with two years of experience in Meat analysis or having degree of Master in Veterinary Public Health with specialization in Meat Hygiene.

3.29. Adequate natural or artificial lighting should be provided throughout the abattoir/meat processing unit. Where appropriate, the lighting should not alter colours and the intensity should be not less than 540 Lux (50 foot candles) at all inspection points, 220 Lux (20 foot candles) in work rooms and 110 Lux (10 foot candles) in other areas. Light bulbs and fixtures suspended over meat in any stage of production should be of safety type and protected to prevent contamination of meat in case of breakage. As far as possible meat inspection shall be carried out in day light. Every abattoir shall be provided with well distributed artificial light.

4. Sanitary Practices:

4.01 Every part of the internal surface above the floor or pavement of such slaughter house shall be washed thoroughly with hot lime wash within the first 10 days of March, June, September and December. Every part of the floor or pavement of the slaughter house and every part of the internal surface of every wall or on which any blood or liquid refuse or filth may have been spit or splashed or with which any offensive or noxious matter have been brought into contact during the process of slaughtering, dressing and cutting, shall be thoroughly cleaned, washed with water, wiped/dried and disinfected within three hours after the completion of slaughter.

4.02 Rooms and compartments in which animals are slaughtered or any product is processed or prepared shall be kept sufficiently free from steam, vapours and moisture and obnoxious odours so as to ensure clean and hygienic operations. This will also apply to overhead structures in those rooms and compartments.

4.03 All parts of the establishments / Slaughter Houses shall always be kept clean, adequately lighted and ventilated and shall be regularly cleaned, and disinfected. The floorings shall be impervious and washed daily. Lime washing, colour washing or painting as the case may be, shall be done at least once in every twelve months.

4.04. All yards, outhouses, stores and all approaches to the establishments / Slaughter Houses shall always be kept clean and in a sanitary condition.

4.05 Suitable and sufficient receptacles furnished with closely fitted covers shall be provided for collection and removal of all garbage, filth and refuse from the slaughter house at a convenient time to a place away from the factory for disposal.

4.06 All blood, manure, garbage, filth or other refuse from any animal slaughtered and the hide, fat, viscera and offal therefrom, shall be removed from the slaughter house within 8 hours after the completion of the slaughtering and in such a manner and by such means as will not cause nuisance at the premises or elsewhere. Every such vessel or receptacle shall be thoroughly cleaned and disinfected immediately after use and shall be kept thoroughly clean when not in actual use.

4.07 The inner side of the skin shall not be rubbed or caused to be rubbed upon the ground within any portion of the slaughter hall. Hides and skins shall not be dragged within the slaughter hall. No gut-scraping, tripe cleaning, manufacture or preparation of meat food products, household washing of clothes or work of any nature other than is involved in the slaughter and dressing of the carcasses shall be permitted in any slaughter hall except in the quarters to the slaughter hall intended for these products and purposes.

4.08 The premises shall be cleaned thoroughly with disinfectants, one day in advance of production of meat food products and the equipments shall be sterilized/sanitized before use. The rooms and compartments in which
any meat food product is prepared or handled shall be free from dust and from odours emanating from dressing rooms, toilet rooms, canteens, rest rooms, and livestock pens.

4.09 Every practicable precaution shall be taken to exclude flies, rats, mice and vermin from the establishments / Slaughter Houses. The use of poisons for any purpose in rooms or compartments where any unpacked product is stored or handled is forbidden. The use of approved bait poisons in buildings containing canned products is, however, not forbidden.

4.10 It shall be ensured that dogs, cats or birds do not have access to the slaughter hall. Open areas in the factory shall be covered with wire mesh netting to prevent carrion birds from access to the slaughter hall or the factory.

4.11 Water used in the establishments / Slaughter Houses shall be suitable and suitable arrangements shall be made for ensuring that water is used for the production of meat and meat products. If required by the licensing authority, the water shall be examined chemically and bacteriologically by a recognised laboratory. The water quality shall comply with the standards prescribed by the licensing authority.

4.12 Raw meat meant for immediate sale need not be stored in cool conditions. It can be transported in a hygienic and sanitary condition in clean insulated containers with covers (lids) to the meat shops/selling units with precautions to ensure that no contamination/loss of contamination or deterioration takes place.

5. Equipment & Machinery:

5.1 The equipment and fittings in slaughter hall except for chopping blocks, cutting boards and brooms, shall be of such material and of such construction as to enable them to be kept clean. The implements shall be of metal or other cleanable and durable material resistant to corrosion.

5.2 No vessel, container or other equipment, the use of which is likely to cause contamination injurious to health shall be employed in the preparation, packing or storage of meat food products. (Copper or brass vessels shall always be heavily lined. No iron or galvanised iron shall come in contact with meat food products).

6. Personnel Hygiene:

6.1 No persons suffering from infectious or contagious diseases shall be allowed to work in the factory. Arrangements shall be made to get the factory staff medically examined at such intervals as the licensing authority deems fit, to ensure that they are free from infectious, contagious and other diseases. A record of these examinations signed by a registered medical practitioner shall be maintained for inspection.

6.2 The staff shall be inoculated against the enteric group of diseases and a certificate thereof shall be kept for inspection.

6.3 In case of an epidemic, all workers should be inoculated or vaccinated.

6.4 The workers working in processing and preparation shall be provided with proper aprons and head wear which shall be clean. The management shall ensure that all workers are neat, clean and tidy.

(a) Animal Welfare

Animal welfare is a major concern in meat production. It is essential that animals be cared, handled, transported, and slaughtered using humane practices. A healthy and peaceful animal is an essential requirement for hygienic slaughter and safety of the meat product.

Careful handling of animals during loading/unloading, transportation and at slaughtering helps in improving the quality of meat and reduction in losses in the value of carcasses/meat.

I. Pre Slaughter Handling of Animal:

Live stock are transported on mass from the farm to the slaughterhouse, a process called "live export." Depending on its length and circumstances, this process stress and injures the animals and some may die en route. Apart from being inhumane, unnecessary stress in transport may adversely affect the quality of the meat. In particular, the muscles of stressed animals are low in water and glycogen, and their 

Transportation of Animals

Following requirements shall be satisfied for Transportation of Animals from a farm to the slaughter house.

1.0 General Conditions
1. Only healthy animals in good condition shall be transported unless they are meant for emergency slaughter. These animals should be certified by a qualified veterinary inspector for freedom from infectious diseases and ectoparasitic diseases and their fitness to undertake the journey.

2. When animals are to be transported from endemic areas to non-endemic areas, the animals should be given protective vaccination and kept in quarantine for 30 days, before transportation.

3. Female animals in advanced stages of pregnancy shall not be transported.

4. When transporting large animals particularly sheep/bulls, special arrangements by providing suitable partitions should be made to protect the animals from suffocation. Similar arrangements should also be made to protect the young ones from being crushed when they are transported.

5. To avoid exhaustion, the animals shall be given humane treatment and care during transportation. The animals shall not be bound or chained during transit and space provided for them shall be large enough to stand or lie.

6. An attendant along with first aid equipment shall accompany the animals in transit.

7. Before loading, the animals should not be fed heavily. Only light feed may be allowed. For journeys less than 12 hours no feed need be carried but for longer journeys sufficient feed shall be carried to last during the journey. Watering facilities shall be provided at regular intervals.

8. Light and heavy animals shall be separated by providing partitions; animals from different pens/sheds shall not be mixed during transportation. Male stock shall not be transported with female stock (adults).

9. All vehicles should be inspected for safety, suitability and cleanliness before loading the animals. The floor and walls should be undamaged and there should be no nails or sharp projections which may injure the animals.

10. The vehicles should be thoroughly sprayed with suitable disinfectant before loading the animals.

11. A layer of clean sand to cover the floor to a thickness of not less than 6 cm shall be provided. This layer of sand shall be moistened with water during the summer months. During hot months arrangements shall be made to sprinkle water on the animals at frequent intervals. In winter, a 2-cm layer of clean sand with another 6-cm layer of whole-straw shall be provided.

12. Animals when driven for loading or unloading shall never be struck with sticks. Driving could best be done by soft-rubber pipe.

13. If animals are to be transported in extreme cold or hot climate, it is preferable to transport them in covered Lorries on road so that they may not die or get exhausted or suffer from acute respiratory disease. Journey under such adverse climate shall be minimised.

14. Each consignment should bear a label showing the following particulars:
   a) Number and kind of the animals loaded;
   b) Name, address and telephone number, if any, of the consignor;
   c) Name address and telephone number, if any, of the consignees;
   d) Instructions regarding feeding and watering.

2.0 Loading:

2.1 Loading during extremes of temperatures shall be avoided.

2.2 Suitable ramp shall be provided for loading and unloading the animals. The floor of the ramp shall have cleats at intervals, so that animals do not slip as they climb or descend. The ramp shall be covered with straw to avoid slipping. At any time of loading and unloading the vehicle shall be kept clean to avoid slipping of animals. Bale

2.3 In case of railway wagons when loading is done on the platform, the door of the wagon may be used as ramp. In such cases, bales or bags of hay, agricultural waste etc. may be placed on the either side of the dropped door to prevent the animals from getting their legs between the sides of the wagons and platform.

3.0 Space Requirements

3.1 Overcrowding shall be avoided. Each animal shall have enough space to lie down.
3.2 Railway wagons shall not accommodate more animals than those specified in IS specifications.

3.3 The speed of truck transporting animals shall not exceed 40 kilometres per hour, avoiding jerks and jolts. The truck shall not load any other merchandise and shall avoid unnecessary stops on the road.

3.4 For journeys exceeding 12 hours, the animals shall be transported by railway. Loading shall be done by evening.

4.0 Slaughter:

Animals are slaughtered by being first stunned and then exsanguinated (bled out). Stunning can be effected through asphyxiating the animals with carbon dioxide, shooting them with a gun or a captive bolt pistol, or shocking them with electric current.

4.1. Stunning:

Stunning before slaughter should be mandatory. By inducing unconsciousness and insensibility, stunning can avoid and minimise reactions of fear and anxiety as well as pain, suffering and distress among the animals concerned. Stunning methods induce temporary loss of consciousness and rely on prompt and accurate stunning procedures to cause death.

It is important that the equipment utilized for stunning and slaughter is maintained in good working condition and that all operators involved are well trained and have a positive attitude towards the welfare of animals.

Electrical stunning consists of passing electricity through the brain to produce instantaneous insensibility.

The following method of slaughter shall be considered humane:

(i) Mechanical stunning of cattle may be carried out by one of the three methods; captive bolt stunning, mushroom head percussive stunning and pneumatic percussive stunning. For cattle, pneumatic stunning should be preferred and the optimum position is that the centre of the stunner should contact the animal at a point of intersection of lines drawn from the medial corners of the eyes and the base of the ears. The best position for pigs is on the midline just above the eye level, with the horn directed down the line of the spinal cord. The optimum position for sheep and goat is behind the poll, aiming towards the angle of the jaw. If an animal shows signs of regaining consciousness after the initial stun, the animal must be immediately killed by the use of a captive bolt gun.

(ii) Electrical stunning - Electrical Head Stunners may be preferred for sheep and goat where both electrodes are placed on the head region. Water bath electrical stunning may be used for poultry birds. A low and controlled voltage must be maintained so that the stunning will not damage the heart and brain or cause physical disability and death to the animals. The minimum current levels recommended for stunning are indicated in the table below.

<table>
<thead>
<tr>
<th>Species</th>
<th>Minimum current levels for head-only stunning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>1.5 Amps</td>
</tr>
<tr>
<td>Calves (bovines of less than 6 month of age)</td>
<td>1.0 Amps</td>
</tr>
<tr>
<td>Pigs</td>
<td>1.25 Amps</td>
</tr>
<tr>
<td>Sheep and goats</td>
<td>1.0 Amps</td>
</tr>
<tr>
<td>Lambs</td>
<td>0.7 Amps</td>
</tr>
<tr>
<td>Broilers</td>
<td>100 milliamps</td>
</tr>
<tr>
<td>Turkeys</td>
<td>150 milliamps</td>
</tr>
</tbody>
</table>

(iii) Gas stunning - Stunning of pigs by exposure to carbon dioxide (CO2) may be preferred. The concentration of CO2 should be 90% by volume but shall not be less than 80% by volume. Ideally pigs should be exposed for 3 minutes. Sticking should be done immediately after exit from the gas chamber. Over-crowding of animals should be avoided in the gas chamber.

5. Precautions for animal welfare:

a. General:

(1) The floor of the slaughter area should not cause slipping or falling of animals.
(2) Vocalization is an indicator of animal discomfort and need to be watched for.

(3) Use of electric prods for moving animal should be discouraged. Movement of animals can be managed by grouping, use of plastic wrapped sticks etc.

(4) Pen stocking density should be monitored. All animals should have room to lie down simultaneously. The condition of animals arriving for slaughter should be closely monitored so that injured, diseased animals are not slaughtered.

(5) High pitch sounds such as whistling and yelling should be avoided to spare distress to animals.

b. The following factors have been identified as critical to animal welfare:

(a) Supervision and training of employees.

(b) Designing of animal transport cart and unloading bay.

(c) Proper construction of holding/resting pen, stunning box, maintenance of stunning equipment, restraining systems, gates and other animal handling equipment.

(d) Avoiding distractions that make animals refuse to move.

(e) Monitoring the condition of animals arriving at the plant.

(f) Proper design of equipment in the slaughter house.

Keeping this in view, the following need to be observed to ensure humane treatment of animals brought for slaughter:

- Pre-slaughter handling of animal should be carefully done to reduce stress. Resting of the animals is essential. Only animals which are disease free and in a condition to walk should be brought for slaughter.

- Distractions that impede animal movements such as, reflections, air blowing towards animals and movement or high pitch noise, need to be avoided. Herding of animals should not be done through electric prods but with help of plastic bags or sticks.

- A high standard of training is required for employees to ensure that the basic hygiene and safety practices are followed while handling animals.

- Equipment which is used for slaughter such as captive bolt stunner, gates, hooks etc should be kept in good working condition and cleanliness of floors etc needs to be ensured. There should be daily check to ensure the smooth working of equipment and cleanliness of floors.

- The condition of the animals arriving at the plant should be monitored. Animals which are injured or not in a condition to walk should not be slaughtered.

- Inspecting personnel should pay particular attention to these points to ensure reasonable standards of animal welfare.

6. Poultry Welfare:

Welfare Programme

The conditions under which broilers are housed and the way that they are managed during their growing phase, transportation and slaughter are set down in several government/industry endorsed Model Codes of Practice designed to safeguard their welfare.

A model welfare program needs to be developed for pick-up, transport and broiler/chicken processing sectors. Processing unit shall incorporate elements of this welfare audit in their own quality plans and manuals.

A Model programme shall envisage following:

Poultry Suppliers and processors must have a documented program for poultry welfare envisaging following:

(a) Catching: Poultry intended for slaughter plant should be clean and in good health. Every reasonable precaution should be taken to minimize injury to poultry. The catcher needs to be trained to this effect.

(b) Transport: For transport of poultry crates shall be in good repair. There shall be no crate/cage damage that would allow injury to poultry or allow crates to accidentally open. Transport crates should not be over-filled and enough space should be provided to allow all poultry to lie down.
(c) Holding: Poultry held in storage sheds should be provided adequate ventilation and climate control such as fans or curtains.

(d) Stunning: Stunmg equipment should be properly maintained to confirm that poultry are insensible prior to slaughter, and the time between stunning and slaughter should be limited to minimize any likelihood that poultry may regain consciousness prior to slaughter.

Economic performance and welfare:

High standards of poultry welfare and high levels of flock performance and economic performance are not incompatible—quite the contrary, they go hand in hand. It simply makes good economic sense as well as being in the poultry's best interests to ensure that flocks are maintained in an environment, in which they are thermally comfortable, protected from injury, fed optimally and kept healthy. Therefore, all measures described elsewhere to ensure that chickens are kept in conditions which optimize their comfort (in terms of temperature, humidity, air flow and air quality), in which they are provided with water, shelter, and a high quality diet that matches their physiological needs, and which optimize their health have just as important effect in terms of poultry welfare as they do on the overall efficiency of the farming operation.

Poultry health and welfare:

When producing chicken meat in a welfare-friendly manner it is also important that the poultry receive prompt and appropriate medication and treatment to prevent and treat diseases if this should become necessary, and that they do not suffer any unnecessary pain, distress, fear or physical injury. It is also important that sick or injured poultry that cannot be adequately or successfully treated are culled quickly and in a humane manner so that they do not suffer.

Humane slaughter (poultry):

While the chickens are reared specifically for human consumption and therefore at some stage have to be slaughtered, they should be slaughtered in a humane manner, and all poultry should be stunned (rendered insensible to pain) prior to slaughter.

Slaughter equipment at all supply facilities should be properly maintained to confirm that the poultry are slaughtered quickly.

7. Autem-mortem inspection

(1) All animals shall be rested before slaughter and shall be subjected to ante-mortem examination and inspection well in advance of the time of slaughter.

(2) No animal which has been received into a slaughter hall for the purpose of being slaughtered shall be removed from the slaughter hall before being slaughtered except with the written consent of the Qualified Veterinary Doctor. An animal which, on inspection is found to be not fit for slaughter shall be marked as "suspect" and kept separately. Each such animal shall be marked as "suspect" only by or under the personal supervision of the Qualified Veterinary Doctor and the marking shall not be removed or obliterated except by the Qualified Veterinary Doctor himself.

(3) An animal showing signs of any disease at the time of ante-mortem inspection and inspection of which would cause its carcass being ultimately condemned on post-mortem shall be marked as "condemned" and rejected.

(4) An animal declared as "suspect" on ante-mortem inspection but which does not plainly show any disease or condition that would cause its carcass to be condemned shall maintain its identity as "suspect" until its carcass and all organs are finally inspected by the Qualified Veterinary Doctor.

(5) No animal in a febrile condition shall be permitted for slaughter. No suspect animal shall be slaughtered until all other animals included for slaughter on the same day have been slaughtered. All animals which, on ante-mortem inspection, show symptoms of rabies or other communicable disease shall be marked as "condemned" and disposed of in accordance with the provisions contained in sub paragraph (8) below.

(6) Animals presented for slaughter and found in a dying condition on the premises of a factory due to recent disease shall be marked as "condemned" and disposed of as provided for "condemned" animals.

(7) Every animal which, upon examination, is found to show symptoms of or is suspected of being diseased or animals declared as "suspect" shall at once be removed for treatment to such special pen and kept there for observation for such period as may be considered necessary to ascertain whether the animal is diseased or not.
(9) All animals declared as "condemned" on ante-mortem inspection shall be marked "condemned" and killed if not already dead. Such carcasses shall not be taken into the abattoir to be slaughtered, dressed, nor shall they be conveyed into any depots or to the factory used for edible products.

8. Post-mortem inspection

1. A careful and detailed post-mortem examination and inspection of the carcasses and parts thereof of all animals slaughtered shall be made soon after slaughter. All organs and parts of the carcasses and blood to be used in the preparation of meat food products shall be held in such a manner as to preserve their identity till the completion of the post-mortem inspection so that they can be identified in the event of the carcasses being condemned.

2. Every carcass including all detached parts and organs thereof which show evidence of any condition which will render the meat or any part or organ unfit for human consumption and which for that reason may require subsequent inspection, shall be retained by the Qualified Veterinary Doctor. The identity of such carcass including the detached parts and organs thereof shall be maintained until the final inspection is completed. Retained carcasses, detached parts and organs thereof shall be maintained until the final inspection is completed. Retained carcasses, detached parts and organs thereof shall in no case be washed, trimmed or mutilated in any manner unless otherwise authorized by the Qualified Veterinary Doctor.

3. No air shall be blown by mouth into the tissues of any carcass or part of a carcass.

4. Every carcass or part thereof which has been found to be unfit for human consumption shall be marked by the Qualified Veterinary Doctor as "Inspected and condemned".

5. All such condemned carcasses, parts and organs thereof shall remain in the custody of the Qualified Veterinary Doctor pending disposal at or before the close of the day on which they are marked "Inspected and condemned" in accordance with sub-paragraphs (11), (12) and (13) below.

6. Carcasses, parts and the organs thereof found to be sound, wholesome, healthful and fit for human consumption shall be marked as "Inspected and passed".

7. Carcasses found affected with anthrax before evisceration shall not be eviscerated but condemned and disposed of immediately in accordance with sub-paragraph (12) below. Any part of a carcass contaminated with anthrax infected material through contact with soiled instruments or otherwise shall be immediately condemned and disposed of as provided in sub-paragraph (12) below.

8. The portion of the slaughtering department including equipment, employees' boots and aprons, etc., contaminated by contact with anthrax material shall be cleaned and thoroughly disinfected immediately.

9. When on inspection only a portion of a carcass on account of slight bruises is decided to be condemned, either the bruised portion shall be removed immediately and disposed of in accordance with sub-paragraph (13) below or the carcass shall be retained and kept till such time it is chilled and the bruised portion removed and disposed of as provided above.

10. Post-mortem inspection shall be a detailed one and shall cover all parts of the carcass, the viscera, lymph glands and all organs and glands.

11. The post-mortem inspection shall be in accordance with the general rules laid down for such inspection in public slaughter houses under the control of local bodies besides special instructions that may be issued from time to time by the licensing authority.

12. All condemned carcasses, organs or parts thereof shall be completely destroyed in the presence of the Qualified Veterinary Doctor by incineration or denatured, after being slashed freely with a knife, with crude carbonate, cressly-disinfestant or any other prescribed agent unless such carcasses, organs or parts thereof are sterilized for the preparation of bone-cum-meat meal before leaving the slaughter house premises, subject to sub-paragraph (13) below.

13. Carcasses, organs or parts thereof condemned on account of anthrax shall be disposed of either by (i) complete incineration or (ii) thorough denaturing with prescribed denaturant in the manner prescribed in the foregoing paragraphs and also in accordance with the rules and regulations prescribed by the local authority.

14. Destruction of condemned carcasses, organs or parts thereof shall be carried out under the direct supervision of the Qualified Veterinary Doctor.

15. If in the opinion of the Qualified Veterinary Doctor a carcass, organ or part thereof is to be held back for further detailed examination, the carcass, organ or part concerned shall not be released till the examination in detail is completed by the Qualified Veterinary Doctor and it is declared thereafter by him as fit. When it is to be detained for detailed
examination, the carcase, organ or part thereof shall be marked as "Held". If on subsequent inspection, the carcase, organ or part thereof is found to be unwholesome and unfit for human food, the Qualified Veterinary Doctor shall mark such a carcase, organ or part thereof as "condemned" and shall dispose of as described in the foregoing paragraphs.

a. Sanitary and Hygienic Requirements for Meat processing units

Following Sanitary and Hygienic requirements shall be satisfied by the meat processing unit.

1. Location:

   1.1 Meat processing unit should be located in areas not subjected to regular and frequent flooding and free from objectionable odours, smoke dust and other contaminants;

   1.2 Roadways and areas serving the meat processing unit which are within its boundaries or in its immediate vicinity should have a hard paved surface suitable for wheeled traffic. There should be adequate drainage and provision for cleaning;

   1.3 Where appropriate, meat processing unit should be so designed that access can be controlled.

2. Building and Facilities:

   2.1 The meat processing unit should provide adequate working space for the satisfactory performance of all operations.

   2.2 The construction should be sound and ensure adequate ventilation, good natural or artificial lighting and easy cleaning.

   2.3 The meat processing unit should be laid out and equipped so as to facilitate proper supervision of meat hygiene including performance of inspection and control;

   2.4 The meat processing unit should be of such construction as to protect against the entrance and harboring of insects, birds, rodents or other vermin as well as the entry of environmental contaminants such as smoke, dust etc.

   2.5 Buildings and facilities should be designed to provide separation by partition, location or other effective means, between those operations which may cause cross-contamination;

   2.6 Meat processing unit should be laid out and equipped so as to ensure, that edible meat does not come into contact with floors, walls or other fixed structures, except those which are specifically designed for contact with meat;

   2.7 The construction and lay out of any chilling room, freezing room, freezer store or freezer should satisfy the requirements of these rules;

2.8 In meat handling areas:

   - Floors should be of waterproof, non-absorbent, washable non-slippery and made of nontoxic materials, without crevices and should be easy to clean and slope sufficiently for liquids to drain to trapped outlets;

   - Walls should be of waterproof, non-absorbent, washable and nontoxic materials and should be light coloured. Up to a height of at least 1.5 metres, they should be smooth and without crevices, and should be easy to clean, space between walls and ceilings should be sealed and covered to facilitate cleaning;

   - Ceilings should be so designed, constructed and finished as to prevent any accumulation of dirt and minimize condensation, mould development and flaking and should be easy to clean;

   - Windows and other openings should be so constructed as to avoid accumulation of dirt and those which open should be fitted with insect screen. Screens should be easily movable for cleaning and kept in good repair. Internal window sills, if present, should be sloped to prevent use as shelves;

   - Doors should have smooth, non-absorbent surfaces and where appropriate, be self-closing and close fitting; and

   - Stairs, lift cages and auxiliary structures such as platforms, ladders, chutes, should be so situated and constructed as not to cause contamination of meat. They should be capable of being effectively cleaned. Chutes should be constructed with inspection and cleaning hatchets;
3. Sanitary Facilities:

3.1 Water Supply:

3.1.1 Supply of potable water under pressure should be available with facilities for its storage, where necessary for distribution, and with protection against contamination;

3.1.2. An supply of hot potable water should be available at all times during working hours;

Note - This provision is intended to cover water for both cleaning purposes and the destruction of microorganisms (especially those pathogenic to man) on knives, utensils etc., and coming into direct contact with meat. For cleaning purposes the temperature of the water should be 65 degree Celsius. The hot water for disinfection purposes should be at 82 degree Celsius and dispensed in such a way (e.g. in specially designed boxes near the working area) that blades of knives etc., can be submerged in the water for a contact time (no less than two minutes). Often this hot water supply is separate from other hot water supplies used for cleaning, hand washing etc. But if there is only one hot water supply the term "adequate" should mean that even at times where large amounts of hot water is used (e.g. during cleaning operations) the water supply from any tap in the establishment should not be decreased;

3.1.3 Ice should be made from potable water and should be manufactured, handled and stored so as to protect it from contamination; and

3.1.4 Steam used in contact directly with meat should be produced from potable water and contain no substances which may be hazardous to health or may contaminate the food.

3.2 Effluent and Waste Disposal - Meat processing unit should have an efficient effluent and waste disposal system. All effluent lines (including sewer systems) should be large enough to carry peak loads and should be constructed in such a manner as to avoid contamination of potable water supplies. Biological oxygen demand level shall be less than 1500, and for that an effluent treatment plant, if necessary may be installed.

3.3 Facilities for Storage of Waste and Inedible Material - Facilities should be provided for the storage of waste and inedible material prior to removal from the establishment. These facilities should be designed to prevent access to waste or inedible material by pests and to avoid contamination of food, potable water and equipment or building.

3.4 Changing Facilities and Toilets - Suitable and conveniently located changing facilities and toilets should be provided in all establishments. Toilets should be so designed as to ensure hygienic removal of waste matter. These areas should be well lit and ventilated and should not open directly on to food handling areas. Hand washing facilities with warm or hot and cold water with suitable hygienic means of drying hands should be provided adjacent to toilets and in such a position that the employee must pass them when returning to the processing area. Where hot and cold water are available, mixing taps should be provided. Where paper towels are used, a sufficient number of dispensers and receptacles should be provided near to each washing facility. Taps of non-hand operable type are preferable. Notices should be posted directing personnel to wash their hands after using the toilets.

3.5 Hand Washing Facilities in Processing Areas:

3.5.1 Adequate and conveniently located facilities for hand washing and drying should be provided wherever the process demands. Where appropriate, facilities for hand disinfection should be provided. The facilities should be furnished with properly trapped waste pipes leading to drains.

3.5.2 All rooms used for deboning, preparing, packing or other handling of meat should be equipped with adequate facilities for cleaning and disinfecting implements conveniently located for the use of personnel during operations. These facilities are for use exclusively in the cleaning and disinfection of knives, steels, cleavers, saws and other implements.

3.5.3 All facilities for cleaning and disinfecting implements should be of such nature and sizes as to permit proper cleaning and disinfection of implements. These facilities should be constructed of corrosion-resistant materials and should be capable of being easily cleaned.

3.5.4 All facilities for cleaning and disinfecting of implements should be fitted with suitable means of supplying hot water in sufficient quantity at all times while meat is being handled in that part of the Meat Processing Unit.
3.5.5 Lighting - Adequate natural or artificial lighting should be provided throughout the meat processing unit. Where appropriate, the lighting should not alter colours and the intensity should not be less than:

- 540 Lux (50 foot candles) at all inspection points.
- 220 Lux (20 foot candles) in workrooms.
- 110 Lux (10 foot candles) in other areas.

Light bulbs and fixtures suspended over meat in any stage of production should be of a safety type and protected to prevent contamination of meat in case of breakage.

3.6 Ventilation - Ventilation should be provided to prevent excessive heat, steam condensation, dust and to remove contaminated air. The direction of the air flow should never be from a dirty area to a clean area. Ventilation openings should be provided with an insect screen or other protective enclosure of non-corrodible material. Screens should be easily removable for cleaning.

4. Equipment and Utensils:

4.1 Materials - All equipment, implements and utensils used in establishments which come into contact with exposed meat and meat products should present a smooth impervious surface and be resistant to corrosion and should be made of material which is non-toxic, does not transmit odour or taste, is free from pits and crevices, is non-absorbent and capable of withstanding repeated exposure to normal cleaning and disinfection. Such equipment should be so constructed that they may be easily cleaned.

4.2 Sanitary Design, Construction and Installation:

4.2.1 All equipment and utensils should be so designed and constructed as to prevent hygiene hazards and permit easy and thorough cleaning and disinfection and where practicable be visible for inspection. Stationary equipment should be installed in such a manner as to permit easy access and thorough cleaning.

4.2.2 Containers for inedible material and waste should be leak-proof, constructed of non-corrosive metal or other suitable impervious materials which should be easy to clean or disposable and where appropriate, able to be closed securely; and

4.2.3 All refrigerated spaces should be equipped with temperature measurement or recording devices.

4.3 Equipment Identification - Equipment and utensils used for inedible material or waste should be so identified and should not be used for edible products.

5. Hygiene Requirements:

5.1 Maintenance. The buildings, rooms, equipment and all other physical facilities of the meat processing unit, including drains, should be maintained in good repair and in orderly condition. Except for rooms where meat processing or cleaning operations are performed, they should be free from steam, vapour and surplus water.

5.2 Cleaning and Disinfection - Cleaning and disinfection should meet the following requirements:

(i) Amenity provided for the use of employees and the inspection service including changing facilities, toilets, and the inspection office space should be kept clean at all times.

(ii) If rooms, intended and most of the time used for the handling, preparation, processing, packaging and storage of meat, are used for any other food preparation purposes, then cleaning and disinfection are necessary immediately before and after such use;

(iii) The temperature in rooms for boning out and trimming should be controlled and held suitably low, unless cleaning of equipment and utensils are carried out at least every four hours;

(iv) To prevent contamination of meat, all equipments, implements, tables, utensils including knives, cleavers, knife pouches, saws, mechanical instruments and containers should be cleaned at frequent intervals during the day and immediately cleaned and disinfected wherever they come into contact with diseased material, infective material or otherwise become contaminated. They shall also be cleaned and disinfected at the conclusion of each working day.

(v) If any skip or trolley or any container used in a department where edible material is handled, enters an area where inedible material is handled it should be cleaned and disinfected immediately before re-entering the edible department.
(vi) Immediately after the cessation of work for the day or at such other times as may be required, the floors and walls should be cleaned to remove contamination. Floor drains should be kept in good condition and repaired with or in place; and

(vii) Roadways and yards in the immediate vicinity of and serving the meat processing unit should be kept clean.

5.3 Hygiene Control Programme - It is desirable that each meat processing unit in its own interest designates a single individual whose duties are diverted from production, to be held responsible for the cleanliness of the meat processing unit. This staff should be a permanent part of the organization or employed by the organization and should be well trained in the use of special cleaning tools, methods of dismantling the equipment for cleaning and in the significance of contamination and the hazards involved. A permanent cleaning and disinfection schedule should be drawn up to ensure that all parts of the meat processing unit are cleaned appropriately and that critical areas, equipment and materials designed for cleaning and or disinfection daily or more frequently if required.

5.4 Storage and Disposal of Waste - Waste material should be handled in such a manner as to exclude contamination of food or potable water. Precautions should be taken to prevent access to waste by pests. Waste should be removed from the meat handling and other working areas at intervals and at least daily. Immediately after disposal of the waste, receptacles used for storage and any equipment which has come into contact with the waste should be cleaned and disinfected. At least daily the waste storage area should also be cleaned and disinfected.

5.5 Dogs, cats or other pet animals should be not allowed to enter meat processing unit.

6. Pest Control

6.1 There should be an effective and continuous programme for the control of insects, birds, rodents or other vermin. Meat processing unit and surrounding areas should be regularly examined for evidence of infestation.

6.2 Should pests gain entrance to the meat processing unit or surrounding areas, eradication measures should be instituted. Control measures involving treatment with physical or chemical or biological agents should only be undertaken by or under direct supervision of personnel who have a thorough understanding of the potential hazards to health and results from the use of these agents, including those which may arise from residues retained in the product. Such measures should be carried out in accordance with the recommendation of the official agency having jurisdiction and with the full knowledge of its inspector, and

6.3 Pesticides should only be employed if other precautionary methods cannot be used effectively. Only pesticides approved for use in the meat processing unit by competent authority should be used and the greatest care should be exercised to prevent any contamination of the meat equipment or utensils. Before pesticides are applied all meat should be removed from the room and all equipment and utensils should be thoroughly washed prior to being used again.

6.4 Handling and Storage of Hazardous substances - Pesticides or other substance which may represent a hazard should be labelled with a warning about their toxicity and use. Except as required for purpose of hygiene such substance which may contaminate meat packing material and ingredients should be handled and stored in a part of the meat processing unit which is not used for preparation, processing, handling, packing or storage of meat. They should be handled and dispensed only by authorised and properly trained personnel. Extreme care should be taken to avoid contamination of meat. However, materials employed in the construction and maintenance of an establishment may be used at any time with the approval of Food Safety Officer.

6.5 Personal Effects and Clothing - Personal effects and clothing should not be deposited in meat handling areas.

6.6 Maintenance Tools - Cleaning and maintenance tools and products should not be stored in meat handling area.

7. Personal Hygiene and Health Requirements:

7.1 Medical examination - Persons who come into contact with meat in the course of their work should have a medical examination prior to their employment. Medical examination of a meat handler shall be carried out routinely and when clinically or epidemiologically indicated, at least once in 12 months.

7.2 Communicable Diseases - The management should take care to ensure that no person, while known or suspected to be suffering from, or to be a carrier of a disease likely to be transmitted through meat or while afflicted with infected wounds, skin infections, sores or with diarrhoea, is permitted to work in any area in any capacity in which there is any likelihood of such a person directly or indirectly contaminating meat with pathogenic microorganisms. Any person so affected should immediately report to the management that he is ill.
7.3 Injuries - Any person who is cut or injured should discontinue working with meat and until he is suitably bandaged should not be engaged in any meat processing unit in the preparation, handling, packing or transportation of meat. No person working in any meat processing unit should wear exposed bandages unless the bandage is completely protected by a water proof covering which is conspicuous in colour and is of such a nature that it cannot become accidentally detached. First aid facilities should be provided for this purpose.

7.4 Washing of Hands: Every person engaged in a meat handling area should wash his hands frequently and thoroughly with a suitable hand cleaning preparation under running potable water while on duty. Hands should always be washed before commencing work, immediately after using the toilets, after handling contaminated material and whenever else necessary. After handling diseased or suspect materials hands should be washed and disinfected immediately. Notices requiring hand-washing should be displayed.

8. Personnel Cleanliness:

8.1 Every person engaged in an area in meat processing unit where meat is handled should maintain a high degree of personal cleanliness while on duty, and should at all times while so engaged wear suitable protective clothing including head covering and foot wear, all of which should be washed unless designed to be disposed and which should be maintained in a clean condition consistent with the nature of the work in which the person is engaged.

8.2 Aprons and similar items should not be washed on the floor, and
8.3 Such items should not be left on equipment in the working area.

8.4 Personal Behavior: Any behavior which can potentially contaminate the meat such as eating, use of tobacco, chewing, spitting, should be prohibited in any part of meat processing unit used for the preparation, handling, packaging or transportation of meat.

8.5 Visitors: Every person who visits an area in any meat processing unit where meat is handled should wear clean protective clothing and head cover.

b) Sanitary & Hygienic Requirements for the Retail Meat Shops

For ensuring the hygiene and safety of meat being sold at retail meat shops, the following requirements should be followed under the supervision of the qualified Veterinary staff.

1. Location of Meat Shop

1. The meat shop sale outlet should preferably be a unit of meat market located away from Vegetable, fish or other food markets and shall be free from undesirable odour, smoke, dust or other contaminants. Wherever a meat market is not available, individual meat shop can be set up considering the above factors, which have a direct bearing on the hygiene conditions of the premises and health of consumers.

(a) The minimum distance between the licensed meat shop and any place of worship should not be less than 50 meters;

(b) The condition of 100 meters distance will apply in case the premises situated directly opposite to the entry gate of religious place of any community.

2. All the meat shops located in the vicinity of religious places shall be fitted with black glass doors, which must be kept closed all times except in case of entry or exit. It must be the responsibility of the meat shop owners to maintain a high standard of hygiene not only inside the shops, but also in the way leading to the shops road pavements or other adjoining place, particularly for insanitary materials originating from the meat business for example, blood, part of offal, meat scraps etc.

2. Size of Meat Shops

2.1 Considering the constraints of commercial space in residential areas in concerned Panchayats / Municipalities the size of meat shops may vary according to the size of business and activities being carried out there in the meat shops.

2.2 The height of shop in all above categories of meat shops should be not less than 3 meters, while in case of air-conditioned meat shops, it should not be less than 2.5 meters.

3. Premises

3.01 The premises shall be structurally sound. The walls up to the height of minimum 5 feet from the floor level shall be made of impervious concrete material (e.g. glazed tiles or hygienic panels, etc.) for easy washing and cleaning purposes.
3.02 The floor should be made of impervious and non-slippery materials with a slope for easy cleaning and removal of filth, waste and dirty water. The slope of the floor shall not be less than 5 cm. for a floor of 3 meters.

3.03 All the fittings in the stall should be of non-corroding and non-rusting type.

3.04 All processing tables, racks, shelves, boards, etc. shall have zinc/aluminium/stainless steel/marble-granite top to facilitate proper cleaning.

3.05 A sign board indicating the type of meat sold shall be displayed prominently. Nothing else but meat should be sold at the premises.

3.06 The premises should have provision of sewer connection for drainage of wastewater.

3.07 There should be provision of continuous supply of potable water inside the premises. In case the water supply is from bore well the arrangement for softening of water for making the same potable shall be made in the premises and intermittent store arrangement should be made.

3.08 The door of the shop should be of self-closing type. The door of the shop should be made of dark glass top and be kept closed. No carcasses should be kept in a manner so as to be seen by the public from outside.

4. Ventilation

4.01 The meat shop should be ventilated with facility of cross ventilation and may be provided with at least one electric fan and one exhaust fan.

4.02 The rails and hanging hooks, if provided for hanging carcasses, should be of non-corrosive metal. The non-corrosive hanging hooks for carcasses shall be 30 cm. apart and the distance between rails shall be 60 to 70 cm. depending upon the size of animals slaughtered and carcasses hanged.

5. Equipment and Accessories

5.01 The meat shop should have suitable arrangement for fly proofing in the form of air-curtains, flytraps, etc.

5.02 It should have display cabinet type refrigerator of size for maintaining a temperature of 4 to 8 degrees C. or freezing cabinet if the meat is to be stored for more than 48 hours.

5.03 The weighing scales used shall be of a type which obviates unnecessary handling and contamination and the plate sketch of the scale shall be made of stainless steel or nickel coated.

5.04 The knives, tools and hooks used shall be made of stainless steel. Sufficient cupboards or racks should be for storing knives, hooks, clothes and other equipments.

5.05 There should be a provision of geysers in all the meat shops to have hot water at a temperature not less than 82 degree C to clean the premises and equipment used in meat shop.

5.06 Washbasin made of stainless steel or porcelain shall be provided with liquid soap dispenser or other soap and nail brush for thorough cleaning of hands.

5.07 The chopping block should be of food-grade synthetic material, which does not contaminate the meat. If the block is of wooden it should be of hardwood trunk, which is solid enough and should not contaminate the meat.

5.08 A waste bin with a pedal operated cover shall be provided in the premises for collection of waste material.

6. Transportation

6.01 The transportation of carcasses from the slaughter house to the premises shall be done under hygienic conditions in boxes of adequate size linked with zinc/aluminium/stainless steel or wire gauze meat safes, which must be washed daily.

6.02 The transportation of carcasses from the slaughter house to the meat shops should be done in insulated refrigerated vans. Under no circumstances, carcasses will be transported in vehicles used for commuting of human beings, or in an exposed condition.

7. Pest Control

7.01 The meat shop should have an effective and continuous programme for control of insects, rodents or other vermin within the premises. The surrounding area of the shop should also be free from insects, birds, rodents and other vermin.
7.02 The post control measures adopted by the owner of shop shall be kept as a record in the premises to be shown to any officer of the concerned Panchayats / Municipalities responsible for local administration / Corporation at the time of inspection.

7.03 Chlorinated hydrocarbons, organo-phosphorus compounds and synthetic perthiroids, rodenticides etc. should neither be used as pesticide nor shall be stored at the meat shop.

7.04 No live animals or birds should be allowed inside or adjacent to the meat shops.

8. Personnel Hygiene

8.01 Every person employed for meat handling at the meat shop shall be medically examined annually by a registered medical practitioner and examination shall include examination of sputum and x-ray of the chest for tuberculosis. The medical examination shall also include examination of stools for protozoal and helminthic infestations for those parasites, which are transmitted by ingestion, and also for the presence of enteropathogenic Escherichia coli, Salmonella, Shigella species and Vibrio cholera.

8.02 A certificate / record of medical fitness of all workers handling meat shall be kept as a record in the premises to be shown to any officer of the concerned Panchayats / Municipalities responsible for local administration / Corporation at the time of inspection.

8.03 No worker suspected to be suffering from fever, vomiting, diarrhoea, typhoid, dysentery or boils, cuts and sores and ulcers (however small) shall be permitted to work in the meat shops.

8.04 All the workers of the meat shop shall keep their finger nails short and clean and wash their hands with soap or detergent and hot water before commencement of work and after each absence, especially after using sanitary conveniences.

8.05 Eating, spitting, nose cleaning or the use of tobacco in any form or chewing betel leaves shall be prohibited within the premises of meat shop processing, packing and storage area of the unit. "No smoking" and "No Spitting" boards shall be prominently displayed in the shop.

9. Sanitary Practices

9.01 The chopping block should be sanitized daily by covering its top with sea-salt, after cleaning it with hot water at close of business activity.

9.02 The floor should be washed with appropriate disinfectant / detergent / sanitizer at the start and close of the business each working day.

9.03 There should be high standard of cleanliness and tidiness in the working area of shop with no organic or other material lying on the floor.

9.04 The refrigerated / freezing cabinet should be regularly cleaned and well maintained.

9.05 Slaughtering of animals / birds inside the shop premises should be strictly prohibited.

9.06 The carcasses shall not be allowed to be covered with wet clothes.

9.07 Wholesale meat obtained from the authorized slaughter house shall only be sold at the meat shops and a record thereof shall be kept in the premises to be shown to any officer of the concerned Panchayats / Municipalities responsible for local administration Corporation at the time of inspection.

9.08 Waste bins should be emptied, transported for disposal as per the arrangements made by the concerned Panchayats / Municipalities and waste bin / dhalau (burial pits) shall be treated daily with a disinfectant.

9.09 The premises shall not be used for residential purposes nor it shall communicate with any residential quarter. No personal belonging like clothing, bedding, shoes etc. shall be kept in the premises. Only dressed carcasses of clean meat shall be stored at the premises.

9.10 Hides, skins, hooves, heads and unclean gut will not be allowed to be stored in the premises at any time.

9.11 The chopping instruments should be cleaned with hot water at a temperature of 82 degree C.

9.12 The preparation of food of any type inside the meat sale outlet should be strictly prohibited.

9.13 The meat obtained from unauthorized sources or unstampet meat is liable to be confiscated and destroyed.

9.14 Waste of the meat shop to be disposed of packed in heavy polythene bags in dhalau (burial pits).
10. Other Requirements

10.01 The prepared meat shall be packed in waxed paper and then placed in polyethylene bags or packed directly in bags made of food grade plastics.

10.02 Failure to comply with any of these instructions may entail legal action against the defaulters, and even result in cancellation of license by the appropriate authority of the concerned Panchayats/Municipalities/Corporation.

10.03 No Objection Certificate from law and order point of view to be obtained from police department or the concerned Panchayats/Municipalities/Corporation before grant of license for buffalo meat and pork shop.

10.04 The concerned Panchayats/Municipalities responsible for local administration in the country shall appoint qualified Veterinary staff for the meat inspection (Ante mortem and Post mortem inspection) or if regular staff cannot be made available or deployed for the purpose shall make contractual arrangements for availing the services of qualified veterinary staff for meat inspection available with the Animal Husbandry Depts. of the concerned state/UT in the country.

10.05 Retail meat shop license shall be granted subject to fulfillment of all the above technical and administrative instructions in relation to the trade.

Part-V

Specific Hygienic and Sanitary Practices to be followed by Practices to be followed by Food Business Operators engaged in catering / food service establishments

In addition to Part-II the Catering/food Service establishment in which food is being handled, processed, manufactured, stored, distributed and ultimately sold to the customers and the persons handling them should conform to the sanitary and hygienic requirement, food safety measures and other standard as specified below.

It includes premises where public is admitted for repose or for consumption of any food or drink or any place where cooked food is sold or prepared for sale. It includes:

(a) Eating Houses
(b) Restaurants & Hotels
(c) Snack Bars,
(d) Canteens (Schools, Colleges, Office, Institutions)
(e) Food Service at religious places
(f) Neighbourhood Tiffin Services / dabbawalas
(g) Rail and airline catering
(h) Hospital catering

1. GOOD MANUFACTURING PRACTICES FOR WHOLE PREMISE

1. Food Preparation Areas

The following rules apply to rooms where food is prepared. There will be no smoke nuisance in the food preparation area. Wherever cooking or frying of any kind is being done, a chimney having appropriate suction capacity as per the size of the kitchen has to be installed prior to start of business.

II. Hand washing facilities and toilets

(1) Adequate number of wash-hand basins made of porcelain/stainless steel shall be provided along with soap to wash hands, with hot and cold running water, and materials for cleaning hands and drying them hygienically. Clean and dry towels shall be kept for the use of customers.

(2) Separate sinks must be provided, where necessary, for washing raw food and cleaning equipment.

(3) Sinks with a draining board, detergent and hot water shall be provided to ensure proper cleaning of utensils, crockery and cutlery there will be a separate place for washing pots and pans.

2. Changing facilities:

Facilities for staff to change their clothes, where necessary must be provided.
Subject: Enforcement of legal provisions and regulations regarding Meat and Meat Products, operations and management of slaughterhouses, and animal handling practices – regarding.

Several animal welfare organizations have expressed concern about the alleged slaughter houses functioning illegally in different states, and have drawn attention to a number of undesirable practices being followed, such as:

(i) Several slaughter houses have been operating in many states without having been granted licenses/ registered under FSS (Licensing and Registration of Food Business) Regulations, 2011;

(ii) Slaughter of animals much beyond the permitted capacity wherever licenses have been issued by the Urban Local Bodies;

(iii) Absence of requisite infrastructure in the slaughter-houses;

(iv) Stunning and animal handling norms are not being followed;

(v) Road-side slaughter units, where live birds are kept and slaughtered, do not have the basic infrastructure for stunning / handling and to maintain hygiene;

(vi) A number of cases where the veterinary officers / supervisors are failing to carry out health checks on the animals and overlook the procedures put in place;

(vii) Hygiene norms and hygienic practices are not being followed/maintained in actual practice;

(viii) Slaughter of animals in the presence of young children at the slaughter houses in the name of their training etc.

(ix) Transportation of livestock – non-compliance with the regulations and violation of the code of practices.
2. Legal provisions on the above subject are mandatory for all concerned besides adoption of good practices for proper handling of the animals as also to ensure that the meat and meat products are safe and hygienically prepared for the consumers. It has been brought to notice that several slaughterhouses have been operating in many states/UTs without having been granted licenses/registered under FSS (Licensing and Registration of Food Business) Regulations, 2011. It is further noted that Urban Local Bodies appear to have taken a view that licenses have to be issued by them under their respective Municipal laws and not under the FSS regulations. The provisions of Section 89 of the Food Safety and Standards Act, 2006 as given below, are brought to your notice in this behalf:

"89. Overriding effect of this Act over all other food related laws. The provisions of this Act shall have effect notwithstanding anything inconsistent therewith contained in any other law for the time being in force or in any instrument having effect by virtue of any law other than this Act."

Thus, all slaughterhouses are required to be licensed/registered under the FSS (License and Registration) Regulations, 2011, in line with the above provisions. It may kindly be ensured that no abattoir/slaughterhouse operates without a valid license/registration.

3. Your kind attention is further invited to the following legal provisions:

(i) Part IV of Schedule IV under FSS (Licensing and Registration of Food Business) Regulation provides for the "Specific Hygienic and Sanitary Practices to be followed by Food Business Operators engaged in manufacture, processing, storing and selling of Meat and Meat Products". A copy of these provisions is enclosed at Annex-I.

(ii) Regulation 2.5 [Meat & Meat Products] of the Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011 notified by the Authority under the FSS Act, 2006;

(iii) The Code of Practice for Transportation of Livestock is detailed in a document on Indian Standards No. IS 14904:2007 of "Transport of Livestock - Code of Practice" developed by BIS, copy of which is enclosed at Annex-II.

4. The Hon’ble Supreme Court of India has directed all the States and UTs to constitute State Committees for Slaughterhouses within the specified time vide its orders dated 23.0.2012 in Writ Petition (C) No. 309 of 2003 – Laxmi Narayan Modi vs. Union of India and Others and as sought compliance by the States and the UTs.

5. Needless to say, it is important that the above mentioned legal provisions, rules and regulations are followed in letter and spirit and that the concerns expressed with regard to handling of animals are addressed in a befitting manner. While complying
with the aforesaid legal provisions, the States and UTs may take the following measures/steps, in particular:

5.1 Requisite infrastructure for Slaughter Houses

(i) It may also be noted that adequate provisions have been outlined for the requisite infrastructure for the slaughterhouses. However, it is noted that this infrastructure is largely absent in most of the existing slaughterhouses. It is, therefore, imperative that necessary budgetary provisions are made for upgrading the infrastructure of the state supported slaughterhouses in the States/UT. Wherever these are operated as private business enterprises, the private operators be called upon to make provision for the same in a time bound manner.

(ii) It is further observed that road side slaughter units, where live birds are kept and slaughtered, do not have the basic infrastructure for stunning/handling and to maintain hygiene. This is detrimental to the health of consumers and is also against animal welfare.

(iii) Mandating the installation of CCTV cameras at all strategic positions in the slaughterhouses may prove to be an effective deterrent to the continuation of any such undesirable practices in order to ensure that stunning and hygiene norms and hygienic practices are actually maintained. Database of such footage must be maintained and audited. It is therefore, necessary to disallow such units in case they are unable to maintain the required infrastructure and hygiene within a defined time frame.

5.2 Transportation of Livestock

A reference to the Legal provisions and the Code of Practice on the Transportation of livestock has been made under para 3 above. The States/UTs are requested to ensure enforcement of the said provisions. As a matter of fact, undesirable practices adopted in the course of transportation of livestock can also be addressed under the provisions of Prevention of Cruelty to Animals Act and the rules framed thereunder. It is strongly recommended that, wherever feasible, enabling provisions may also be made in the Motor Vehicles Act to ensure proper transportation of animals.

5.3 Training of the personnel engaged in the business of slaughter of animals:

(i) A CD, showing videos of slaughtering of animals in a rather cruel manner, is enclosed herewith. It is reported that animals are also slaughtered in the presence of young children for their training. Since, slaughtering of animal is done manually, it is extremely important to maintain hygiene to prevent contamination that may compromise with the health of consumers. Unless the butchers are trained properly, appropriate practices will not get implemented.
It is, therefore, important to provide compulsory training to the personnel engaged in all slaughterhouses, big or small, commonly referred to as 'butchers'.

(ii) The Indian Council of Agricultural Research, Ministry of Agriculture, issued instructions to the National Research Centre (NRC) on Meat, Hyderabad to develop the syllabus for one-month training to the butchers. A copy of the syllabus prepared by NRC Meat, Hyderabad is enclosed at Annex-III. The state governments/UTs are strongly urged to organize training programmes for the target groups in collaboration with the NRC Meat, Hyderabad as well as Department of Animal Husbandry of your State/UT. As a matter of fact, in case your state has any university dealing with the subject of Animal Sciences, this training could be imparted in these universities. FSSAI will be happy to share the training costs for the training programmes, on the basis of specific proposals received from the States/UTs in this behalf.

5.4 Enforcement of Legal provisions:

It has also been brought to our notice that animals not allowed to be slaughtered under FSS Act and Regulations are also getting slaughtered illegally. A communication has been sent to all the Food Safety Commissioners of different States/UTs on 06/08/2014, wherein the provisions of the FSS (Food Products and Food Additives) Regulations, 2011 have been brought to the notice of the State Governments/UTs so that necessary steps can be taken to prohibit slaughter of animals other than those allowed by these regulations. A copy of the letter issued by FSSAI is at Annex-IV and we would request compliance with these regulations in addition to all other legal provisions.

6. It has been decided to hold the next meeting of the Central Advisory Committee (CAC) of FSSAI on the 29th December 2014. It is proposed to discuss and review the above enforcement issues and plans. It would be appreciated if the State Food Commissioners come prepared with their action plan on the above points so that we together delineate a future roadmap on the subject.

(S. Dave)
Advisor - FSSAI
Phone: 011-2323.7436

To,
1. All Food Safety Commissioners
2. Secretary, Urban Local Bodies in all States/UTs

CC: CEO, FSSAI
CC: PS to Chairperson, FSSAI