

# **APEDA EXECUTIVE MANUAL**

**SERIES VOLUME 2**

## **SANITARY AND PHYTO-SANITARY REQUIREMENTS IN EXPORT ORIENTED MEAT PROCESSING PLANTS**



**APEDA**

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## **PREFACE**

The APEDA approved integrated meat processing plants receive the animals for slaughter in specially designed transport vehicles, where animals are transported in a comfortable posture without any stress. Thereafter the animals are handled carefully keeping in view their welfare, slaughtered humanely after ascertaining their fitness for human consumption both in ante-mortem and post-mortem inspections by a competent veterinarian. The meat is then processed (chilled & frozen), stored and exported in refrigerated containers to the importing countries.

The meat plants are required to have APEDA registration and should conform to the sanitary regulations in the process of meat. The person handling the meat should conform to the sanitary and hygiene requirements for food safety as laid down in the Export of Raw Meat (Chilled / Frozen) (Quality Control and Inspection) Rules, 1992, and other standards as specified in this manual like GMP, GHP, HACCP, ISO 9001:2008 and others. It is the responsibility of the Meat Exporter to ensure that these sanitary measures are adopted for production of safe meat. The Inspection Team of APEDA drawn from different agencies, regularly monitor the safety guidelines being practiced by the meat plants so as to instill confidence in the end users.

The meat slaughter (Buffalo, Sheep and Goats) for export has a unique value chain and is well organized right from livestock markets, transport of animals to the slaughter houses, production of finished product, transport of meat in refrigerated containers to ports for shipment to importing countries. This manual has been prepared to deal with all the quality and safety measures to be adopted for production of red meat including the minimum requirement of APEDA approved abattoirs where animals are slaughtered.

## **CHAPTER 1**

### **PREMISES**

#### **1.1 Location of Abattoir**

The location of the abattoir where animals are slaughtered and meat is produced should conform to BIS. The premises should be away from environmentally polluted areas and industrial activities which produce obnoxious soot, dust, smoke, chemical or biological emission and pollutants that pose a serious threat of contaminating the meat. The location should be free from floods, pests and where wastes, either solid or liquid, are dumped and can not be removed.

The abattoir and processing plant should not be used for residential purposes and livestock market.

#### **1.2 Layout and Design of Abattoir /Meat Processing Plant**

The layout of the abattoir and processing unit should permit Good Hygienic Practices (GHP) including protection against cross contamination between and during the operations. The activities in lairage, abattoir, processing, packaging and loading should be compartmentalized.

The layout should have a bio-security built-in in the Plant where two zones should be clearly demarcated namely, black zone and white zone. There should not be any cross movement of trucks/animals. The trucks carrying the animals for slaughter should enter through the black zone where there is an arrangement for disinfecting the truck tyres with 1% formalin so as to exclude the contamination entering into the plant. The trucks carrying animals should never be allowed to enter through the white zone which is meant for exit of finished product only.

There is always a forward movement of the animals. The animals are registered and tagged at the unloading area. Thereafter, animals are kept in the resting pens. The resting pens should be covered. The capacity of resting pens including isolation pen depends upon the capacity of slaughtering per shift.

The plant should have lairage, race, abattoir hall, slaughter lines, chillers, deboning and packing area, freezing and cold storage.

### **1.3 Emergency Slaughter room**

An emergency slaughter room adjacent to the main abattoir to slaughter 8-10 animals at any one time should be provided. Emergency slaughtering is done for injured animals or animals escaped from confinement which might be of concern to the workers employed in the plant. It has to be carried out in the emergency slaughter room provided in the premises and may be carried out even beyond the working hours in order to minimize the sufferings of the animal.

### **1.4 Identification and Traceability**

Identification of animals has to be carried out as soon as the animals arrive at the slaughter house at unloading area for slaughter. This will create a preliminary traceability system that will commence as soon as the animal arrives and is a first step. Thereafter the traceability should be enforced at various stages, namely, ante-mortem, abattoir, post-mortem, chilling and processing hall with assigning the batch number.

### **1.5 Resting Pens**

The resting pens should be covered and provided with adequate supply of drinking water so that animals can rest after a stressful transportation. It is here that ante-mortem examination is carried out.

### **1.6 Isolation Pen**

The premises should have an isolation pen where suspected animals can be kept for detailed examination.

### **1.7 Lairage and Race**

A covered lairage and race have to be provided where animals are cleaned, washed and moved before slaughter.

### **1.8 Utility Services**

1. Suitable and adequate facilities should be provided to the workers employed in the plant for changing their clothes, cleaning of their foot wear, hand gloves etc.

2. Similarly adequate provision of toilets and change room should be made. Separate toilets, latrines and change rooms are provided for male and female workers.
3. Where five or more employees are working the following provisions are to be made.

<b>Number of workers</b>	<b>Number of latrines</b>	<b>Number of wash basin</b>
Not exceeding 25	1	1
Between 25-49	2	2
Between 50-100	3	3
More than 100	5	5

4. Adequate facilities for lockers be provided.
5. Adequate facilities for canteen of workers and executive be provided.
6. Facilities for prayer should also be provided.
7. Hand sanitation station should also be provided where elbow and knee operated taps should be installed. Where paper towels are used, sufficient number of receptacles should be provided. Notices should be pasted at the washing station.
8. Laundry facilities for cleaning of workers uniforms should be provided.
9. First aid and medical room for a part time medical doctor be provided for large units. For smaller units emergency call facility should be available.
10. Adequate natural and artificial lighting should be provided throughout the meat processing. About 540 lux should be provided at all inspection points, about 220 lux in work room and 110 lux at other places. All bulbs should be covered and protected so as to avoid contamination of meat in case of breakage.
11. Adequate ventilation should be provided to prevent excessive heat, steam, condensation and dust to remove the contamination. Ventilation openings should be provided with an insect screen or other protective enclosures of non-corrosive material.

### **1.9 Guest House**

The premises may have a guest house where foreign delegation could stay with all the arrangement for boarding and lodging. There should be a well maintained clean kitchen.

### **1.10 Laboratory**

The in-house microbiological laboratory with sterilization room, media preparation room, incubation room, laminar flow and washing room have to be provided to do the microbiological examination of meat, water, air and personnel working in the plant.

### **1.11 Rendering Plant - (Optional)**

Suitable capacity dry rendering/wet rendering plant to treat bones and non-edible offals should be provided in the premises to produce value added meat cum bone meal and tallow for feeding poultry and soap manufacturing. This will also check the pollution in the plant. A No Objection Certificate from State Pollution Control Board is mandatory requirement of APEDA for registration of plants and export of meat.

### **1.12 Effluent Treatment Plant**

A suitable capacity effluent treatment plant needs to be provided to treat the effluent both aerobically and anerobically to check the pollution. The effluent with 30 BOD can then be utilized either for in-house agriculture purposes or let into the farmers field for growing crops.

### **1.13 Lecture hall for in-house training**

For in-house training of butchers, veterinary doctors and other skilled workers, a separate lecture hall with black/green board be provided.

### **1.14 Hide Room**

A separate hide room where salting of hides is performed is to be provided depending upon the capacity of the slaughter house.

### **1.15 General Store**

General store should be provided to store all the products.

### **1.16 Work shop**

There should be a work shop for daily repairing and maintenance of the plant.

### **1.17 Generator Room**

There should be a stand-by generator room for providing power during the break-down.

The premises should not be used for residential purposes. No personnel belongings like clothing, bedding and shoe should be kept in the premises.

No food should be allowed in the processing hall. Chewing of tobacco and smoking should strictly be prohibited and notices to this effect be pasted at appropriate locations.

## CHAPTER 2

### ANIMAL WELFARE

Animal Welfare is directly related with quality of meat production. The animals should be handled, transported, rested and slaughtered using humane practices. If the animals are in stress, the quality and shelf life of the meat are affected.

#### 2.1 Pre-Slaughter Handling of Animals

Animals for slaughter should be transported from farm/livestock markets in a comfortable posture as per the guidelines provided in prevention of cruelty towards the Animal Act of 1960 by providing adequate space in the vehicles and /or as per the guidelines given by the Bureau of Indian Standards (2007). If the animals are transported under stress by over loading then their body water and also the glucose level in the body muscles are reduced thus they fail to attain acidic pH while in the chillers affecting meat shelf life.

The following requirements should be followed while transporting the animals from farm to slaughter house.

1. Healthy animals free from diseases should be transported to the slaughter house. The animals meant for slaughter should be certified by a qualified veterinarian for their fitness to undertake the journey and their use as meat animals.
2. The transported animals should be in groups of preferably same sex and age so as to avoid fighting due to their social behavior. Advanced pregnant animals should not be transported as they are not fit for human consumption.
3. The vehicles should be thoroughly disinfected with a suitable disinfectant before loading the animals. Thereafter clean sand layer of about 6 cm should be provided to prevent injuries to the animals. During summer it can be moistened with water and in winter paddy straw may be used over the sand layer.
4. While driving the animals for loading / unloading stick should never be used. It can be done with soft rubber stick.
5. During extreme weather conditions the animals can be transported in covered vehicles so as to avoid extreme heat/cold.
6. If the journey is more than 4 hours the animals should be properly watered and fed.
7. The trucks transporting the animals should not exceed the speed limit of 40 km per hour so as to avoid jerks and injuries to the animals.

## 2.2 Loading and Unloading of Animals

Animals should be loaded on a ramp which should have a gradual slope and with anti-slippery device namely cleats at frequent intervals. It is better to have these ramps covered so as to avoid extreme weather condition.

## 2.3 Density of Animals

Bureau of Indian Standards (2007) and Ministry of Environment and Forest (2009) have given the following guidelines in their specification which have been adopted by APEDA.

Approximate floor space for transporting different classes of animals as per the Ministry of Environment and Forest notification 2009 is as follow :-

Vehicle Size Length x Width (Sq Mtr.)	Floor Area of vehicle (Sq Mtr.)	Number of Cattle			
		Weighing upto 200 kg 1 Sq.Mtr.	200-300 Kg 1.2 Sq Mtr.	300-400 Kg 1.4 Sq Mtr	400 kg above 2 Sq Mtr.
6.9 x 2.4	16.56	16	14	12	8
5.6 x 2.3	12.88	12	10	8	6
4.16 x 1.9	7.904	8	6	6	4
2.9 x 1.87	5.481	5	4	4	2

For Sheep and Goats the following space requirement will be followed :-

Approximately weight of animals in Kg	Space required in Sq. Mtr.	
Up to 20 Kg	0.17	0.16
20-25 Kg	0.19	0.18
26-29 Kg	0.23	0.22
30-39 Kg	0.27	0.25
More than 40 Kg	0.32	0.29

The space requirements should be scrupulously followed while transporting the animals.

## **2.4 Resting**

The animals for slaughter are rested for 24 hours in pens where adequate water and shade are provided to alleviate the stress of the animals during their transportation. It is here that ante-mortem examination is carried out. The suspected animals are kept in the isolation pens where detailed examination is carried out by qualified veterinarian.

The animals should be provided adequate space for resting namely 2 sq meters for large animals and 0.8 sq meters for sheep/goats.

## **2.5 Moving the Animals**

While moving the animals on race, the use of electric rods should be avoided. The animals can be moved with plastic sticks. The animal caretaker should be properly trained to handle the animals humanely for slaughter.

## **2.6 Knocking Box**

From race the animals are led to knocking box where the animals to be slaughtered can not see the slaughtered animals in the abattoir. The knocking box could be for an individual animal or for two animals. Knocking box helps in restraining the animals for slaughter where slaughter is done either by stunning the animals or without stunning as per the requirement of the importing country.

## CHAPTER 3

### HUMANE SLAUGHTER

Animals are slaughtered by being stunned and slaughtered mostly by Halal method in all the export oriented units. For some countries stunning is mandatory where as for other countries stunning is not allowed.

Stunning induces un-consciousness and minimizes the reaction of fear, anxiety, pain and distress to the animal.

The following methods of stunning are considered humane:-

1. **Mechanical Stunning of Cattle:** There are 3 methods namely; captive bolt stunning, mushroom head percussive stunning and pneumatic stunning. For cattle and buffaloes, pneumatic stunning has been recommended. The stunner is placed at the intersection of the lines drawn from medial corners of the eyes and the base of the ears. For sheep and goats, the stunner is placed behind the poll, aiming towards the angle of the Jaw.
2. **Electrical Stunning:** It is allowed in few countries where Halal slaughter is mandatory. The electrodes are placed on the head region in cattle, sheep and goats. The minimum current levels for head stunning in cattle is 1.5 Amps, calves, sheep and goats 1.0 Amps.

#### 3.1 Ante-Mortem Inspection

Animals after resting be subjected to ante-mortem examination by the qualified veterinarian. Only animals fit for human consumption be sent for slaughter. Animals showing signs of any disease be marked as ‘suspect’ and kept in isolation pen. No animal in febrile condition be slaughtered.

Animals found not fit for human consumption be declared as “condemned” on ante-mortem inspection and removed. The condemned carcasses are disposed off as in para given separately under the head “Disposal of Condemned Carcasses”.

#### 3.2 Slaughtering of Animals

1. The slaughtering of animals should not be done in the sight of slaughtered animals.

2. It should be done by Halal method with Islamic Shariyat in case producing halal meat with a sharp knife which should cut carotid vein, carotid artery, trachea and oesophagus in one incision. It should not cut the spinal cord.
3. The carcass after slaughtering is hanged to bleed for 5-6 minutes and then dressing is done on the slaughter line. It should not be done on the floor.
4. The hide is pulled by the dehider and hide is then pushed through the chute at a place for keeping the hides.
5. Thereafter the carcass be split in two and eviscerated.
6. All the floor of the abattoir should be hard, impervious and anti-slippery to check contamination.
7. The internal walls of abattoir should also impervious, glazed upto atleast height of 5 meters in case of large animals and 2 meters in case of small ruminants.
8. Cold and hot potable water should be available in the abattoir in sufficient quantity for washing of carcasses.
9. There should be proper ventilation in the abattoir so as to minimize condensation.
10. It should be fly proof and should prevent the entrance of pests
11. There should be efficient drainage and disposal of edible and non edible offals.
12. The blood should be collected in an under drainage facility/tank.

### **3.3 Post-Mortem Inspection**

1. After slaughter a detailed post-mortem inspection of carcasses and parts be done soon after in the abattoir. All organs and parts of the carcasses are held in a manner so as to keep their identity till the completion of post-mortem inspection. It is important so as to remove them in the meat chain in case the carcasses are condemned.
2. Every carcass which is found to be wholesome and fit for human consumption shall be marked as 'Inspected and passed'.
3. Animals found affected with anthrax firstly should not be allowed to go for slaughter since the disease can be detected in ante-mortem inspection. In case the animals have been slaughtered the carcass should not be opened and marked as "condemned" and buried under the ground as per disposal requirement of anthrax carcass.

### **3.4 Disposal of Condemned Carcasses**

The condemned carcasses /non-Halal carcasses are shifted to rendering plant by a separate line where the whole carcass are rendered. The anthrax carcass should not be sent to rendering plant but burried in the soil with lime.

### **3.5 Chilling, Freezing and Storage**

After the carcasses have been inspected and passed, they are washed with hot water and sanitized with 20 PPM of Chlorine. It is further processed as the procedure given in Chapter 7.

## **CHAPTER 4**

### **GOOD HYGIENE PRACTICES (GHP)**

#### **SANITARY AND HYGIENIC REQUIREMENT OF PROCESSING UNIT**

##### **Sanitary Facilities**

##### **4.1 Water Supply**

It is important to have an adequate supply of potable water available with proper safe storage and distribution. Similarly adequate supply of hot potable water should be available during the working hours. This water will be used for washing the carcasses, equipment (knives etc) which come in direct contact with meat.

For cleaning purpose the temperature of water is kept at 65°C. For disinfection of knives hot water at 82°C be used.

The blade of the knives needs to be submerged in the sterilizer for at least 2 minutes. This water supply is separate from the hot water supply used for cleaning and hand washing.

Steam and ice in the plant should be produced from the potable water.

##### **4.2 Safety of Water**

Water is potential source of contamination of the raw food. Water is excessively used in cleaning of carcasses to avoid any contamination. It is used in cleaning of the abattoir and deboning halls and the table tops, fixtures etc. Thus keeping in view the extensive use of water in the meat plant, it must be assured that the water used in the different processes must be potable. A regulated supply of hot water (at 82°C) is also assured regularly so as to clean the working area as well as the instruments. The quality of the water is monitored by examining the harmful metals and microbiological content through some recognized external agency. Thus, it avoids any risk of contamination from water. The regular supply of hot water in the plant be ensured.

### **4.3 Cleanliness of Food Contact Surfaces**

Adequate facilities are provided for cleanliness of food contact surfaces namely floor, wall, knives, hooks, plastic crates, equipment and table tops. The abattoir and deboning area are cleansed and washed with detergents and hot potable water (65°C). Table tops are sanitized with chlorine. Floor and walls are scrubbed and washed with soap and hot water (at 65°C) dried by wipers and sanitized with chlorine thereafter. Tables are cleaned, washed with hot water (65°C) and mopped with chlorine (100-150 ppm). Knives and splitters are washed with hot water and mopped with chlorine while hooks are dipped in caustic soda water then washed with hot water (65°C) and detergents. Pullies are oiled with edible oil. Plastic crates are scraped so as to remove any pieces of meat; then washed with detergents and hot water dipped in chlorinated water and stocked to dry before use. The cleaning and disinfection programmes ensure that all parts of establishment are appropriately clean.

### **4.4 Prevention of Cross Contamination**

Pathogens can be transferred from one food to another either by direct contact or by food handler's contacts of visitors. Raw unprocessed meat is effectively separated either physically with effective intermediate cleaning facility. Visitors are required to put on clean protective clothing including foot wear and wash their hands before entering the plant. The surfaces of table tops, fixtures and fittings are thoroughly cleansed and disinfected after raw meat has been handled and processed both in the abattoir and in deboning hall including the whole utility building which is cleaned every morning, evening and at lunch time every day. It is also cleaned before the start of the work and after the shift is over. Following are the precautions to be taken at the factory to prevent microbiological cross-contamination:-

1. The factory premises have adequate separation between clean (white zone) and semi clean (black zone) to prevent cross-contamination.
2. At the black zone the tyres of trucks are allowed to dip in the disinfectant so as to prevent bacterial contamination in the factory.
3. The factory has to have a reception area. The common visitors are prohibited entry in the Slaughter and Deboning Halls. Only the authorized workers are allowed entry with proper attire to check the contamination.
4. The factory has to have an enough area for reception of animals and an adequate sheltered lairage. Any animal found suffering from any zoonotic disease is rejected so as to avoid cross-contamination.

5. The factory has to have separate slaughtering place for sheep/goat and for buffaloes.
6. Continuous and thorough washing is always carried out in the slaughtering area.
7. It is ensured that dogs, cats and birds do not gain access in the slaughter/deboning hall.
8. Any carcass/part of carcass rejected is immediately passed onto the Rendering plant through a separate chute.
9. Suitable and separate space is provided for the storage of skin and hides.
10. A Constant hot water supply (82°C) is ensured in both the Deboning and Slaughter hall.
11. Receptacles with suitable finely fitted covers are provided for lifting garbage and refuse from the Slaughter area.
12. It is prohibited to drag the hide in the Slaughter hall. They are passed to the place below devider and skin through the chute provided below the hide puller.
13. Personnel working in the Deboning area are always allowed to go to the deboning hall through clean area while personnel from slaughter area pass through semi clean area. Inter mingling of personnel from abattoir to deboning and packing area is not allowed.
14. It is mandatory for the workers to undergo medical checkup by a qualified registered medical practitioner every six month. Records are maintained for the medical certificates. This avoids the cross-contamination of the meat through handlers.
15. Samples are taken randomly daily from different tables and meat cuts for the microbiological examination.
16. Likewise swab examination is done randomly from butchers hands, knives, hands of workers working on packaging tables for microbiological examination.

#### **4.5 Hand Washing, Sanitizing Facilities**

Any person who directly handles packaged or unpackaged meat, equipment or food contact surface must comply with the hygienic food requirement. Facilities should be available to ensure personal hygiene to avoid any food contamination. All the butchers working in the deboning hall must wash their hands with soap and sanitize their hands and knives with chlorinated water at 20 ppm before entering the area. All the visitors have to follow the same procedure of washing and sanitizing

their hands before entry. Proper dress code should be strictly followed for all the different category of personnel entering the abattoir / deboning / packing hall.

#### **4.6 Proper Labeling and Storage**

Food grade polythene film should be used in all the different procedures of packing. Proper labels should be placed in between the layers of polythene sheet. The products are packaged in appropriate cartons. The cartons are properly strapped and shrink wrapping is done on each package so as to avoid any damage to cartons. The cartons are passed through heating tunnel (temperature at the heating tunnel is maintained from 150°C to 180°C) for 10 seconds to effect proper shrink wrapping of the film. These shrink wrapped cartons are stocked in the blast freezers. Procedure for freezing the packages is by keeping the cartons in between the plates of the blast freezer. The temperature of the blast freezer is maintained at -30°C to -35°C. The holding period of the cartons in the blast freezer is 8-12 hours. The cartons are properly pressed in between the plates from the top plate to the bottom plate for proper contact for giving a good shape. The temperature of the blast freezer is monitored hourly and records are maintained. The cartons are taken out from the blast freezer after 12 hours and stacked pallets. These pallets are placed on the designated racks in the cold storage till they are loaded in refrigerated containers. The temperature of the cold storage and the containers are maintained at -18°C.

#### **4.7 Control of Employees Health Conditions**

Exporters/Processors should monitor the health conditions of their employees. Healthy and strong worker works with vigour for long hours. Moreover a sick worker is a potential danger in the transmission of disease not only to other workers but may disseminate the pathogens to the food which he handles while working. The health of the worker is thoroughly checked every 6 months on a routine basis. Moreover, the workers are vaccinated with Typhoid and the records are maintained for the medical check-up of each worker who handles the meat. The plant should be equipped with adequate first aid facilities.

#### **4.8 Exclusion of Pest**

Exporters should be conscious about the menace of the flies, mosquito, rats and other pests. Pest not only contaminates the food, food contact surface, food packaging materials but they themselves are carriers of different diseases. It is to be ensured that the utility building and its surroundings must be insect and pest free. Different pest control measures are to be taken both outside and inside the plant to make it free from this menace. Rat traps are to be placed in switch room. Cartons and packing material should be stored hygienically by sealing crevices to prevent entry of rodent & pests through the drain, Air curtains are placed at each entry

point in the utility building. Insect catchers are also fitted in canteen and at halal point in the slaughter house to eliminate living and flying insects. Automatic closing windows (chutes) are provided in the slaughter hall to deliver the rejected carcasses for rendering. Chutes are also provided in the bone room. This prevents the entry of birds and other flying objects to enter in the deboning /slaughter hall. Nuvan is regularly sprayed throughout the utility building. Moreover, regular cleaning of toilets and keeping of naphthalene balls prevents the flies and mosquito entry in the plant. Pesticides are sprayed outside the building regularly to reduce insects from immediate vicinity. There should be proper pest control mapping and installation.

## CHAPTER 5

### EQUIPMENT AND UTENSILS

In the abattoir and processing units, there are many types of equipment like knives, de-hider, splitting machines, eviscerator, trays, weighing machines, pallets, metal detector, trolleys etc, which need proper maintenance and periodic cleaning.

#### 5.1 General hygiene of equipment

- a) The processing unit should have suitable arrangements for fly proofing in the form of air-curtain and flytraps.
- b) All the processing units namely, chillers, freezers, cold storage etc. should have temperature gauges to indicate the inside temperature.
- c) The knives and other chopping equipment like splitting saw should be cleaned with hot water at a temperature of 82°C to properly sterilize the equipment.
- d) The working tables should be of smooth stainless steel with no corrosion.
- e) They should be easily cleaned and should have a sufficient height to check for any leftover of meat products.
- f) Sufficient number of foot operated dustbins/drums should be provided to dispose of the waste/s.
- g) Sufficient number of stainless steel trolleys (rust proof) should be provided in the processing hall for quick removal of bones and other wastes. Separate trolleys should be provided for abattoir, deboning hall and packing area to avoid cross contamination and easy identification.

**5.2** Proper and regular calibration of equipments be ensured in house and or out sourced.

## **CHAPTER 6**

### **PERSONNEL HYGIENE AND HEALTH REQUIREMENT**

- 6.1 The personnel working in the plant are required to have good health, are properly attired with aprons, head wears, mouth mask, hand gloves, and gum boots.
- 6.2 No people suffering from any infection or contagious disease are allowed to work in either abattoir or processing hall. They should be examined every six months to ensure that they are free from infectious and contagious diseases. Their medical examination reports are maintained for the audit inspection.
- 6.3 The staff working in the processing hall should have trimmed hair & nail. No jewellery is allowed to be worn by the workers.
- 6.4 While using the toilets during working hours, workers will follow the same drill of washing the hands and sanitizing with chlorine and no instruments, like knives, will be allowed by the workers to carry in the toilets.
- 6.5 The staff should be inoculated against enteric diseases (like cholera, typhoid, tuberculosis) once a year and a certificate to that effect should be kept in the record.
- 6.6 Spitting, sneezing, chewing of betel and smoking should be prohibited inside the plant.

## **CHAPTER 7**

### **PROCESSING OF MEAT**

After proper post-mortem inspection of carcasses and found fit for human consumption, the carcasses are washed and sanitized with chlorine labeled “inspected and passed”. They are then kept in the chillers at 0-4°C for 24 hours. In chilling, the pH of the meat becomes acidic and comes below 6 where FMD virus is killed.

After chilling, the meat is deboned in the deboning hall where all the lymph glands and connective tissues are removed. The temperature of deboning hall is maintained at 12°C - 15°C.

After deboning the meat is packed in the cartons as per the requirement of the consumers. The cartons are then sealed with polyethylene and passed through the shrinkage machine. After sealing, the meat is passed through the metal detector and put in the freezer.

#### **Packaging and labelling**

Proper cuts are packaged in cartons which has labels indicating the product, date of manufacturing, shelf life, brand name, etc to provide the consumer the information about the contents. Thereafter, the packed cartons are passed through the metal detector before freezing the meat either in plate freezer/blast freezer.

#### **Freezing of the Meat**

The meat is frozen in the plate freezer / blast freezer at -40°C for 10 hours where deep bone temperature is brought down to -18°C. Thereafter, the meat is kept in the cold storage.

#### **Cold Storage**

The frozen meat is kept in cold storage maintained at -18°C to -20°C till it is cleared for loading from the in-house laboratory.

## **CHAPTER 8**

### **LOADING OF REFRIGERATED CONTAINER**

While loading the refrigerated container, the temperature in the container has to be brought to  $-18^{\circ}\text{C}$  so that there is no thawing of the frozen meat cartons while they are loaded.

The reefer container has to be clean and disinfected before loading. After proper loading it is sealed taken to port either by rail /road. The temperature has to be maintained at  $-18^{\circ}\text{C}$  at all times.

## **CHAPTER 9**

### **HAZARD ANALYSIS AND CRITICAL CONTROL POINTS (HACCP)**

HACCP is a food safety measure which has to be followed by each export oriented abattoir cum meat processing plant. It is mandatory to get registration from APEDA. HACCP should be process specific (both for integrated and processing units) and not in general. Examples of PRP, OPRP and CCC may be give because in most cases it is the same.

### **PROCEDURE FOR PREPARATION OF HAZARD ANALYSIS AND CRITICAL CONTROL POINTS (HACCP) MANUAL**

#### **9.1 PURPOSE**

To ensure that animals slaughtered, meat processed, stored and distributed by export oriented unit are safe for human consumption.

#### **9.2 SCOPE**

This covers all stages of procurement of animals, reception, processing and distribution of product(s).

#### **9.3 DEFINITIONS**

- i. Control- To take all necessary steps to ensure and maintain compliance with criteria established in the HACCP Manual.
- ii. Corrective Action- Any actions to be taken when the results of monitoring at the CCP indicate omission of control.
- iii. Critical Control Point (CCP)- A step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level.
- iv. Critical Limit- A criterion which distinguishes acceptability from unacceptability.
- v. Flow Diagram - A systematic representation of the sequence of steps or operations used in the production or manufacture of a food item.
- vi. HACCP- A system which identifies, evaluates, and controls hazards which are significant for food safety.

- vii. HACCP Plan / Manual- A document prepared in accordance with the principles of HACCP to ensure control of hazards which are significant for food safety in the segment of the food chain under consideration.
- viii. Hazard: A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.
- ix. Hazard Analysis- The process of collecting and evaluating information on hazards and conditions leading to their presence to decide which are significant for food safety and therefore is addressed in the CCP plan.
- x. Monitor: To conduct a planned sequence of observations or measurements to assess whether a CCP is under control.
- xi. Step- A point, procedure, operation or stage in the food chain including raw materials, from primary production to final consumption.
- xii. Validation-Obtaining evidence that the elements of the HACCP Manual are effective.
- xiii. Verification- The application of methods, procedures, tests and other evaluations, in addition to determine compliance with the HACCP Plan.

## **9.4 RESPONSIBILITY**

The responsibility for development application and monitoring HACCP programme lies with the HACCP team constituted at each export oriented unit.

## **9.5 PRELIMINARY STEPS**

### **1. Constitution of HACCP team**

A multi-disciplinary HACCP team is to be constituted which represents the expertise and experience needed for documenting, verifying and implementing HACCP system. The HACCP team members are trained on basic principles of HACCP/Food Safety Management System. The HACCP team meets once in 6 months to review the status of implementation of HACCP system.

It is useful if a plant layout is also available because a bad layout may provide avenues for cross contamination from raw material to products, facilities to products and persons to product. This should also form part of on-site verification.

## **2. Describe Product**

The products manufactured have to be fully described including relevant safety information such as composition, physical, chemical structure (pH, heating, freezing etc.), packaging, storage conditions and distribution. The description also includes the major raw material, food ingredients, preservation and packing materials used. A description of the method of distribution includes type of transport and any special consideration to maintain product safety.

## **3. Intended end use of the product**

The description of intended use is based on the expected uses of the product by the end user or consumer. It is indicated how the product is to be used including if it is to be fully cooked before consumption, what preparations will be needed, what will be serving requirements, shelf life etc.

## **4. Construction process flow diagram**

The HACCP team constructs a process flow diagram for each product indicating critical steps of control. Each step within the specified area of operation is analyzed for the particular part of the operation under consideration to produce the flow diagram. Consideration is given to steps preceding and following the specified operation. The process flow diagram is used as the basis of the hazard analysis and should therefore contain sufficient technical detail for the study to progress. Each step within the specified area of operation is analyzed for the particular part of the operation under consideration to produce the flow diagram. (Annexure-1)

## **5. On-site Verification of Process Flow Diagram**

The HACCP Team has to conduct on-site verification of the flow diagram to see that all stages and conditions are covered. This is partly in-office exercise and partly on-site activity. In-office exercise includes dissecting the process stage and discussing the implications of process parameters and then they are verified at the site. The verification of the flow diagram at site is done by actually walking through the plant to confirm the accuracy and completeness of processing operation against the flow diagram during all stages and hours of operation and amend the flow diagram and make sure that the steps listed on the diagram describe what really occurs in producing the product.

## **9.6 STEPS BASED ON HACCP PRINCIPLES**

### **1. Conducting Hazard Analysis (Principle 1)**

HACCP team has to conduct a hazard analysis and listed all the biological, chemical and physical hazards that are reasonably expected to occur at each step and has described the preventive measures that can be used to control these hazards. The list includes such of the hazards which are of the nature that their elimination or reduction to acceptable levels is essential to the production and distribution of safe products. The team has considered preventive measures for each hazard to eliminate hazards or reduce their impact or occurrence to acceptable levels. More than one preventive measure may be required to control specific hazard(s) and more than one hazard may be controlled by a specified preventive measure.

In conducting the hazard analysis, the HACCP team has to keep in mind the following:

- the likely occurrence of hazards and severity of their adverse health effects,
- the qualitative and/or quantitative evaluation of the presence of hazards,
- survival or multiplication of micro-organisms of concern,
- production or persistence in foods of toxins, chemicals or physical agents, and
- Conditions leading to the above.

The team then consider what control measures, if any, exist which can be applied for each hazard. At the end of each product, the basis for determination of occurrence of hazards and severity of their adverse health effects is given.

### **2. Determine Critical Control Points (Principle 2)**

The Team has to identify CCPs by applying the decision tree, using their experience and on the basis of training provided to them to determine whether a step is a CCP for the identified hazard during hazard analysis. All hazards that may be reasonably expected to occur, or be introduced at each step, have been considered. If a hazard has been identified at a step where control is necessary for food safety, and no control measure exists at that step, or any others, then the process is modified at that step, or at any earlier or later stage, to include a control measure.

### **3. Establishing Critical Limits for Each CCP (Principle 3)**

Since CCPs define the boundaries between safe and unsafe products, it is vital that they are set at the correct level for each criterion. The HACCP team has therefore to use criteria governing safety at each CCP in order to set the appropriate critical limits. Critical limits have been specified for each preventive measure. Where required more than one critical limit has been elaborated at a particular step. Criteria used include control of foreign matter, moisture, microbial load and sensory parameters such as taste and flavour and visual appearance and enforcement of strict plant and personnel hygiene.

### **4. Establish monitoring System for each CCP (Principle 4)**

The HACCP team has to establish a monitoring mechanism for control of CCPs. Monitoring is one of the most important aspects of HACCP system. It is the scheduled measurement and observation of a CCP relative to its critical limits. The monitoring procedures are designed in such a way that they are enabled to detect loss of control at the CCP and provide information in time for corrective action to be taken to regain control of the process before there is a need to reject the product. The person at the site is authorized, if necessary in consultation with In-charge Quality Control, to carry out corrective actions.

In-charge Quality Control evaluates data derived from monitoring once in three months to find out any adverse trend. The frequency of monitoring has been specified which is sufficient to guarantee that the CCP is under control. The system also includes calibration of equipment.

Most monitoring procedures for CCPs adopt rapid testing because they relate to on-line processes and there will not be time for lengthy analytical testing. Physical and chemical measurements are often preferred to microbiological testing because they may be done rapidly and can often indicate the microbiological control of the product. All records and documents associated with monitoring CCPs are signed by the person(s) doing the monitoring and by a responsible reviewing official (s) in the functional area.

## **5. Establish corrective actions (Principle 5)**

Specific corrective actions have to be developed for each CCP in the HACCP system in order to deal with deviations/ nonconformities when they occur. The actions taken ensure that the CCP has been brought under control. Corrective actions taken also include proper disposition of the affected product. Corrective action also occurs when monitoring results indicate a trend towards loss of control at a CCP. Remedial action is taken to bring the process back into control before the deviation leads to a safety hazard.

## **6. Establish Verification Procedures (Principle 6)**

The HACCP system designed includes verification procedures to provide assurance that HACCP system is being complied with on day-to-day basis. Using internal quality audit method also monitors this most effectively. This ensures that the HACCP system is working correctly and effectively.

Monitoring and auditing methods, procedures and tests, including random sampling and analysis are used to determine if the HACCP system is working correctly. The frequency of audit and verification are kept at appropriate intervals to validate the HACCP system. Verification activities include:

- Review of the HACCP system and its records- During internal audit once in six months
- Review of deviations and product dispositions-Immediately after occurrence of deviations.
- Verification of operations to determine if CCPs are under control-During internal audit.
- Validation of established critical limits- Once in a year

## **7. Establish Documentation and Record Keeping (Principle 7)**

The HACCP Team has to establish an efficient record keeping. An efficient and accurate record keeping is essential to the application of a HACCP system. Records are therefore kept of all areas, which are critical to product safety to demonstrate that the HACCP system is in compliance with the documented system. Documentation of HACCP procedures at all steps are to be kept. Records provide basis for analysis of trends as well as for internal investigation of meat safety accidents, which might have occurred. A unique reference numbering has to be allocated to each HACCP record.

## 9.7 PREREQUISITE PROGRAMME

The organization has to be fully committed for application of HACCP system for meat safety. Prior to application of HACCP, it has to ensure that the general principles of food hygiene are in place based on Recommended International Code Of Practice - General Principles of Food Hygiene {**CAC/RCP I - 1969 Rev 3 (1997)**}; and food safety legislations such as Prevention of Food Adulteration Act, 1954, Standards of Weights and Measures Act, 1976 and Food Safety and Standards Act (2011) are implemented.

During hazard identification, evaluation and subsequent operations in designing and application of HACCP system, due consideration has to be given to the impact of raw materials, ingredients & Packing Materials and food manufacturing practices. The role of manufacturing processes to control hazard and likely end use of the product, categories of consumers of concern and epidemiological evidence related to meat safety are to be considered.

## **CHAPTER 10**

### **REFERENCES**

**B.I.S.            2007**

**SPCA            1960**



## PROCESS FLOW CHART OF SAFE AND HYGIENIC MEAT PRODUCTS IN MEAT PLANTS



