FOOD SAFETY AND STANDARDS AUTHORITY OF INDIA
Inspiring Trust, Assuring Safe & Nutritious Food

Training Manual
Food Safety Supervisor Course
Special – (Level 3) – Manufacturing
Meat and Meat Products (Animals)

ACKNOWLEDGEMENT

Food Safety is best achieved when all the stakeholders join hands and contribute in tandem for this noble cause. This **"Safe and Nutritious Food Handbook for Meat and Meat products (Animals)"** is one such initiative, which will act as a Meat and Meat Product Training Manual. We believe it will go a long way in ensuring the Meat and Meat products, produced in India are manufactured with scientifically validated processes that ensures safety for the consumers.

This document is prepared by **CII-HUL Initiative for Food Safety Sciences (CHIFSS)**.

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CHIFSS TEAM

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Disclaimer: The content of this handbook/ manual is only for training and capacity building purpose, and is not intended to substitute applicable law, which may be referred separately.

Welcome to the manual –

The manual is designed for small, medium and large-scale meat and meat products processors and manufacturers
This manual explains General Requirements on Hygienic and Sanitary Practices to be followed by all Food Business Operators engaged in Meat and Meat Products processing establishments, as per Food Safety & Standard Act, 2006.
This manual presents bare minimum requirements of Food Safety and Hygiene to be followed by Food Business Operators along with Industry best practices.

Learning Outcome –

The objective of this manual is to train the personnel, about food safety and hygiene requirements which are to be followed in their businesses and who can be designated as Food Safety Supervisors in the Meat & Meat Products establishments. The Food Safety Supervisors (FSS) may interpret these requirements according to the size and type of their establishment.
The desired outcome of this manual is better understanding of food safety and hygiene requirements and high standards of food safety practices in the industry.

The Food Safety Supervisors (FSS) of Meat and Meat Products Industry are to be trained on:
General Requirements on Hygiene and Sanitary Practices, as per "Part II and Specific Hygienic and Sanitary Practices to be followed by Food Business Operators engaged in manufacture, processing, storing and selling of Meat and Meat Products as per "Part IV of Schedule 4" of Food Safety and Standards (Licensing and Registration of Food Businesses) Regulations, 2011.

(http://www.fssai.gov.in/home/fss-legislation/fss-regulations.html) under Food Safety & Standards Acct,2006.
(http://www.fssai.gov.in/home/fss-legislation/food-safety-and-standards-act.html)

And Industry Best Practices as applicable to Meat and Meat Products

Rationale: The GMP, GHP and HACCP implementation will help establishments prevent physical, chemical, biological hazards resulting from the environment and processes.

What the law says -

The establishment in which Meat and Meat Products are handled, processed & packed, by the food business operator and the persons handling them should conform to the sanitary and hygienic requirement, food safety measures and other standards as specified below. It shall also be deemed to be the responsibility of the food business operator to ensure adherence to necessary requirements.

In addition to standard requirements by FSSAI, the food business operator shall identify steps in the activities of Food businesses, which are critical to ensure food safety, and ensure that safety procedures are identified, implemented, maintained and reviewed periodically.

In India, the mandatory General sanitary and hygiene requirements for food business operators are- "Part II of Schedule 4" and Specific Hygienic and Sanitary Practices to be followed by Food Business Operators engaged in manufacture, processing, storing and selling of Meat and Meat Products "Part IV of Schedule 4" of Food Safety and Standards (Licensing & Registration of Food Businesses) Regulations, 2011 (http://www.fssai.gov.in/home/fss-legislation/fss-regulations.html) under Food Safety & Standards Acct, 2006. (http://www.fssai.gov.in/home/fss-legislation/food-safety-and-standards-act.html).

For the ease of understanding, the relevant sections from Part II and Part IV of Schedule 4 of Food Safety & Standards (Licensing & Registration of Food Businesses) Regulation, 2011 has been segregated as per flow of operations.

Section A- Introduction to Food Safety

A1 Key Definitions

A2 Food Safety and Hazards

A3 Food Spoilage

A1 Some Key Definitions for Meat and Meat Products Processing

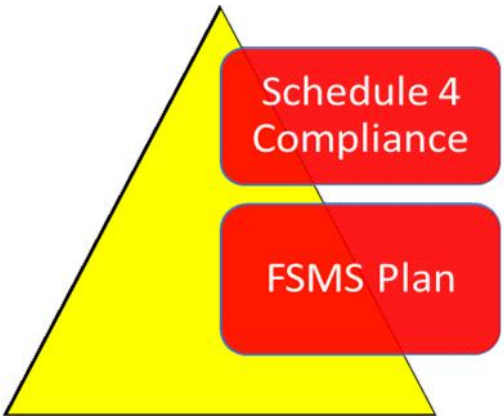
1. **Abattoir/Slaughter house**- Abattoir/Slaughter house is an establishment where specified animals are slaughtered and dressed for human consumption and that is approved, registered and/or listed by the competent authority for such purposes.
2. **"Animal"** means an animal belonging to any of the species specified below (i) Ovines; (ii) Caprines; (iii) Suillines; (iv) Bovines; (v) Domestic rabbits (Oryctolagus cuniculus); and includes poultry and fish
3. **Ante-mortem inspection**-Any procedure or test conducted by a registered veterinarian person on live animals for the purpose of judgement of safety and suitability and disposition.
4. **Carcass**- The body of an animal after dressing
5. **Contaminant** -Any biological or chemical agent, foreign matter, or other substance not intentionally added to food that may compromise food safety or suitability.
6. **Disease or defect**- Any abnormality affecting safety and/or suitability.
7. **Dressing**- The progressive separation of the body of an animal into a carcass and other edible and inedible parts.
8. **Establishment**- A building or area used for performing meat processing activities that is approved, registered, licensed and/or listed by the competent authority for such purposes.
9. **Fresh meat**- Meat that has not been treated in any way to ensure its preservation.
10. **Hazard -**A biological, chemical (including allergens) or physical agent in, or condition of, food with the potential to cause an adverse health effect.
11. **Inedible**- Inspected and judged by a competent person, or otherwise determined by the competent authority to be unsuitable for human consumption.
12. **Manufactured/Processed Meat** - Products resulting from the processing of raw meat or from the further processing of such processed products, so that when cut, the cut surface shows that the product no longer has the characteristics of fresh meat.
13. **Meat-** All parts of animal that are intended for, or have been judged as safe and suitable for, human consumption.
14. **Meat food products** -means any food items which is made from flesh or any edible part of carcass through the process of marination /mixing, drying, curing, smoking, cooking, seasoning, flavoring, freezing,
15. **Post-mortem inspection**- Any procedure or test conducted by a registered veterinarian on all relevant parts of slaughtered/killed animal for the purpose of judgement of safety and suitability and disposition.
16. **Primary production** -All those steps in the food chain constituting animal production and transport of animals to the abattoir.
17. **Raw meat**- Fresh meat, minced meat or mechanically separated meat.
18. **Ready-to-Eat** (RTE) products- Products that are intended to be consumed without any further biocidal steps.
19. **Ready to cook-** "Ready to Cook" means that the food or a material in the food must be brought to a temperature sufficient to kill any pathogenic microorganisms before it is safe to consume.

A2. Food Safety & Food Safety hazards

Food Safety means assurance that food is acceptable for human consumption according to its intended use.

As per FSS Act 2006, Food Safety Management System means the adoption of Good Manufacturing Practices, Good Hygienic Practices, Hazard Analysis and Critical Control Point and such other practices as may be specified by regulation, for the food business.

For the purpose of this document and all assessments conducted there under, the definition of FSMS shall be read as the above and the requirements for this be taken as that defined under **Schedule IV & Critical Control Point.**



FSMS Program

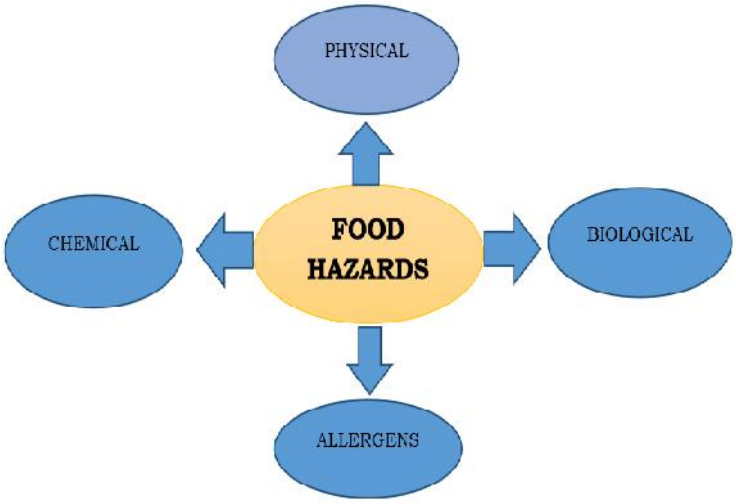
Schedule IV

1. **Why?** Section 16 of the FSSA, holds FSSAI responsible for regulating and monitoring the manufacture, processing, distribution, sale and import of food so as to ensure safe and wholesome food.

2. **How?** By introducing basic hygiene and safety requirements in the form of Schedule IV

3. **Where in FSSR?** The Schedule IV has been mandated for compliance by introducing it as a licensing requirement/condition under the Food Safety and Standards (Licensing and Registration of Food Businesses) Regulations, 2011.

✓ **Food Safety Hazard** means biological, chemical (includes allergens) or physical agent in food, or condition of food, with the potential to cause an adverse health effect. There are majorly four types of hazard.



Types of Food Hazards

Physical Hazards -Any foreign object (inanimate) found in the food or a naturally occurring object (metal, hard plastic), that poses a hazard is called as Physical Contamination or Hazard.
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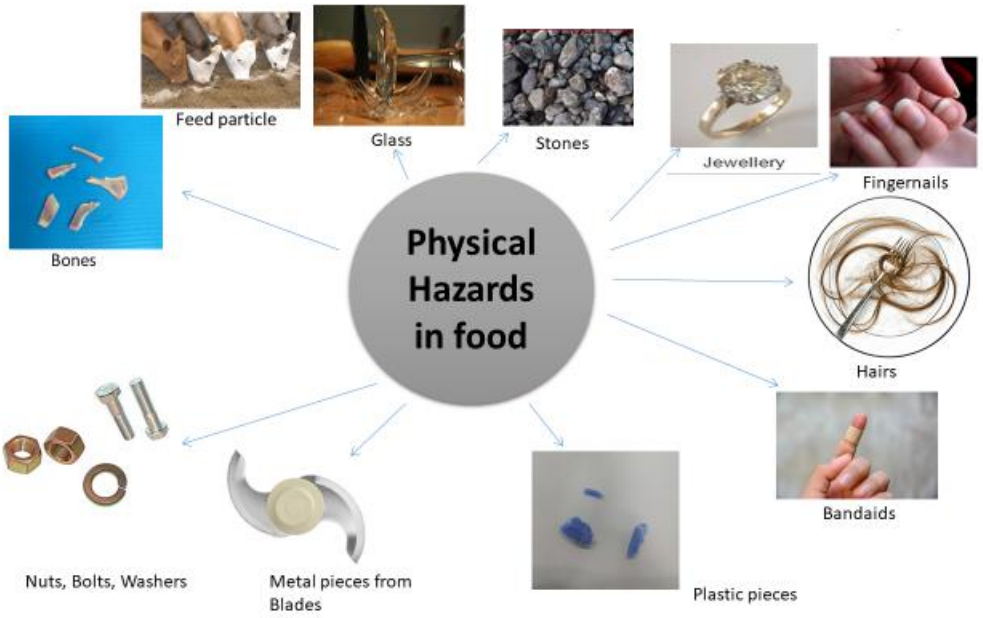
Common Physical Hazards include:

- Glass
- Bone/ cartilage in boneless meat
- Feather
- Chipped pieces from equipment
- Metal from trolleys, hooks, SS Knives, screw, bolt
- Blades
- Plastic or chipped pieces of disposables
- Lint and threads
- Band- aids
- Hair
- Finger nails
- Jewellery pieces
- Stone
- Feed Particles



Examples of Physical Hazards

Control Measure for Physical Hazards-

Glass and Hard Plastic Policy:

All glasses and windows in the production areas need to be of safe break type. In case of any glass / hard plastic breakage the glass / plastic shards shouldn't fall into the products. Lights, lighting fixtures, clocks, measuring device such as flasks, temperature measuring device etc. need to be safe break. Various plastic items are used in meat industry during process and storage e.g. buckets, resting tables, cutting boards and lab items (beakers, etc.).

Jewellery Policy:

No Worker, working in a Processing Plant is supposed to put on any type of Jewellery. Jewelries and its mountings can contaminate the product and could be hazardous and a strict Jewellery Policy should be defined for men and women employees to adhere. By considering religious view mangalsutra can be allowed by taking proper precautions.

Visitors Policy:

To prevent any contamination from the visitors, Visitor's Policy should be in place. All visitors shall declare their health status if they are suffering from any

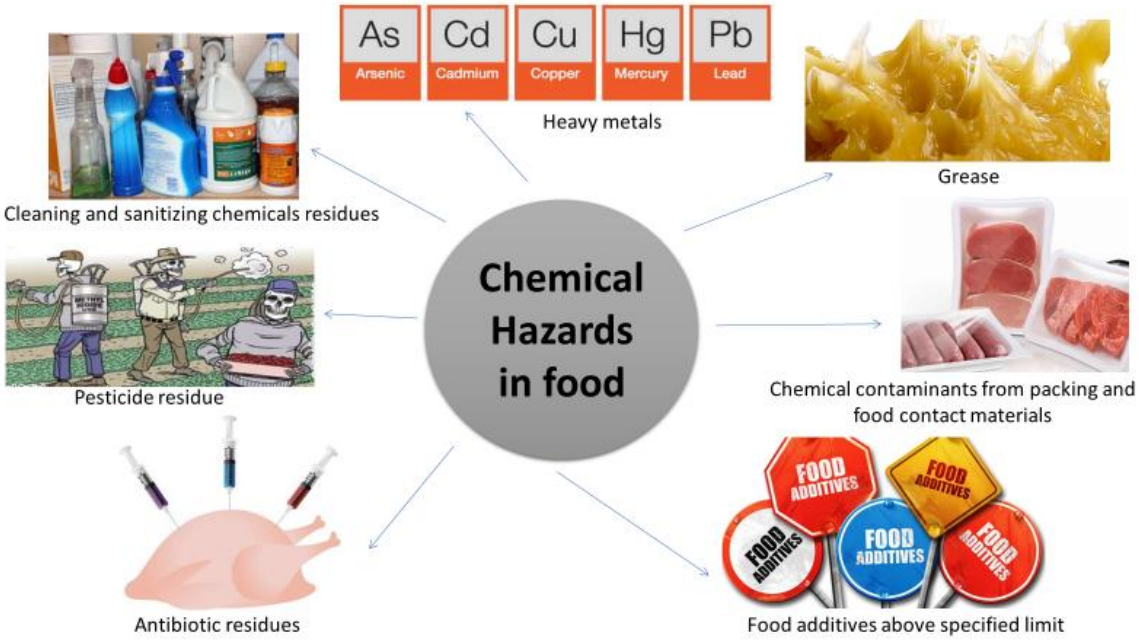
contagious disease such as cold, diarrhea etc. Provide giving instructions to visitors as to what are the basic requirements during visit to the Meat Industry, should be followed.

Chemical Hazard- Naturally occurring and process induced chemical substances that can cause a food borne illness are called as Chemical Contaminant or Hazard.

- **Intentionally added** -Preservatives, Nutritionally additives & Color additives above the specified limit as per the FSS (Food Additive) Regulation

- **Unintentionally**
  - Pesticides, Antibiotic and other Veterinary drug residues.
  - Naturally Occurring Toxins Substances (NOTS).
  - Heavy metals

- **Chemicals used like:**
  - Cleaning and sanitizing chemicals residues
  - Chemical contaminants from packing and food contact materials
  - Lubricating material such as Grease and oils



Examples of Chemical Hazards

Control Measures:

1. Chemical contamination-
   - Adequate physical separation should be maintained between chemicals and food items.
   - All possible measures should be developed and effectively implemented to avoid any chance of cross contamination.
2. Pesticides, Insecticides and Veterinary Drug Residues-

- Approved Supplier.
- Certified Agencies for Pest Control
- Feed Control
- Follow recommended withdrawal period.

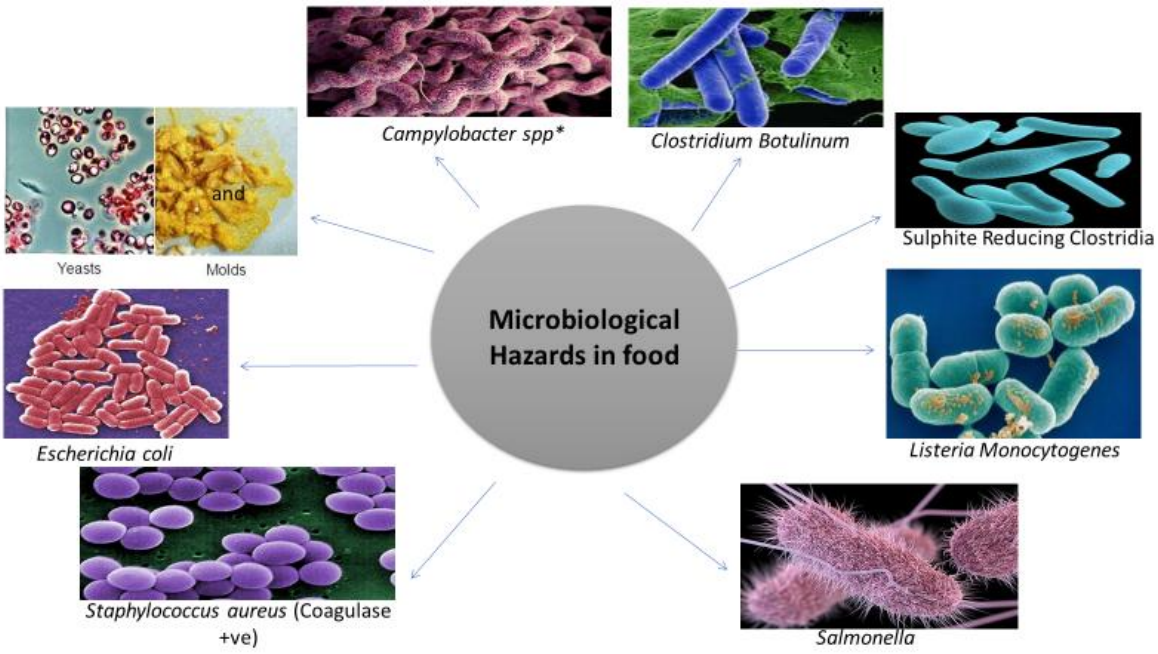
3. Chemical Additives-
    - Chemical additive concentration need to be controlled as per regulatory guideline and approved levels shall be maintained.
4. Packaging Material-
    - Food grade packaging material to be used.
5. Lubricants, Grease-
    - Separate lockable storage
    - Use of food grade grease only for food contact surface lubrications
    - Vehicle inspection should be conducted regularly.
    - Also control on cleanliness should be maintained from supplier's end.
    - Inspection to be carried out at each and every step under preventive maintenance plan.
    - Preventive maintenance of all equipment's should be followed as per defined frequency.
6. Heavy metals-
    - Periodic water testing
    - Approved feed supplier in primary production
    - Animals to be procured from approved supplier

Biological Hazard

Biological hazards are organisms, or substances produced by organisms, that pose a threat to human health. They are a major concern in food processing because they cause most food borne illness outbreaks.

The 4 types of biological hazards are-

- ✓ **Bacteria** – Escherichia coli, Staphylococcus aureus, Salmonella, Listeria Monocytogenes, Sulphite Reducing Clostridia, Clostridium Botulinum, Campylobacter Spp.
- ✓ **Viruses** – Foot and Mouth Disease Virus etc.
- ✓ **Fungi** – Y & M etc.
- ✓ **Parasites** – Round worms, Tape worms



Microbiological Hazards in Food

Bacterial pathogens are of two types-

- ✓ **Spore forming pathogens**- Clostridium Botulinum, Clostridium perfringens

- ✓ **Non-Spore forming pathogens**- Campylobacter, E. coli O157:H7, Listeria monocytogenes, Salmonella, Staphylococcus aureus.

- ✓ **Clostridium botulinum**
  Food borne botulism (as distinct from wound botulism and infant botulism) is a severe food borne disease caused by the ingestion of foods containing the potent neurotoxin formed during growth of the organism. Botulism has a high mortality rate if not treated immediately and properly.
  Foods associated with illness include: improperly canned meat products such as canned sausages, canned seafood products etc.

- ✓ **Clostridium perfringens**
  Perfringens foodborne illness is the term used to describe the common foodborne disease caused by the release of enterotoxin during sporulation of C. perfringens in the gut.
  Foods associated with illness include: canned meat and products.

- ✓ **Campylobacter jejuni**
  Campylobacteriosis is the illness caused by C. jejuni. It is also often known as campylobacter enteritis or gastroenteritis. It is often spread by consuming meat from infected animal.

- ✓ **Escherichia coli sp-** Hemorrhagic colitis is the name of the acute disease caused by E. coli O157:H7.
  Foods associated with illness include: undercooked or raw hamburger (ground beef); in sporadic cases, other meat products, etc.

- ✓ **Listeria monocytogenes**
  Listeriosis is the name of the general group of disorders caused by L. monocytogenes.
  Foods associated with illness include: cooked meat, cooked poultry, and raw milk, supposedly pasteurized fluid milk, and cheeses (particularly soft-ripened varieties). Its ability to grow at temperatures as low as 3^{o}C permits multiplication in refrigerated foods. Environment is also a potential source of Listeria monocytogens.

- ✓ **Salmonella spp.**
  S. typhi bacteria are normally septicemic and produce typhoid fever in humans and are predominantly human bacteria. Other forms of salmonellosis generally produce milder symptoms. Salmonella spp. are found in the intestinal tracts of warm blood animals.
  Foods associated with illness include: raw and cooked meats, poultry, eggs etc.

- ✓ **Staphylococcus aureus**
  Staphylococcal food borne illness (staphylococcal enter toxicosis; staphylococcal enterotoxaemia) is the name of the condition caused by the enterotoxins that some strains of S. aureus produce and release into the food product.
  Foods associated with illness include: meat and meat products; poultry and egg products; egg, tuna, ham, chicken, potato, and macaroni salads; sandwich fillings; milk and dairy products; etc.

Viruses - A virus is a small infectious agent that replicates only inside the living cells of other organisms. E.g. Foot and Mouth Disease virus etc.

Fungi – Fungi are a kingdom of mostly microscopic organisms that are closely related to animals. Aspergillus spp., Fusarium spp are the commonly isolated fungi from dried meat products.

Parasites – Parasite is defined as an organism that lives and feeds on or in an organism of a different species and causes harm to its host. Round worms, Tape worms are commonly seen parasites surviving on meat.

Mechanism of Food Borne Disease

- ❖ **Food Borne Infections** - This result when a person consumes food containing pathogens; which grow in the human intestine and cause discomfort or disease. Typical symptoms of a food borne Infections do not appear immediately.

- **Food Borne Intoxications** - This result when a person consumes food containing toxins in it; that cause discomfort or disease. Typical symptoms of a food borne Intoxication appear quickly.

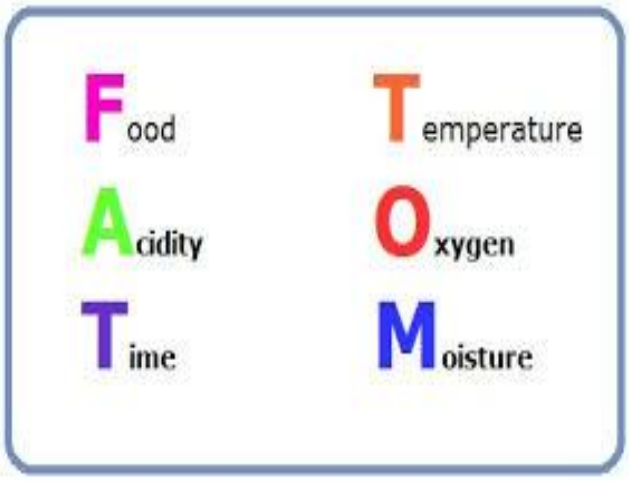
  Food Borne toxin are mediated infections, that result when a person consumes food containing toxins produced by the pathogens in it; which grow in the human intestine and produce toxins that cause discomfort or disease.

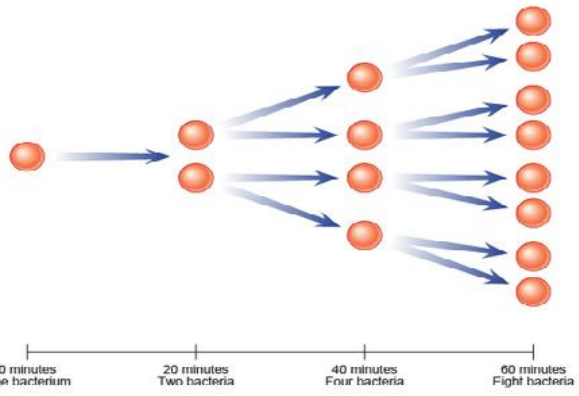
Conditions favouring growth of Microorganisms

FAT TOM

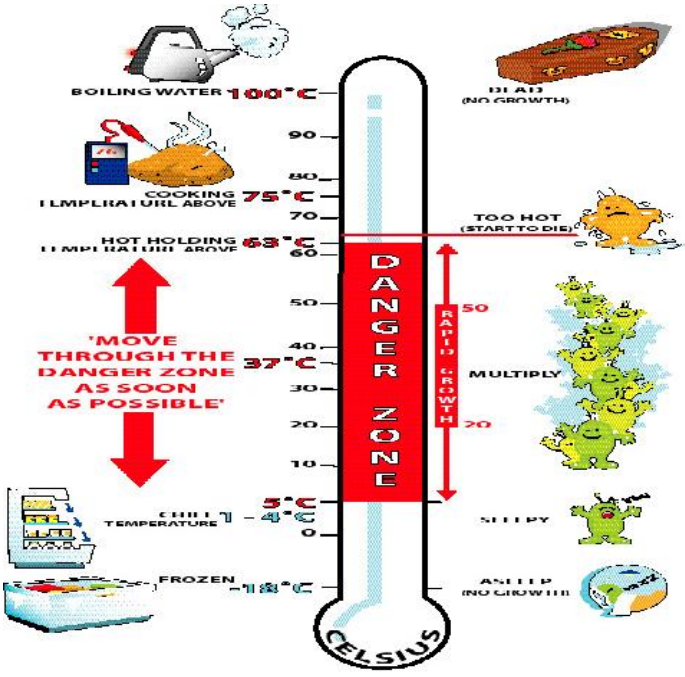
Conditions	Definition
Food	Food borne Microorganisms draw nutrients from Potentially hazardous foods
Acidity	Food borne Microorganisms grow well between the pH range of most foods
Temperature	Microorganisms grow well between the temperature range of 5^0C – 60^0C,most commonly known as the 'Danger Zone'
Time	Microorganisms need sufficient time to grow; when exposed to the 'Danger Zone'
Oxygen	Microorganisms require oxygen in free or combined state; to favor their growth
Moisture	Microorganisms require moisture to grow and is measured in the form of 'Water Activity (Aw)'

FATOM: Conditions favoring growth of microorganisms

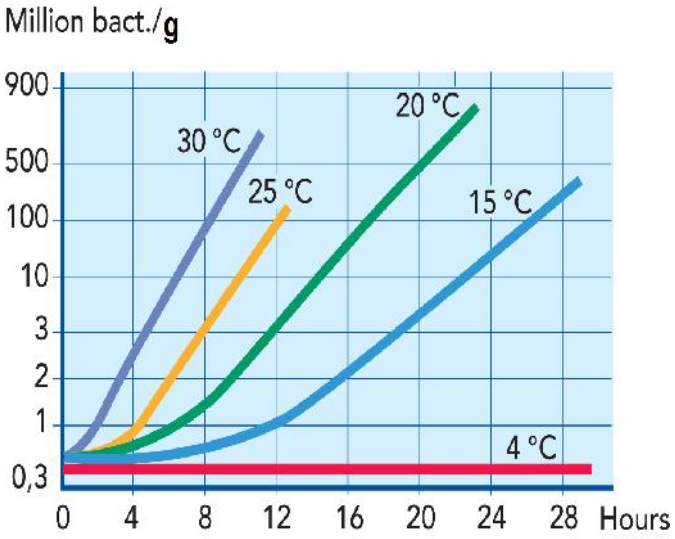




Factors necessary for the growth of microbes "FAT TOM"



Danger zone temperature



Temperature & Growth rate

Categorization of food on the basis of risk

✓ **High Risk Food (HRF)**

HRFs are identified as vehicle for food poisoning and Food born disease outbreak. RTE foods support rapid growth of food poisoning bacteria because intended use of RTE is without further heating to destroy bacteria. Usually such foods are high protein and high moisture content which favors the growth of pathogens. HRF generally prepared from meat, fish & poultry and which requires refrigerated storage.

Cooked meat and poultry, dairy products, cooked fish, shell fish, cook-chill meals, baby foods, etc. must be kept separate from raw foods. Since Raw foods are often contaminated with large no of bacteria including pathogens so it shall be kept separate from RTE foods even if frozen.

✓ **Low Risk foods**

Normally stored at ambient temperature, as they cannot promote multiplication of bacteria e.g. dry products. This category of foods is rarely implicated for food

poisoning. Foods with high sugar content, acid or acidified foods, fried or dried foods with low Aw (less than 0.85), baked foods, canned foods, powdered foods, etc. are examples but once the powder is reconstituted, the same becomes High Risk Foods.

What are the risk factors associated with foods and Food Borne Diseases?

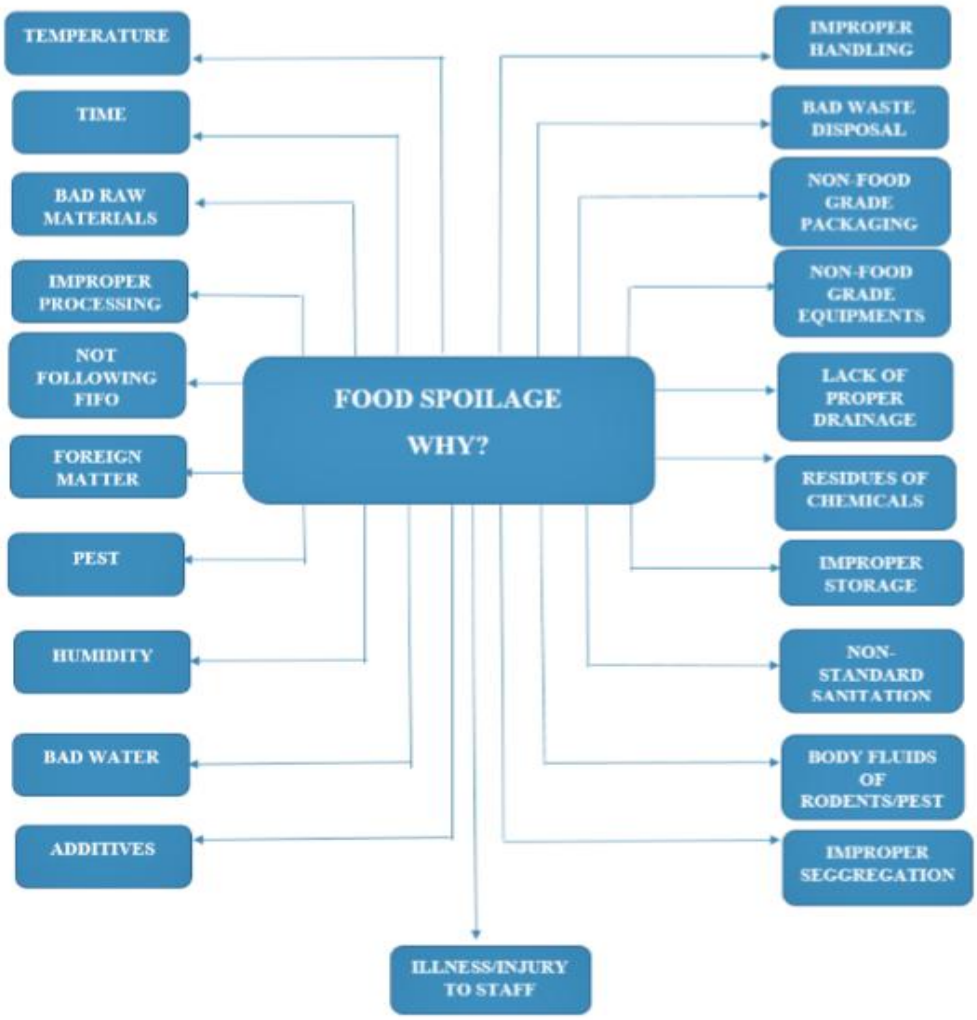
Understanding these risks is necessary to control them as we know it is the risk that is to be prevented, eliminated or reduced to acceptable level through the hygiene and prerequisite programs and hazard control.

Unsafe food refers to food that contains harmful bacteria, viruses, parasites, or chemicals making it unfit for human consumption. Also, physical contaminations like glass particles, stones, and other extraneous matter in food causes food to be unsafe.

Food spoilage, as a part of unsafe food, means that the original nutritional values, texture, flavor of the food are damaged; the food become harmful to consumers and unsuitable to eat.

A3 Food spoilage

Food spoilage means that the original nutritional value, texture, flavor of the food are damaged, the food become harmful to people and unsuitable to eat.
Major reasons for food spoilage are-



Reasons of Food Spoilage

Various causes of Unsafe Food

1. **Foreign matter**: Human hair, stapler, metal particles, fabric, plastic, alkali etc. are big threats to food safety. Anything that is not considered as food or food substance is considered as foreign matter.

2. **Pest:** Food infested with pest causes harm to human health. Contamination may be caused by body fluids like urine, fecal matter of rodents, reptiles,

pests, nocturnal animals and birds present in the storage yard, marketing yard, transportation etc.

3. **Non- food grade equipment**: Non-corrosive, food grade material to be used for processing equipment's; to prevent metal contamination, chemical contamination.

4. **Improper handling:** Unclean hands, wrong selection of equipment causing cross contamination, and packing in unsuitable material.

5. **Improper processing:** Wrong process methods can lead to major changes in end product. Right temperature, right time, proper additives and understanding process steps is essential to ensure food safety.

6. **Residues of chemicals:** Chemicals from crop contaminants, residues from equipment or utensil sanitation operations. It is important to ensure thorough washing is done before equipment is taken into production.

7. **Non-standard sanitation:** Sanitation must be based on strict guidelines of either historical data or validation. If chemicals are used in less or more quantity or in an unverified process or method, sanitation will fail to achieve proper results giving way for food to become unsafe.

8. **Poor quality raw materials:** Quality of raw materials to be checked based on frequent sampling, before selection.

9. **Poor quality animal:** to be checked by veterinarian.

10. **Additive:** Additives of any nature like essence, flavors etc. can spoil food if not used in the right quantity. Unauthorized additive also must not be used.

11. **Water:** Water is involved in food process in various stages from washing to soaking then involved in either directly food production as an ingredient or in some in-direct manner as steam. It is also important for washing and sanitation operations. Potable water should conform to the specifications of IS 10500:2012.

12. **Improper storage:** Right combination of duration, temperature, ventilation and segregation defines a good storage. Any deviation in one of these could result in food becoming unsafe.

13. **Illness/Injury to staff:** Food safety is much dependent on the food handler's personal behavior and health status. A person with cough, cold, open wound, itching and any illness which is of an irritable nature tends to make him handle things without washing his hands after touching the body.

The most common danger to food safety is from cough and cold and open wounds for food handlers.

14. **Improper segregation:** Where certain ingredients/raw material contain/ or are allergens, the appropriate segregation of such materials, equipment, tools and final product is important to ensure consumer safety.

15. **Humidity:** Humidity is a major cause for enabling microbial growth, and rancidity. Food zones must have lesser than 65% humidity to ensure food safety.

16. **Temperature**: Temperatures of processing, holding, storing, transporting, are all important factor in food being safe.

17. **Time:** No raw material or product should be held beyond designated shelf life.

18. **Non-food grade packing:** Intermediate and final product should be packed only in acceptable packing material to ensure food safety.

19. **Improper waste disposal:** Waste if not disposed in a hygienic manner, can breed pest and microorganisms which are a threat to food safety.

Section B- Implementation of Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP)

1. ESTABLISHMENT: DESIGN AND FACILITIES

Sl No.	Operational Flow	Sub Sec No.	Heading
1.	Design and Facilities	1.1	Location and Surroundings
		1.2	Layout and building design
		1.2.1	Construction, Design and Layout
		1.2.2	Internal Structure and Installation
		1.3	Equipment and Containers design and Installation
		1.4	Facilities and Utilities
		1.4.1	Water
		1.4.2	Ice and Steam
		1.4.3	Air Quality and Ventilation
		1.4.4	Electricity & Lighting
		1.4.5	Personal Hygiene Facilities
		1.4.6	Compresses air and other gases
		1.4.7	Cleaning Facility
		1.4.8	Storage Facility
		1.4.9	Lab Facilities
		1.4.10	Waste and Drainage System Facility
		1.4.11	Other Facilities

1.0 DESIGN AND FACILITIES

1.1 LOCATION AND SURROUNDINGS

Introduction

Meat processing involves slaughter at facilities along with other processes which includes canning, cooking, curing, freezing, or making meat products. Meat and meat processing uses large quantities of water and generates wastewater which includes significant amounts of organic matter such as fat, blood, manure, hair, feathers, and bones. This wastewater can also contain disease-causing organisms, bacteria, parasite eggs, oil, grease, salt, nitrogen and ammonia compounds, phosphorus, and chlorine. Air pollution generated by meat and meat processing can include particulate matter, volatile organic compounds, and hazardous air pollutants. Other by-products of processing include odours, noise, and solid waste for treatment or disposal.

Statutory Requirements-

"No Objection Certificate" to be obtained from Municipality or Panchayat or applicable local bodies before grant of license.

"No Objection Certificate" from the pollution control board of the State has to be obtained.

License/Registration under FSS Act' 2006 as per the Food Safety and Standards (Licensing and Registration of Food Businesses) Regulations, 2011

Regulatory Compliance

Selection of Location & Surrounding Area –

- Slaughter Houses shall be located away from:
  - environmentally polluted areas and industrial activities which produce disagreeable obnoxious odour, fumes, excessive soot, dust, smoke, chemical or biological emissions and pollutants, and which pose a serious threat of contaminating food. In case there are hazards from other environment polluting industries located nearby, appropriate measures shall be taken to protect the manufacturing area from any possible contamination;
  - areas subject to flooding, otherwise measures should be taken to locate the premises at elevated level in a sanitary place;
  - areas prone to infestations of pests;
  - areas where wastes, either solid or liquid, cannot be removed effectively;

- without any direct access to any residential area, in case cannot be achieved, sufficient measured shall be demonstrated to show its not posing threat to food safety.

Slaughter Houses / Meat processing units

- It shall permit adequate maintenance, cleaning and/or disinfection, prevent any potential contamination, and provide adequate working space to allow good manufacturing and hygienic practices for all the operations.
- Slaughter Houses should have adequate drainage and easy provision for cleaning. All drains and gutters shall be properly and permanently installed. Drain or Storm water shall be prohibited to enter the premises.
- Access should be controlled, and site boundaries shall be clearly identified.
- Access to animals other than intended for slaughter shall be restricted.
- The external area of the site shall be maintained in good order to avoid any potential contamination like pest harbourage and infestation.
- Roadways and areas serving the establishment which are within its boundaries or in its immediate vicinity shall have all weather surfaces suitable for wheeled surface to allow ready transport of animals.
- There should be adequate facilities for the ETP and location of ETP shall be at such a distance as to avoid the possibility of contamination.
- The facility shall be used for the purpose that it is meant for.

Location & Surrounding for Slaughter Houses

1.2 LAYOUT AND BUILDING DESIGN

1.2.1 Construction, Design and Layout

1.2.1.1 General Requirements

- The building layout should be designed, constructed and maintained in order to facilitate good manufacturing and hygiene practices.
- The unit shall be laid out and equipped so as to facilitate proper supervision of meat hygiene including performance of inspection and control.
- To minimize cross contamination, continuous forward movement to be maintained- so that there is no possibility of reversal, intersection or overlapping between the live animal, and between meat & by products or waste.
- Segregation between clean and unclean sections. E.g. rooms and compartments for handling edible products shall be separate and distinct from inedible products.
- Adequate working space for satisfactory performance of all operations.

The premises shall have the following facilities for the satisfactory performance of all operations.

Reception Area/ animal holding yard/ resting yard (for animals)

- Resting of animal preferably between 12-24 hours (as required).
- Sufficient space shall be provided to avoid overcrowding and should be provided with adequate ventilation and climate control such as fan and foggers.
- Facility - Adequate supply of drinking water so that animal can rest after a stressful transportation.


Resting area for animals

- Ante Mortem Inspection before slaughter is done here.

Covered Lairage and Race –where animal is cleaned, washed and moved before slaughter.

Isolation pen – where suspected animal (contagious or infectious diseases) can be kept for detailed examination shall be provided with arrangements of water and feed.

Slaughter hall for animal

- Must maintain separate provision 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.
- Shall be such as slaughter of an animal should not be done in sight of other live animal.

- Proper isolation of scalding, de-feathering, evisceration (similar operations) areas from dressing/ portioning & processing areas in order to prevent blood contamination.
- Physical separation of Stunning & bleeding areas from evisceration area, wherever applicable.
- Having appropriate facility for collection of blood and waste
- Adequate facility to be provided for refrigeration facility, laboratory, administrative block, rendering unit and ETP plant.
- Separate holding area for suspected / condemned carcass.
- Separate halls for hide and skin collection, paunch collection, offals collection with a separate exit,
- Separate room for cleaning of edible parts.

Continuous forward movement:

The slaughter house shall have separation between clean and dirty sections and shall be organized to maintain unidirectional flow without any possibility of reversal, intersection or overlapping between the live animal meat, and between meat and by products or waste.

During the designing of layout of the abattoir we also have to consider below mention points-

- Species of animals as cattle/buffalo, sheep/goat, pig to be slaughtered.
- Maximum number of species of animals to be slaughtered per day.
- Range of operations (slaughter/dressing/deboning/packaging).
- Availability of fund.
- Byproduct Processing.https://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=imgres&cd=&cad=rja&uact=8&ved=0ahUKEwjg6ILg2ZXYAhWILY8KHaQjCcUQjRwIBw&url=http%3A%2F%2Fwww.malupork.com%2Fold%2Ftheabattoir.htm&psig=AOvVaw2b0q-2HYdAgO4fxnmxs3UP&ust=1513760045812529

Portioning / Deboning Section

Portioning / Deboning section should be separate from slaughter, and evisceration area.

- Entry to this section should be separate to maintain required hygiene standard
- Protective clothing of staff and workmen should be different to that of slaughter/ Evisceration area
- Appropriate hall temperature shall be ensured to maintain quality of meat.
- Effective cleaning & sanitation program to be in place and carried out maintain the hygiene standard.

Processed Product Section

- Separate entry to be provided to Processed Product Section
- Separate workmen should be deployed in this section and they shall not be permitted to work in slaughter / Portioning & deboning area
- Protective clothing of staff and workmen should be different

- Appropriate hall temperature between 12- 15 degree Celsius shall be maintained to ensure quality of meat.
- Effective cleaning & sanitation program to be in place and carried out maintain the hygiene standard.

Note:

Meat Portioning and processing section shall 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.

Meat Portioning sections

Meat Storage

- All units shall make separate provision for storage of chilled or frozen meat and meat products at or below 4 °C and at or below -18 °C respectively.

1.2.2 Internal Structure & Design:

1.2.2.1 Floors

- Shall be hard, waterproof, non-absorbent, impervious, washable, cleanable and Sanitizable, non-slippery (like epoxy, polyurethane concrete, tiling etc.) and made of nontoxic materials;
- without crevices and should be easy to clean and
- Slope should be sufficient so that liquids drain to trapped outlets

Floor Design Coving between floor & wall

1.2.2.2 Walls

- Should be waterproof, impervious, washable, cleanable & subitizable and nontoxic materials and should be light coloured,
- Should be smooth and without crevices and should be easy to clean to avoid accumulation/ absorption of dust, blood/ meat particles and microbial/fungal growth.
- The walls/floor junctions, corners and structural supports should be sloped/curve so that adequate cleaning can be done easily.

1.2.2.3 Ceilings and overhead fixtures

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

1.2.2.4 Windows and other openings

- Should be so constructed as to avoid accumulation of dirt
- Screens should be easily movable for cleaning and kept in good repair.
- Windows covered with wire mesh to prevent entry of dirt, dust, insect, pests, and birds.

1.2.2.5 Doors

- Should have smooth, non-absorbent surfaces and
- Where appropriate, be self-closing and close fitting;
- Air curtains/filters may be placed, wherever necessary
- Easy to clean & Sanitize
- In case of coated doors – No paint flaking

Ceiling

Window with mesh screen

Doors

1.2.2.6 Stairs, lift cages and auxiliary structures such as platforms, ladders, chutes, should be so situated and constructed as to facilitate easy cleaning, sanitation and maintenance to avoid contamination.

1.2.2.7 Carcass hanging: Suitable hoists will be provided to hang the carcass

Stairs

Carcass hanging

Establishment design that permits suitable cleaning

Wall and ceilings with crevices and mold growth

1.2.2.8 Vehicular areas

- Properly drained and concrete paved areas should be provided at places where vehicles are loaded or unloaded.

1.2.2.9 Wood Usage

- The use of wood not to be allowed in slaughter house/establishment. Implements with wooden handles shall not be permitted inside the establishment

1.2.2.10 Others

- Suitable facilities for sterilization of knives, scissors and other equipment. Preferable to have knives and scissors of SS.

***Note:** The construction of any chilling room, freezing room or freezer store shall satisfy the requirements mentioned above.

1.3 EQUIPMENT AND CONTAINERS

Equipment, Utensils and Machinery that come in direct contact with food shall be hygienically designed, constructed, located and, if necessary, installed to ensure that they can be adequately cleaned, sanitized and maintained to avoid contamination.

Equipment's and containers in contact with exposed meat and meat products should:

- have smooth impervious surface,
- be resistant to corrosion.
- made of material which is non-toxic,
- does not transmit odour or taste,
- is free from pits and crevices
- be non-absorbent,
- be of Food grade material
- capable of withstanding repeated exposure to normal cleaning and disinfection,
- be easily cleaned and disinfected

Meat Grinder

Meat Hooks

https://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwjHwPmT8NfYAhVHWrwKHXjoBuAQjRwIBw&url=http%3A%2F%2Fwww.lemproducts.com%2Fproduct%2Fbig-bite-tilt-mixer-50-lb%2Fsausage-meat-mixers&psig=AOvVaw3DPEWAJJqhYp9dpcNszMwO&ust=1516033784088724

Sausage Stuffer

Meat Mixer

Meat Ball Maker

No vessel, container or other equipment, the use of which likely to cause metallic contamination injurious to health shall be employed in the preparation, packing or storage of meat food products. It is recommended that all essential equipment should be made up of stainless steel.

All permanently mounted equipment shall either be installed sufficiently away wall and above the floor (minimum 300 mm) to provide access for cleaning and inspection.

Suitably designed Food contact surfaces and equipment

Note that -

1. All equipment shall be kept clean, repaired and maintained in sound condition all the time.
2. All measuring instruments / equipment like temperature gauges, pH meter, weighing balances, etc. shall be calibrated periodically for correct measurement.

Working table: Shall be made of non-corrosive material that is easily cleanable and sanitizable. While designing avoid areas that can accumulate dirt and difficult to approach for cleaning

Sanitary equipment: Placing and location of all sanitary equipment should permit easy access and thorough cleaning.

Containers for inedible material and waste should be leak proof, constructed of non-corrosive metal which is easy to clean or disposable and where appropriate, able to be closed securely.

Refrigerated system should be in place in different sections (like deboning, packing, freezing, cold storage) of the processing area with temperature monitoring devices and these devices shall be calibrated at regular intervals.

Shackles/Hooks, knives, other tools and equipment shall be clean and sanitized (recommended 50-100ppm chlorine) prior to use. They should be made up of Stainless Steel.

Equipment Identification: Equipment and utensils used for inedible material or waste should be so identified and should not be used for edible products. Also,

containers holding hazardous substances shall be closed when not in use, stored separately and lockable to prevent malicious or accidental contamination of food.

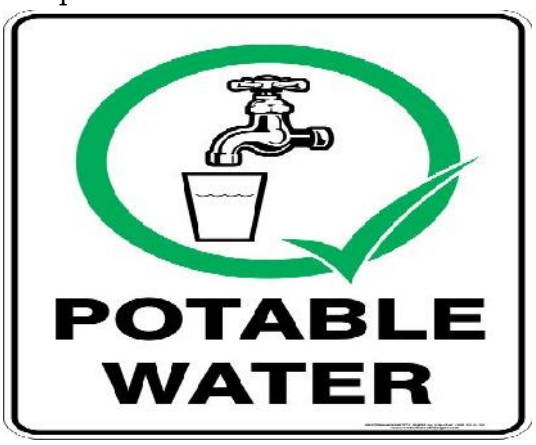
1.4 FACILITIES AND UTILITIES

The facilities and utilities are essential services that play a vital role to industry. Quality facilities and utilities provided like

- ✓ Provision of Water Supply
- ✓ Ice and Steam
- ✓ Air Quality and Ventilation,
- ✓ Electricity and Lighting
- ✓ Personal Hygiene Facilities
- ✓ Compressed Air and Other Gases
- ✓ Cleaning facilities for food contact surfaces
- ✓ Waste Disposal & Drainage System
- ✓ Storage Facilities
- ✓ Laboratory & technical Staff
- ✓ Other Facility

1.4.1 Water Supply

- An adequate supply of ***potable water*** with appropriate facilities for its storage and distribution shall be available.
- Potable water quality shall be as specified in the latest edition of BIS standard on drinking water (IS 10500). Potable water shall be tested bi-annually to confirm that it meets the requirements of this standard.

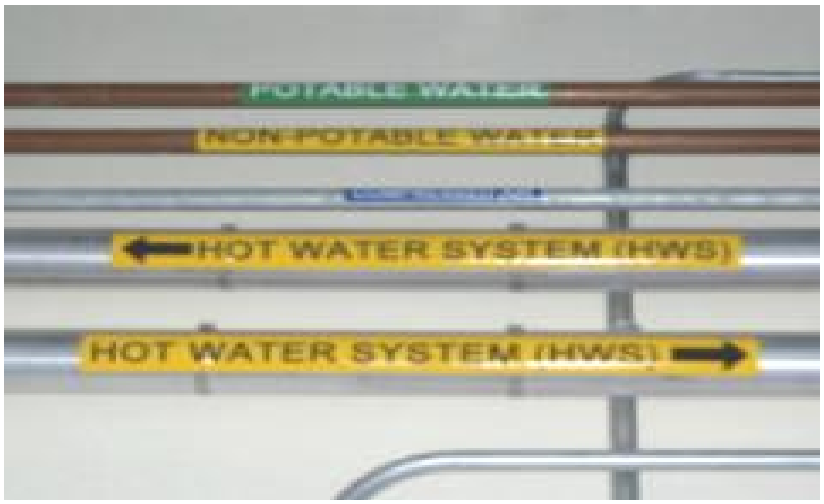


Potable water

Adequate supply and / or water storage facilities in Meat & Meat Industry

- Adequate supply of potable water with appropriate facilities for its storage and distribution should be available wherever necessary to ensure the safety and suitability of food.
- Surface of Water tanks shall be easily cleanable & Sanitizable
- Storage tanks and water pipes should be protected against contamination. They shall be adequately designed, made of material that is on toxic, corrosion resistant material, and periodically cleaned and maintained.

- The records of the same shall be maintained. The tanks shall be covered to prevent access by pests and other extraneous matter.
- Where water filters are used, they shall be regularly monitored or effectively maintained.
- Provide sufficient supply of hot water wherever necessary in the establishment.
- Non-potable water can be used for cleaning of those equipment which does not come in contact with food and food contact surfaces. It can also be used for firefighting, refrigeration equipment, lavatory etc.
- Non-potable water pipes shall be clearly distinguished from those in use for potable water and shall not connect with, or reflux into, potable water systems.
- Colour coding is



recommended for different type of water lines.

Separate pipelines for potable and non-potable water

1.4.2 Ice

- Ice should be made from potable water and should be manufactured, handled and stored to protect it from contamination.
- Quality evaluation of ice for microbial and chemical parameters should be done.
- No Walking over the ice in ice room, ice transfer mechanism shall be hygienic

1.4.3 Air Quality and 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 clean area.
- Ventilation openings should be provided with an insect screen (easily removable and cleanable) or other protective enclosure of non-corrosive material.
- Air handling unit should have facilities to filter the flushing-in air through filters which reduce dust, humidity and bacterial load to recommended levels.


Exhaust fans

- This system should be subject to routine maintenance, cleaning and disinfection.
- System shall be accessible for cleaning, filter changing and maintenance. so that they do not become a source of contamination.

Best Practice: An air quality monitoring program should be implemented to ascertain effective interval for changing filters.

1.4.4 Electricity and Lighting

- In case of electricity breakdown, minimum electricity power backup shall be available to maintain the temperature of storage area where meat and meat products are stored.
- Adequate natural or artificial lighting should be provided throughout the slaughter house.
- Resulting colour of the light shall not be misleading.
- Light bulbs and fixtures should be covered to prevent contamination of meat in case of breakage.

Light with Cover

Processing Areas	**Recommended Light Intensity (Lux)**
All Inspection areas	540 Lux
Work rooms	220 Lux
Other areas	110 Lux

Recommended light intensity

1.4.5 Personnel Hygiene Facilities

- Personnel hygiene facilities shall be available to ensure that an appropriate degree of personal hygiene can be maintained to avoid any cross contamination.
- Such facilities shall be suitably located & designated so that the employee must pass them when returning to the processing area.
- Facility shall have following facilities- hand washing, toilets, changing facility, rest and refreshment room.

1.4.5.1 Hand washing facilities

- Hand washing facility should be provided with potable water at adequate temperature, fitted with dispensers for liquid soap or other hand cleansing agents (sanitizer) and suitable hygienic means for drying hands.
- Taps of non-hand operable type are preferable like foot/elbow/sensor/knee /automatic type etc.

Hand washing and drying facility

- Non- Perfumed liquid soap should be used.
- Where hand driers were installed should be in working condition at all time during working hours.
- Where paper towels are used, a sufficient number of dispensers and receptacles should be provided near to each washing facility. Generally, and preferably, hand driers are considered better than paper towels based on cost efficiency and effectiveness.
- Dustbins to throw used paper towels should be foot-operated.
- Posters directing personnel how to wash their hands effectively near hand wash stations.
- Hand sanitizer should be provided and should be used after drying of hands. This is the next step of disinfecting hands after cleaning.

1.4.5.2 Provision of toilets:

- Sufficient number of latrines, urinals, for each gender shall be provided. Generally, 1:25 is followed for facility: employee ratio
- Toilets should be well lit and ventilated and should not open directly on to food handling areas.

- Adequate supply of water should be provided in toilets and urinals.
- Potable water should be used at the toilet wash basin stations

Gender Specific Toilets

Changing Facility with Lockers

Refreshment Room

1.4.5.3 Changing rooms/lockers:

- Suitable and sufficient facilities (for e.g. lockers, gum boots stand, apron stand etc.) for persons working in the slaughter houses/meat processing units should be provided for changing their clothes, keeping their personal belongings and Street footwear.
- Adequate facility for lockers shall be provided. Separate lockers should be provided for home personal clothes and company uniforms.
- Lockers shall be made of such material that can be cleaned and sanitized effectively.
- Foot dip to be present at the entry level of the processing unit (Recommended Chlorine concentration – 100-200 ppm depending on the hygiene requirement of the establishment).

Locker Facility

1.4.5.4 Rest and refreshment room

- Rest & Refreshment Rooms shall be separate from other areas.
- These areas shall not lead directly to the manufacturing and storage areas,
- Only personal belongings to be kept in lockers,
- Floor and walls must be impervious, cleanable and sanitizable.

Note: A display board mentioning' **Dos' and 'Don'ts'** for workers should be posted in a prominent place inside the premises, in English or local language, for all to understand.

Do's and Don'ts

1.4.6 Compressed air and other gases

- Compressed air, carbon dioxide, nitrogen and other gas systems wherever required used in manufacturing and/or filling shall be constructed and maintained so as to prevent contamination.
- The pipelines of gases exposed to production area and product must be made of such material that can be cleaned and shall not pose risk of contamination

1.4.7 Cleaning Facilities for food contact surfaces

- Adequate facilities shall be available for cleanliness of food contact surfaces namely floor, wall, plastic crates, equipment, table tops etc.
- Suitable and sufficient facilities shall be made available at convenient places with in the slaughter house/ meat processing unit for the sterilization of knives and other equipment used in the slaughter house/ meat processing unit

1.4.8 Waste Disposal and Drainage System

- Adequate and efficient drainage and disposal system to be provided in the establishment.
- Necessary permission shall be obtained from respective state pollution control board.
- Disposal of waste shall be done in accordance with respective State Pollution Control norms and local rules which are enforced from time to time.
- Waste bins shall be kept closed, preferably foot operated, or arrangements shall be made to prevent piling of waste. Removal of waste at defined frequency to prevent microbial cross contamination.

Proper Slope & Design of drainage

1.4.9 Storage Facility

- Adequate facilities for the storage shall be provided.

- Storage facility shall provide protection from dust, condensation, waste, pest access and harbourage and other sources of contamination.
- It shall be dry, well ventilated and enable monitoring and control of temperatures in storage areas where required.
- It should be easy to maintain and clean.
- All materials and products shall be stored off the floor and with sufficient space away from the walls to allow inspection and pest control activities to be carried out.

Separate storage for:

- Raw material & Semi processed material
- Packaging material
- Returned/rejected material / Recalled material
- Final product
- Allergens
- Hazardous chemical
- Cleaning & disinfection chemical
- Waste material (both bio degradable & non-biodegradable

Recommended Temp control (wherever required):

- Freezer: -18°C or below
- Chillers: 0 - 4°C
- Deboning/ Portioning Hall: 12-15°C or suitable temperature shall be maintained to keep meat temperature below 10 to12 degrees centigrade

Temperature control

1.4.10 Laboratory & Technical Staff:

- Employ registered veterinarian depending on the size of operation for antemortem and post-mortem examination.
- Consistent with the size of the factory and volume and variety of meat products manufactured, a laboratory shall be provided, equipped and staffed with qualified (chemist/analyst and microbiological/ veterinary microbiologist/ veterinary public health) and trained personal.
- In house microbiological laboratory with sterilization room and other rooms for incubation, laminar flow/ biosafety cabinets and washing to do the microbiological examination of meat, meat products, water, air, contact surface of product and personal working in the plant.

Post mortem examination

Quality Control lab

1.4.11 Other Facility -

Work Shop: for routine repairing and maintenance of the plant.

Generator Room: stand by generator for providing power during the breakdown,

Boiler and Steam generator: required for cleaning and sterilizing the knives

Refrigeration Plant: Suitable capacity of refrigeration system shall be provided to achieve adequate temperatures wherever required.

2. RECEIPT AND STORAGE

Sl No.	Operational Flow	Sub Sec No.	Heading
2.1	Receipt, Storage and Transportation	2.1.1	Transportation of Live Animals
		2.1.2	Receipt of live animals at slaughter house
		2.1.3	Receipt and Storage of Raw and Packaging material

2. RECEIPT AND STORAGE

2.1 RECEIPT, STORAGE AND TRANSPORTATION

2.1.1 Transportation of animals from farm to slaughter house

- Healthy animals to be transported in properly ventilated vehicle to slaughter house
- Humane treatment during transportation.
- Pregnant animal should not be transported as they ae not permitted to be slaughtered.
- Ensure minimal risk of injury
- Animals should be certified by a qualified veterinarian for freedom from infectious diseases and their fitness to undertake the journey.
- Transportation to be done with due care to avoid fighting or other issues:
    - Suitable partition to protect animals from fighting.
    - Young ones to be protected from getting crushed.
    - Male animals should not be transported with female animals.
- Cleaning and disinfection of vehicle before loading of animals.
- Loading under extreme conditions should be avoided. If transported under extreme cold and hot climate, preferred to be transport under closed lorries. Sprinkling of water on the animal at frequent intervals during summer.

- Soft rubber stick to be used while driving the animals for loading / unloading
- Animal to be accompanied by an attendant with first aid equipment during transit.
- They shall be properly watered at frequent intervals.
- Journey less than 12 hours, no feed need to be carried but for longer journeys sufficient light feed to be provided.
- Railway transport preferable during more than 12 hours journey along with light feed.
- Floor and walls of the vehicle to avoid injury to animals.
- Transporting vehicles shall not drive beyond 40 km/hour speed.
- Label on each consignment to have:
    - Number and kind of animals loaded
    - Name, address and telephone number, if any, of the consignor
    - Name, address and telephone number, if any, of the consignee
    - Instructions regarding feeding and watering

Why these transportation instructions??

All this is needed to prevent the animal from stress conditions. As under stress, their body water and the glucose level in the body muscles are reduced; thus, they fail to attain acidic pH while in the chillers affecting the shelf life.

Transportation and Receipt of animals at slaughter house

2.1.2 Receipt of animals at slaughter house

- Animals intended for slaughter shall be in good health.
- Marking with unique ID No. for all animals.
- Appointment of qualified & registered veterinary for inspection of animals. In case of public slaughter house, the concerned panchayat/municipality representative for local administration shall appoint a qualified veterinary doctor for meat inspection from the State Animal Husbandry Veterinary Doctor.
- Segregation of animal suspected of contagious or infectious diseases in separate isolation pens with watering & feeding arrangements.
    - Such animal should be referred or further appropriate action/diagnosis for confirmation thereof by the State Animal Husbandry Veterinary Doctor.
- Loading of animal on a ramp having gradual slope (not greater than 30°C) with anti-slippery device with cleats at frequent intervals.
- Ramps & transport vehicles to be covered to avoid extreme weather conditions.

Numbering of animal

Transportation and receipt

2.1.3 Receipt and Storage of Raw and Packaging Material

- Raw material should be purchased from FSSAI registered/Licensed vendors
- All raw materials, food additives and ingredients, where applicable, shall conform to all the regulations and standards laid down under the Food Safety and Standard Act.
- Records of raw material, food additives and ingredients as well as their source of procurement shall be maintained in a register for inspection for ease of traceability.
- All raw material shall be checked/cleaned/sieved/sorted depending upon the nature of raw material.
- All raw material like seasoning, spices, additives etc shall be stored at specified separate storage area and at desired temperature.
- All allergens shall be stored at specified area to avoid mixing up with other raw materials and for better control.
- All rejected and expired products shall be stored with clear identification to control non-usage of those.
- Storage of raw material, ingredients, work in progress and processed/cooked or packaged food products shall be subject to FIFO (First in First Out), FEFO (First Expire First Out), FMFO (First Manufacturing First Out) stock rotation system as applicable.
- Raw material and food shall be stored in separate areas from printed packaging materials, hardware and cleaning chemicals.
- Packaged raw material must be checked for expiry date/best before/ use by date, packaging integrity and storage conditions.
- Receiving temperature of chilled foods should be between 0-4-degree Celsius.
- Receiving temperature of frozen food should be at or below -18-degree Celsius or below.
- Packaging material procured shall be food grade.
- Ensure effective protection from dust, condensation, and other sources of contamination during storage.
- All materials and products shall be stored off the floor and with sufficient space between the material and walls on racks/pallets to allow inspection, cleaning and pest control activities to be carried out.

Raw Material Store

Packaging Material Store

3. SLAUGHTER, DEBONING/PORTIONING AND PROCESSING INCLUDING TRANSPORTATION

Sl No.	Topics	Sub Sec No.	Heading
3.1	Slaughter, Deboning/Portioning	3.1.1	Procurement &Quality inspection
		3.1.2	Resting (Holding Area) of animal
		3.1.3	Ante-Mortem Inspection
		3.1.4	Animal Washing
		3.1.5	Stunning
		3.1.6	Slaughtering and Bleeding
		3.1.7	Scalding and Dehairing
		3.1.8	Evisceration
		3.1.9	Post Mortem Examination of animal
		3.1.10	Washing of carcass
		3.1.11	Carcass Chilling
		3.1.12	Deboning, Portioning & packing of Meat
		3.1.13	Processed Product Section
		3.1.14	Outsourcing of Meat
3.2	Allergen Management	3.2.1	General
		3.2.2	Allergen Control Program
3.3	Packaging and Warehousing	3.3.1	Packing
		3.3.2	Warehousing
3.4	Rework & Control of Non-Conforming Products	3.4.1	Rework Management
		3.4.2	Non-Conformance Handling
3.5	Transportation		

MANUFACTURING PROCESS FLOW CHART OF MEAT ABBATOIR

Procurement & Quality inspection of animal
↓
Holding/ Resting area
↓
Ante-mortem Examination ⟶ Condemned animals to be disposed
↓
Animal Washing
↓
Stunning
↓
Slaughtering & Bleeding (for 5-6 minutes for sheep, for 6-7 min for pigs) ⟶ Blood for disposal
↓ and goat and 15-20 minutes for Buffalo)
Scalding and dehairing (in case of Pigs only)
↓
Evisceration ⟶ Non-edible offal's for disposal & Water for ETP
↓
Post-mortem Examination ⟶ Rejected Carcass send to rendering
↓
Inner & Outer Washing ⟶ Water to ETP
↓
Carcass Chilling ⟶ Water to ETP
(Core temperature should be less than or equal to $7^{O}C$[1])
↓
Weighing & Grading
↓
Chilled Meat

[1] http://www.fao.org/docrep/004/T0098E/T0098E02.htm

3.1.1 Procurement & Quality inspection of live animals

- Healthy animals must be sourced.
- Each animal must be verified for their Travel Fitness Certificate (TFC) report by a registered veterinary practitioner.
- It is here that ante-mortem examination is carried out.
- Should of adequate size sufficient which facilitates veterinary inspection.

3.1.2 Resting (Holding Area) of animal

- It should be dry, clean and free from pests and vermin and should have adequate ventilation and climate control.

Lairage area

- Enough space for mobility should be provided so that animal can move freely, electric pods must be discouraged for moving animals.
- Animals should be allowed to rest between 12-24 hours (recommended) in resting pens.

3.1.3 Ante mortem Inspection of Animal

- Examination by registered veterinarian well in advance of slaughter.
- External examination of general condition done on each animal.
- Veterinary doctor examines 12 animals in one hour is adequate i.e. 96 animals in a shift of 8 hours.
- Records of examination maintained.
- An animal found fit, shall be approved for slaughter.
- Animal not found fit for slaughter marked as suspect and kept separately in isolation pen-only by or under the personal supervision of a registered Veterinary Doctor till it was confirmed whether the animal is diseased or not.
- Symptoms:
    - All animals which shows symptoms of railroad sickness, parturient paresis, rabies, tetanus and any other communicable diseases shall be marked as “Rejected” and appropriate measures/action should be taken for the safe disposal of the affected animals and refer to the State Animal Husbandry Dept.
    - Showing signs of anthrax should be disposed and condemned immediately either by: i.) complete incineration or ii.) thorough denaturing with prescribed denaturant.

3.1.4 Animal Washing

- Animal should be properly washed prior to stunning and slaughtering.

3.1.5 Stunning

Stunning (Post Antemortem and Prior to Slaughtering)

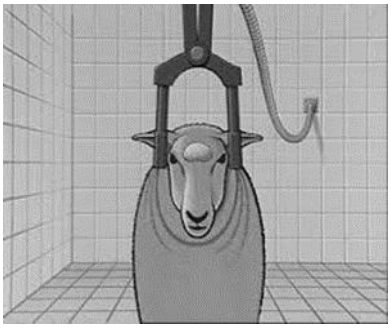
- Stunning before the slaughter should be mandatory except in case of ritual slaughter practices.
- Stunning induces un-consciousness and minimizes the reaction of fear, anxiety, pain and distress to animal.
- Stunning equipment should be properly maintained in good working condition to confirm that animal is insensible prior to slaughter.
- The time between stunning and slaughter should be minimal.

Stunning pen

- Area where animals are made unconscious before killing.
- Its design depends on type of stunning procedure to be followed.
- Steady frame for ejection.
- Animal vision should be blocked so that they do not see people or suddenly moving objects.
- Metal shields should be installed around the animal head on box type restrainers with non-slip flooringhttps://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=imgres&cd=&cad=rja&uact=8&ved=0ahUKEwjxw7LM0M_YAhVDuI8KHQ1GDWwQjRwIBw&url=http%3A%2F%2Fwww.fao.org%2Fdocrep%2F003%2Fx6909e%2Fx6909e09.htm&psig=AOvVaw1_oagu_sXy79qA0KIvWtxx&ust=1515749927506964

A) Types of Stunning Process:

1) **Electrical** (stunning / slaughtering with electric current is known as electro narcosis)
This method is used for swine, sheep, calves, buffalo and goats. Electric head stunners may be preferred for sheep and goat where both electrodes are placed on head region. The low and controlled current must be maintained so that stunning will not damage the heart and brain or cause physical disability and death of the animals.



Electric Stunning

2) Mechanical Stunning

It can be carried out by one of three methods-:

- Captive Bolt Stunning is used mainly for stunning cattle, sheep and goats, it is also employed to a lesser extent for pigs. A captive bolt gun has a steel bolt that is powered by either compressed air or a blank cartridge. The bolt is driven into the animal's

Captive bolt stunning in center track restrainer

brain. After the animal is shot the bolt retracts and is reset for the next animal.

➢ **Pneumatic percussive stunning:**

- For cattle optimum position is that the center 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.
- For pigs on the midline just above eye level, with the host directed down the line of the spinal cord
- For sheep and goat, it's behind the poll, aiming towards the angle of the jaw.

3) Gas Stunning

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

CO_2 Gas Stunning

3.1.6 Slaughtering and Bleeding

Requirements of Slaughter area for animal

- The slaughtering area must be clean, hygienic and sanitized.
- Animal to be slaughtered shall be well-fed and watered.
- All tools or equipment's used in slaughtering shall be clean and sharp.
- A qualified and trained veterinarian shall be appointed and be responsible for approving healthy animal for slaughter and to check that the animal are properly slaughtered.
- Dressing of carcass should only commence after ascertaining that the animal is dead.
- Regular removal of Non-edible offal from evisceration section.
- Post mortem reports shall be prepared.

Slaughtering and Bleeding

- Slaughtering should not be done in the sight of another live animal.
- Vocalization is to be watched for discomfort of animals.

Slaughtering of Animals

- It is recommended to do Humane slaughter by halal, jhatka, koscher. After slaughtering, sufficient time shall be allowed to bleed out from the carcass.
- Approx. Bleeding Time for each animal on bleeding conveyor/line:
    - Sheep, Goat: 5 to 6 minutes (approx)
    - Pig: 6 - 7 Minutes (approx)
    - Buffalo and other big animal: 15 to 20 minutes(approx)

Slaughtering of Animals

- Bleeding conveyor shall be so located, that the blood shall not be splashed on another carcass.
- The blood should be collected in an under-drainage facility/tank and removed at regular intervals.
- In case of pigs, after slaughtering they should enter the scalder.
- Dressing of carcass should not be done on the floor. Adequate means and tools for skinning of the animal should be provided. 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/dressing hall.
- Cold and hot potable water should be available in the slaughter house in sufficient quantity for washing of carcasses during working hours.
- Working platform should be of such height that he should be able to reach operation zone in his natural standing position.
- Suitable facilities shall be made available for the sterilization of wiping clothes, knives and other equipment used in the slaughter house. They should be sterilized to a minimum temperature of 82°C.
- Every part of the floor or pavement of the slaughter/dressing house shall be thoroughly washed and cleaned with water and disinfectant within three hours after the completion of slaughter/dressing.
- Stamping of carcass should be done for identification at the time of slaughter.

Stamping of Carcass

Permitted food grade dyes should be used as per BIS standards for e.g. Fuchsin which is a deep red synthetic dye used as a biological stain and disinfectant.

3.1.7 Scalding and Dehairing of Animal (in case of pigs only)

- **Scalding** means passing the animal through scalding tank containing water at appropriate temperature (usually 60-65°C for 5-6 minutes), so as to loosen the hair follicle so that dehairing of animal (usually for pig) will be done effectively. Time and temperature combination vary depending as per animal size, machine manufacture and speed of line.
- No live animal shall enter the scalder.
- **Dehairing of pigs** means removal of loosed hair immediately after scalding. After dehairing, slaughtered pigs to pass through potable water.

Scalding and Dehairing of animals

3.1.8 Evisceration of Animal

- Before evisceration, the carcass has to be examined carefully for any pathological lesions by a registered veterinarian.
- Evisceration consists of removal of all internal organs from the slaughter animals with minimum damage to internal organs to avoid contamination.
- After evisceration, carcass along with the viscera and edible offal's shall be subjected to post-mortem examination by a registered veterinary doctor.
- Non-edible offal shall be removed regularly from the evisceration section to avoid cross contamination.

Evisceration of Animals

3.1.9 Post- Mortem Examination of Animal

- Systematic examination of dressed carcass and visceral organs by registered veterinarian for evidence of abnormal conditions.
- Post Mortem Inspection shall be detailed one and shall cover all parts of the carcass, the viscera, lymph glands and all organs and gland.
- Every carcass including detached parts and organs thereof shall be maintained and marked as "Held" until final inspection is completed by the registered veterinarian.
- No air shall be blown by mouth into the tissues of any carcass or part of a carcass.
- Post Mortem Inspection Record to be maintained.
- After inspection- carcass, parts and organs are marked by registered veterinarian as:
    - Inspected and passed- if found sound, wholesome, healthful and fit
    - Inspected and Condemned- if found unfit for human consumption
- All such condemned carcass, parts and organs shall remain in custody of registered veterinarian and be treated as below:
    - All condemned carcasses, organs or parts thereof shall be completely destroyed in the presence of the Registered Veterinarian by incineration or denatured, after being slashed freely with a knife, with crude carbolic acid, cresylic-disinfectant 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.
    - 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 or the carcass shall be retained and kept till such time it is chilled and the bruised portion removed and disposed of.

Post Mortem Examination of Animals

By-products Harvesting

- Consists of harvesting/collection of edible animal organs such as liver, kidney, heart etc.
- Can be done manually or mechanically

3.1.10 Washing of Carcass

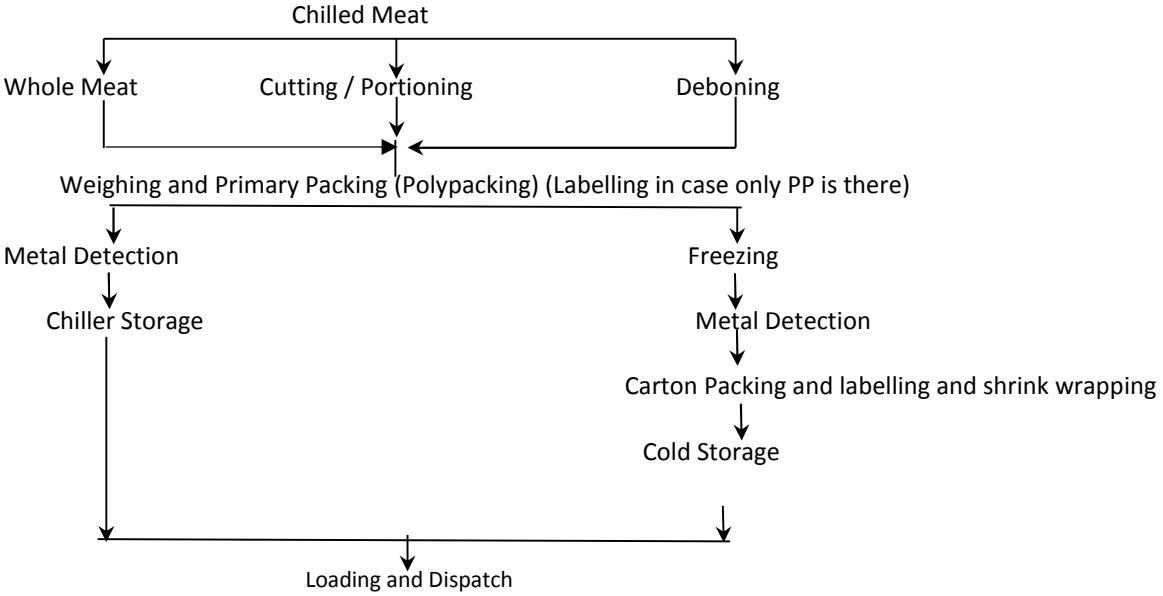
Inner and outer washing

- After the carcasses have been inspected and passed, they should be washed with potable water having 20-50 ppm of chorine.
- The washing is done before laboratory testing to remove all the unusual dirty material. The water should be potable water and should be internally tested for colour, odour, pH, & TDS. The washing potable water should also be tested for microbiological tests.
- Carcass shall be properly washed from inside as well as outside before chilling.
- Wash station nozzles and their angles to be maintained for effective cleaning.
- All records shall be kept.

3.1.11 Carcass Chilling and Storage in Chillers

- Washed Carcass shall attain core temperature at or below 7°C at a set temperature of 2-4°C in chillers within 18-24 hours of chilling.
- Chilled carcass should be utilized for further purpose.
- Temperature to be monitored at regular intervals and records maintained.
- FIFO / FMFO / FEFO to be followed in chillers & cold stores until dispatch.

MANUFACTURING PROCESS FLOW OF PORTIONING, DEBONING & PACKING OF MEAT



3.1.12 Deboning, Portioning and Packing of Meat

3.1.12.1 Weighing and Grading

- Weighing and Grading of can be done manually or with automatic grading machine

3.1.12.1 Deboning, Portioning and Packing

- Meat shall be handled, stored and transported in a manner that will protect
- it from contamination.
- All operations of preparation (Portioning/Deboning) or packing of meat shall be carried out under hygienic conditions.
- Particular attention needs to be given to temperature control. Cold chain shall not be interrupted.
- The temperature in rooms for deboning/ portioning / trimming/ packing shall be maintained (recommended 12-15^{O}C) so that meat temperature can be controlled below 10-12^{O}C.
- Chilled meat shall be maintained 4^{O}C or below and frozen meat at -18^{O}C at the thermal centre till dispatch.
- All knives and accessories should be properly sanitized before, at regular interval and after use.
- All storage bins, crates and other storage facilities shall be cleaned and sanitized before use.
- All finished product is made to pass through working metal detectors. Regular checks are made to confirm all the metal detectors are in working condition and the sensitivity is as per required. Calibration/Verification at defined frequency to assure food safety.
    - Ideal sensitivity of metal detectors:
        - 1.5mm for Ferrous
        - 2.0 mm for Non-ferrous
        - 2.5 mm for Stainless steel

***Note:** Sensitivity of metal detectors shall be always less than as required or 7.0mm for any kind of metal.

Processing hall for Deboning

3.1.13 Processed Product Section

3.1.13.1 General Requirements

- Separate entry to be provided to Processed Product Section
- Separate workmen should be deployed in this section and they shall not be permitted to work in slaughter / de-hairing / Portioning & deboning area
- Appropriate hall temperature shall be ensured to maintain quality of meat.
- Effective cleaning & sanitation program to be in place and carried out maintain the hygiene standard.

3.1.13.2 Specific requirements for Manufacturing of Processed Meat Products

- All operation in connection with the preparation or packing of meat products shall be carried out under hygienic conditions.
- Particular attention needs to be given to temperature control.
- The temperature of the processing and packaging rooms shall be controlled so as to maintain the temperature of the product in chilled or frozen condition as desired.
- Special care of food safety control measures related to cooking, handling and packing shall be taken for cooked meat products.
- Cooked meat products are those products that are subjected to heat treatment, wherein minimum thermal core temperature of 75°C is achieved.
- The cooking should be adequate to eliminate and reduce hazards to an acceptable level which might have introduced at raw food level.
- Products which are heated below 75°C but above 60°C there may be a microbiological safety risk, such type of products shall be treated as semi-cooked products. These products shall be re-heated above 75°C before consumption. Special instruction shall also be given on the product label stating re-heating of the product above 75°C before consumption.
- Products which are exposed to heating but below 60°C shall be treated as raw processed meat products. Such type of products shall be cooked above 75°C

before consumption. Special instruction shall also be given on the product label stating cooking of the product above 75 degree Celsius before consumption.

3.1.14 Outsourcing of Meat

- All meat to be used for production of meat products shall only be procured from a FSSAI licensed slaughter facility. It shall be ensured that ante-mortem and post-mortem inspection have been carried out in accordance with the requirements prescribed in ante-mortem and post-mortem examination.
- Such meat shall be transported from the slaughter facility to the meat processing unit under hygienic and sanitary conditions. It shall be transported in a clean insulated refrigerated container with covers (lids) with precautions to ensure that no contamination /cross contamination or deterioration takes place and at appropriate temperature (chilled meat at or below 4°C and frozen meat at or below -18°C)

Meat transportation

3.2 ALLERGENS

3.2.1 General

An allergen is a substance that causes an immediate allergic reaction in a susceptible person. Food allergens are almost always proteins although other food constituents, such as certain additives, are known to have allergenic (allergy-causing) properties.

Food allergy is a potentially serious immune response to eating or otherwise coming into contact with certain foods or food additives.

A food allergy occurs when the immune system:

- Identifies a particular food protein as dangerous and creates antibodies against it.
- The next time the individual eats that food, immune system tries to protect the body against the danger by releasing massive amount of chemicals including Histamine.

- Histamine is a powerful chemical that can cause a reaction in the respiratory system, gastrointestinal tract, skin or cardiovascular system.
- In the most extreme cases, food allergies can be fatal. Although any food can provoke an immune response in allergic individuals, a few foods are responsible for the majority of food allergies.

The following foods and ingredients are known to cause hypersensitivity amongst selective individuals & shall always be declared:

The big 8 Allergens declared in U.S. are followed in India currently by food industries in general which are listed as below:

1. **Cereals containing gluten; i.e., wheat, rye, barley, oats, spelt or their hybridized strains and products of these;**
2. Crustacea and products of these;
3. **Eggs and egg products;**
4. Fish and fish products;
5. **Peanuts, soybeans and products of these;**
6. **Milk and milk products (lactose included);**
7. Tree nuts and nut products; and
8. Sulphite in concentrations of 10 mg/kg or more

The allergens marked in bold maybe more commonly encountered in Meat and Meat Products Industry.

Source: *http://www.foodallergens.info/Legal/CODEX.html*

3.2.2 Allergen Control Program (ACP)

PEOPLE

- Employee awareness through product and utensil identification
- Hand washing in between non-allergic and allergic materials
- Clothing- change of clothes wore while handling allergen materials.
- Rework control- Utmost care to be taken to handle allergen materials to avoid any accidental cross-contamination.
- Waste control- Allergen material wastes should not be allowed to pile up or spill which can result in environment cross contamination.

RAW MATERIALS & INGREDIENTS

- Knowledge of ingredients from suppliers to avoid any possible cross-contamination.
- Clear labelling and identification of all raw materials and ingredients
- Safe transport from supplier to receiving place
- Allergen items to store separately in food processing units.
- Avoid any spillage

PACKAGING

- Good and safe package integrity from supplier
- Correct labelling

CLEANING:

- Effective cleaning to avoid risk of cross contamination
- Cleaning of equipment shall be done before using same equipment's for allergen and non-allergen material.
- Cleaning schedule to be developed keeping in mind all the chances of cross contamination
- Regular cleaning of spillages of allergen materials throughout processing

PRODUCTION:

- Minimize movement of materials
- Scheduling of production runs with appropriate cleaning between the runs
- Physical barriers between allergen and non-allergen materials
- Schedule allergen containing product last in production plan or necessary cleaning shall be done during shifting of production from non-allergen containing products from allergen containing products.
- Control and trace reworked products

3.3 PACKAGING AND WAREHOUSING

3.3.1 Meat & Meat products Packaging

- The packaging design and materials shall provide protection for products in order to prevent contamination, damage and accommodate required labelling as laid down under the FSS Act & the Regulations there under.
- Only Food grade packaging materials as specified by FSSR regulation shall be used. Usually, food grade polythene film is used in all the different procedures of packing.
- Packing material should confirm FSSAI regulation i.e. Food Safety and Standards (Packaging and Labelling) Regulations, 2011 and regulation made there under. Packing should be covered and secured to prevent spoilage and contamination during transit and storage.
- Packaging section to be considered high care zone & access restricted & controlled via changing facility
- Clean protective clothing & footwear to be worn before entry
- Daily internal Calibration & recording of packaging equipment like weighing scales.
- Wrapping & Packaging operations to be carried out to avoid contamination
- Non-toxic PM or gases to be used to not pose threat to the safety and suitability of processed product

Labelling –

- Product labelling must confirm the requirement laid down by Food Safety and Standards (Packaging and Labelling) Regulations, 2011 and and regulation made there under.
- Product Label minimum should contains below information as required by FSSAI.
    1. The Name of Food
    2. List of Ingredients
    3. Food Category number & Name
    4. Nutritional information
    5. Declaration regarding Veg or Non veg
    6. Declaration regarding Food Additives
    7. Name and complete address of the manufacturer with FSSAI Numbers
    8. Net quantity in terms of Weight, Number or litres
    9. Lot/Code/Batch identification
    10. Date of manufacture or packing
    11. Best Before and Use By Date
    12. Country of origin for imported food
    13. Instructions for use etc.

3.3.2 Meat & Meat Products Storage including Warehousing

- If the meat / meat product is intended to be chilled or frozen, ensure that the meat remains chilled or frozen, as intended, during storage and adequate temperature is maintained and monitored.
- Chilled condition - it shall be stored at or below 4°C.
- Frozen condition - it shall be subjected to freezing in an appropriate equipment in such a way that product attains a temperature of -18°C or below at the thermal centre after thermal stabilization. It shall be further stored at or below -18°C.
- Maintain and monitor temperature of chillers and cold storages at regular intervals
- All rejected and expired products shall be stored with clear identification to control non-usage.
- Stored off the floor and with sufficient space between the material and the walls to allow inspection and cleaning activities to be carried out

Storage in Chiller

Cold Storage

3.4 REWORK AND CONTROL OF NON-CONFORMING PRODUCTS

3.4.1 Rework management

- Rework shall be stored, handled and used in such a way that product safety, quality, traceability and regulatory compliance is maintained.
- Rework shall be clearly identified and/or labelled to allow traceability. Traceability records for rework shall be maintained (e.g product name, production date, shift, line of origin, shelf life etc.).
- When rework activities involve removing a product from filled or wrapped packages, controls shall be put in place to ensure the removal and segregation of packaging material and to avoid contamination of the product with extraneous matter.
- Stored rework materials shall be protected from exposure to microbiological. Chemical or extraneous matter contamination.
- If rework is incorporated into a product as an 'in process step', the acceptable quantity, the process step, method of addition, type and conditions of rework, including any necessary pre-processing stages, shall be defined

Rework

Non-conforming product tag

3.4.2 Non-conformance handling

- A non-conformance could be identified through-
    - customer complaints,
    - internal audits,
    - external audits,

  - incoming material inspection
  - or simply during normal testing and inspection activities.
- All non- conformance incidents should be recorded and assessed.
- There should be a defined storage area and handling procedure for non-confirming raw material, packing material and finished goods.

3.5 TRANSPORTATION

All the transportation systems are expected to maintain the temperature of the processed meat and meat products within close limits to ensure its optimum safety and recommended shelf life. It is important that the processed meat and meat products is at the correct temperature before loading since the refrigeration systems used in most transport containers are not designed to extract heat from the product but to maintain the temperature of the product. In large containers used for long distance transportation, food temperature can be kept within recommended frozen temperature (at or below minus 18 degrees Celsius for frozen and at or below 4 degrees Celsius for chilled products). Transportation systems should be properly calibrated as well as licensed under FSS Act'2006.

Transport vehicle

- Vehicle inspection shall be in place.
- Conveyances and/or containers used for transporting shall be kept clean and maintained in good repair condition to protect meat from contamination and shall be designed and constructed to permit adequate cleaning and/or disinfection.
- Ensure loading and unloading methods does not contaminate the product. The containers have to be clean and disinfected before loading.
- While loading in the refrigerated containers, the temperature in the container has to be brought to -12^{o}C (Precooling) so that there is no thawing of the frozen

meat cartons while they are loaded. However, in case of chilled products, pre-cooling temperature shall be at or below 4°C.

- Avoid thawing of frozen meat cartons during loading
- After Loading, the meat shall be transported under hygienic conditions and at appropriate temperature that can be monitored at frequent intervals (Frozen meat at or below -18°C and chilled/fresh meat at or below 4°C at all times.
- Effective cleaning and sanitation of containers between loads when used for transporting non-food items.
- Where conveyances and/or containers are used for transportation anything other than foodstuffs or for transporting different foods, there shall be effective cleaning between loads to avoid risk of contamination

4.0 PERSONAL HYGIENE

Sr. No.	Topics
4.1	Health Status, Illness and Injury
4.2	Personal Cleanliness
4.3	Personal Behaviors
4.4	Work Wear and Gowning
4.5	Visitor control

4.0 PERSONAL HYGIENE

4.1 HEALTH STATUS, ILLNESS AND INJURY

- ✓ Meat handlers and employees of the slaughterhouse shall undergo a medical examination by a registered medical practitioner annually to ensure that they are free from any infectious and other communicable diseases. The establishment shall maintain relevant personal health records of personnel. Employees who come into direct or indirect contact with edible parts of animals or meat in the course of their work shall:
    - where necessary, have a medical examination prior to employment
    - have medical examination routinely and when clinically or epidemiologically indicated
    - not work while clinically affected by, or suspected to be carrying, communicable agents likely to be transmitted through meat; and be aware of and comply with reporting requirements to the slaughter house operator in respect of communicable agent.
    - People known, or suspected, to be suffering from, or to be a carrier of a disease or illness likely to be transmitted through meat or while afflicted with infected wounds, skin infections, sores or with diarrhoea, shall not be allowed to enter any meat handling area. Any person so affected shall immediately report illness or symptoms of illness to the management of the slaughterhouse.

- ✓ All meat handlers shall be inoculated against the enteric group of diseases and a certificate thereof shall be kept for inspection.
- ✓ In case of an epidemic, all meat handlers shall be inoculated or vaccinated.

PERFORMA FOR MEDICAL FITNESS CERTIFICATE FOR FOOD HANDLERS

(FOR THE YEAR .....)

(See Para No. 10.1.2, Part- II, Schedule - 4 of FSS Regulation, 2011)

It is certified that Shri/Smt./Miss.....
employed with M/s....., coming in direct contact with food items has been carefully examined* by me on date ..... Based on the medical examination conducted, he/she is found free from any infectious or communicable diseases and the person is fit to work in the above mentioned food establishment.

Name and Signature with Seal
of Registered Medical Practitioner /
Civil Surgeon

***Medical Examination to be conducted:**

1. Physical Examination
2. Eye Test
3. Skin Examination
4. Compliance with schedule of Vaccine to be inoculated against enteric group of diseases
5. Any test required to confirm any communicable or infectious disease which the person suspected to be suffering from on clinical examination.

Performa for Medical Fitness certificate for food handlers

In case of any injury/cut:

- Any person who is cut or injured should discontinue working immediately in any meat processing unit area (preparation, handling, packing or transportation);
- Should be suitably bandaged;
- All bandages should be 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 available.

Wound on hand

4.2 PERSONAL CLEANLINESS

- Meat handlers shall maintain a high degree of personal cleanliness with adequate, suitable and clean:
    - Protective clothing,
    - head cover,
    - face mask and
    - gumboots
- Workers shall be provided with neat, clean and hygienic uniform/protective gears. The facility for cleaning and sanitation can be in house or outsourced.
- The personal protective clothing shall be worn in such an order to avoid any cross-contamination of dust/dirt, etc.; i.e. starting from head to foot. Head caps/headgears to be worn first and foot wears to be worn at the last.
- The facility for cleaning and sanitation can be inhouse or outsourced.

Protective clothing

Use of Gloves -

- If wearing gloves during the slaughter and the handling of meat, ensure that they are approved type for particular activity e.g. stainless steel chain gloves, synthetic fibres, nitrile etc.
- Gloves to be washed and sanitized prior to use/ when contaminated followed by passing through potable water.

Hand washing Techniques:

Before entering the establishment/processing hall all persons should wash their hands in a dedicated sequence:

- Wet hands with potable water
- Apply liquid soap and make a lather for at least 30 seconds
- Apply, clean and rinse every part of hands including nails, between fingers, covering full hands, and on both the sides of the hands.
- Wash thoroughly with potable water
- dry hands with hand dryer / disposable tissue
- Sanitize hands

Notices requiring hand-washing should be displayed

Hand washing

- Hand washing with soap & water
- Elbow/foot/knee/automatic/sensor operated taps (to avoid direct touch), paper towel (for drying hands), foot operated dustbins (for throwing paper towels), sanitizer dispensers should be used.

Non-hand operative displayed hand washing stations

- Sanitize hands with chlorinated water at 20-50ppm or any other sanitizer before entering the area
- Training on hand washing techniques

Hand Dip and Foot Dip Facility

Hand washing should be done:

- At the beginning of food handling activities;
- Immediately after using the toilet;
- After handling animals or any contaminated material, tools, equipment or work surface, chemicals
- On coughing/sneezing, to avoid contamination of food items.
- In-between breaks & whenever they look dirty.

4.3 PERSONAL BEHAVIOUR

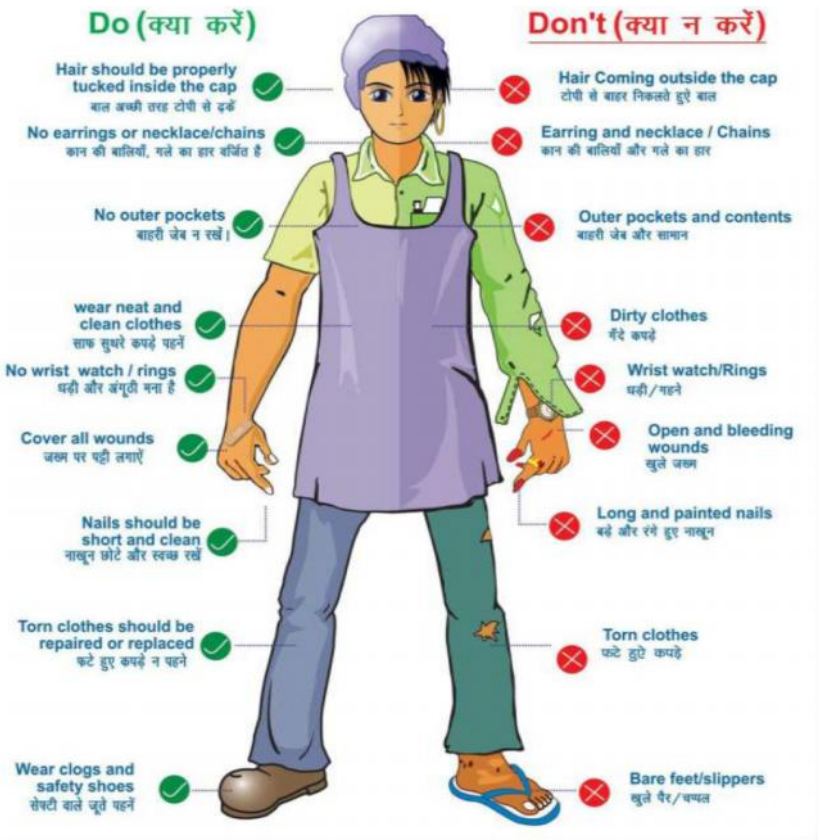
Persons working directly with and handling animal or carcass shall maintain high standards of personal cleanliness at all times.

Tobacco and Smoking Not permitted inside food handling area

- They shall:
  - Do not smoke, spit, eat or drink, chew gum/ tobacco in areas or rooms where animals and carcass are handled;
  - Wash hands at least each time work is resumed and whenever contamination of their hands has occurred; e.g. after coughing / sneezing, visiting toilet, using telephone (use of mobile should be restricted wherever possible) etc.

- avoid certain hand habits - e.g. scratching nose, running finger through hair, rubbing eyes, ears and mouth, scratching beard, scratching parts of bodies etc.- that are potentially hazardous when associated with handling carcass, and might lead to carcass contamination through the transfer of bacteria from the employee to carcass during its preparation.
- Not wore jewellery, watches, pins or other items as it pose threat to the safety and suitability of food. And keep nails short and clean.

(*Note- When unavoidable, hands should be effectively washed before resuming work after such actions.)



Protective Clothing

4.4 WORK WEAR AND GOWNING

- Personnel who work in, or enter into, areas where exposed products and/or materials are handled shall wear protective work clothing that is fit for purpose, clean and in good condition (e.g. free from rips, tears and fraying material.)
- Work wear shall not have buttons, outside pockets above waist level
- Work wear shall provide adequate coverage to ensure that hair, perspiration etc cannot contaminate the product.
- Hair, beards and moustaches shall be protected (i.e. completely enclosed) by restraints.

- Personal protective equipment, to be maintained in hygienic condition to prevent product contamination

Protective clothing

4.5 VISITORS

- Proper care shall be taken to ensure that food safety & hygiene is not getting compromised due to visitors in slaughterhouse/ meat processing unit.
- Generally, visitors shall be discouraged from going inside the production area or meat handling areas.
- Any visitor who visits slaughter house/ meat processing unit where meat is handled should wear clean protective clothing, footwear, mask, head cover and adhere to other personal hygiene and cleanliness provisions.
- All visitors should provide declaration in written of carrying no infectious disease.

Visitor handling

5.0 SUPPORT SERVICES

Sl.No.	Topics
5.1	Quality Control and Testing Facility
5.2	Pest Control System
5.3	Cleaning and Maintenance
5.4	Waste Handling (Waste Disposal Management)
5.5	Training and Management
5.6	Audit, Documentation and Record Keeping
5.7	Product Information and Consumer Awareness
5.8	Traceability and Recall

5. SUPPORT SERVICES

5.1 QUALITY CONTROL

- The slaughterhouses and processing units shall have a quality control programme in place to include inspection and testing of incoming, in-process and finished products.
- Adequate infrastructure including the laboratory facility, trained and competent testing personnel (chemist/analyst and microbiologist) shall be available for carrying out testing.
- Recommended to have in- house microbiological laboratory with sterilization room, media preparation room, incubation room, laminar flow and washing rooms.
- Microbiological examination needs to be carried out periodically for air, water, personal hygiene (hand swabs), food contact surface (knives, tables, equipment's etc.) etc, to ensure safety in finished products.
- If pathogen testing to be conducted in house, microbiology laboratory shall not open directly into process area.
- Calibration of laboratory equipment's shall be done periodically.
- Each category or type of meat shall be tested as per FSS standards & regulations 2011 at least once in six months from own or FSSAI notified laboratory. It is recommended to retain the control samples, till the end of shelf life.
- Records of testing shall be maintained.

Quality Evaluation

Finished products are tested in laboratory as per the documented sampling plan identified by the processing plant, for both physio-chemical and microbiological parameters. And it should be done in accordance with standards of FSSAI.

5.2 PEST CONTROL SYSTEMS

Pest Control

- Every suitable measure shall be taken to exclude pest and vermin from the establishments / slaughter houses.
- A valid and legal contract with the third party/ pest control service providers should be available in the premises.
- The organization shall have nominated pest control technician to manage pest control activities and/or deal with external pest management agency.
- Slaughter house/ meat processing unit and surrounding areas should be regularly examined for evidence of infestation.
- There should be an effective and continuous programme for pest control. Records shall be maintained for the same.
- Bait stations should be installed outside and Glue traps inside the processing and slaughtering halls.
- Only approved baits should be used.
- In case any pest gain entrance to the slaughter house/ meat processing unit or surrounding areas, control measures (involving treatment with physical or chemical or biological agents) should only be undertaken by or under direct supervision of a trained personnel who have thorough understanding of the

potential hazards to health resulting from the use these agents , including those which may arise from residues retained in the product..

Insecticutors to be switched

Unsuitable water accumulation

Pesticides can be used but:

- Should only be employed if other precautionary methods cannot be used effectively.
- Only pesticides approved for use in the Slaughter house/ meat processing unit by competent authority should be used
- Maintain record of MSDS or each pesticide used in the workplace shall be available at the site.
- They shall be handled and dispensed only by authorized and properly trained personal.
- Greatest care should be exercised to prevent any contamination of the meat equipment or utensils.
- Pesticides to be stored away from processing area, in close cabinets outside the premises.
- 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.
- As pesticides represent a hazard should be labelled with a warning about their toxicity and use.

Pest control 4 D method

1D – Deny Entry- Preventing Entry	2D – Deny Shelter – Elimination of Harborage of Pests	3D – Deny Food- Eliminate food sources to pests	4D – Eradication of Pests
• Seal all holes, crevices at ceilings, walls and floors • Threshold clearances of doors < 6mm, fix metal kicking plates • Double door / air curtains / strip curtains / mesh screens, self-closing doors at appropriate locations Missing / damaged gratings of drains installed / replaced	• Avoid False sealing in processing and storage area • Repair defects on walls, floors, ceilings, woodwork & other structures • Remove disused / obsolete articles from food premises	• Store all foods and condiments in sealed / covered containers • Floor free from food remnants • Prohibit preparing food and utensils cleaning at other places • Store refuse in dedicated closed container and discard periodically to prevent accumulation. • Surface channels and gratings clean and clear of food remnants	• Clean & disinfect pest infested places, clothing and equipment • Use Insectocuter – Place 4.5 to 6 m away from food handling area • Use low wall mounted insectocutors • Clean insectocutor every week • Cover all foods during Pest control treatment • Use glue pads inside and rodent boxes outside the processing areas • Pest or chemical contaminated food be discarded.

4D Method of Pest Control

Pest control measures

5.3 CLEANING AND MAINTAINANCE

Cleaning and Sanitation

Maintenance

6.3.1 Cleaning and Sanitation

- Food premises and equipment shall be maintained in an appropriate state of repair and cleanliness in order to function as intended, facilitate all sanitation procedures and prevent contamination of food, such as from metal shards, flaking plaster, food debris and chemicals.
- Cleaning and disinfection chemicals shall be approved for use in food industry wherever chances are it may come in direct or indirect contact through equipment or plant surfaces. These chemicals shall be handled and used carefully and in accordance with manufacturers' instructions, for example, using the correct

dilutions, and stored (designated area with lock and key provisions, having access to authorized person only) in clearly identified containers to avoid the risk of contaminating meat

Cleaning Procedures and Methods

Cleaning shall remove meat residues and dirt and it can be carried out by a separate or the combined use of physical methods, such as heat, scrubbing, turbulent flow and vacuum cleaning or other methods that avoid the use of water, and chemical methods using detergents, alkalis or acids. For e.g. Tables, Floor and walls should be scrubbed and washed with soap and potable water (temperature not less than 65°C wherever required) and should be sanitized with appropriate sanitizer thereafter. Knives, scissors, honing steels etc. should be washed & disinfected (temp not less than 82°C).

Dedicated chemical (cleaning / pest control) storage room with provision of lock and key

Cleaning and Sanitation Procedure includes one or more following steps appropriate to the equipment's requirements

a. **Dry Clean-** removing all pieces of meat, fat and other product residues.
b. **Soaking-** small pieces/parts of equipment can be soaked in a tank of water and detergent. Large Equipment, floor and walls can be foamed.
c. **Physical Cleaning-** after soaking, equipment is cleaned manually, using a brush mechanically using high pressure or steam cleaning. Manual scouring to remove protein crusts and adhesive layers.
d. **Rinsing-** thorough hose down with warm water to remove detergent residues, contamination.
e. **Drying-** excess water should be removed from horizontal surfaces by wiping with paper towels or scraping with scrubbers.
f. **Sanitation-** sanitising agents may be applied as spray or mist, immediately after post cleaning rinse until next day's production.
g. **Pre-operation hose down-** this serves to remove sanitizer residues and to rinse off contamination

Cleaning and Sanitizing Programme

Cleaning and sanitizing programmes shall be established at facility to ensure that the equipment and environment are maintained in a hygienic condition to prevent contamination of meat and meat products , such as from metal shards, flaking plaster, meat debris and chemicals and records of the same shall be maintained.

- The programme should ensure that all parts of the establishment are appropriately clean and shall include the cleaning of cleaning equipment.
- A validation mechanism should be in place for all cleaning programme.
- Master cleaning & sanitation schedule shall be maintained for overall facility which includes:
    - Areas (e.g. holding area, abattoir, processing hall storage area, refrigerated spaces, freezing cabinets, changing facilities, toilets, inspection area etc) equipment (scalder, dehairing, eviscerator, hangers, chiller, metal detector, trolleys etc), utensils and implements (like knives, saws, mechanical instruments, trays, weighing machines, pallets, etc.) to be cleaned;
    - Cleaning method and frequency of cleaning;
    - Monitoring arrangements for checking effectiveness of cleaning
    - Person responsible for cleaning; and
    - Persons responsible for monitoring & verification of effectiveness of cleaning.
    - In case of any deviation, correction & corrective actions taken shall be recorded.

- **Cleaning and Sanitation program must cover following (Recommendations) –**

Floors & Walls: immediately after the completion of slaughter.

Other areas: All yards, outhouses, stores and all approaches to processing/ slaughter houses

Building maintenance & Premises

- ✓ No dogs, cats or birds should have access to the slaughter hall.
- ✓ Covered wire rope for all open areas in the factory
- ✓ Washing and painting

Waste bins:

- ✓ Suitable and sufficient dustbins with closely fitted covers
- ✓ Shall be thoroughly cleaned and disinfected immediately after use
- ✓ Location and identification

Water: Potable and shall comply to IS 10500.

Multi-use rooms:

- ✓ If used for any other food preparation purposes, then cleaning and disinfection immediately before and after use of every different product.

Chiller-

- ✓ Maintained under strict hygienic conditions
- ✓ Wash floors and walls with detergent and hot water each time a room is emptied, rinse them with clean water, and spray solution containing chlorine
- ✓ Clean pallets and storage containers

Chillers chambers

Employee Amenities:

- ✓ provided for the use of employee including changing facilities, toilets and the inspection office space should be kept clean always.

Equipment & Tools:

- ✓ Prevent contamination
- ✓ At frequent intervals during the day;
- ✓ Immediately whenever they come into contact with diseased material
- ✓ At the conclusion of each working day;
- ✓ Designated storage area, away from meat handing process

Equipment & Tools Installation:

- ✓ Away from walls and above the floor
- ✓ Preferably Wall mounted cabinets and electrical connections (such as switch boxes, electrical control panels)

CLEAN THESE TOO.!!

Cleaning tools

Proper Storage of cleaning chemicals

6.3.2 Maintenance

Maintenance

- **Preventive maintenance** of equipment and machinery shall be carried out regularly as per the instructions of the manufacturer.
- A preventive maintenance programme must include all devices used to monitor and/or control food safety hazards and cover the maintenance procedure, frequency and identification of the person (and/ or external agency) responsible for maintenance activity.
- Internal & External calibration schedule for critical food safety equipment's should be maintained.

- **Breakdown/Corrective maintenance** shall be carried out in such a way that production on adjoining lines or equipment is not at risk of contamination and post maintenance verification to be get verified.
- Temporary fixes when used shall not put product safety at risk and should be removed / permanently fixed in a timely manner.
- Lubricants, heat transfer fluids or any other similar material used shall be food grade where there is a risk of direct contact with the product.
- It is recommended as best practice to maintain plant equipment's breakdown records.
- Loose items control policy (Nut & bolts, Nails broken pieces or smaller parts of machines) should be followed to prevent any contamination with product or packaging material.

Storage of maintenance tools

5.4 WASTE DISPOSAL MANAGEMENT

5.4.1 Drainage System

- Efficient drainage and plumbing systems, permanently installed
- Traps and screens on all drains & gutters to prevent entry of pests
- Underground drainage system (in case of blood) for easy cleaning or a portable receptacle with lid
- An effluent line (including sewer systems) should be large enough to carry peak loads.

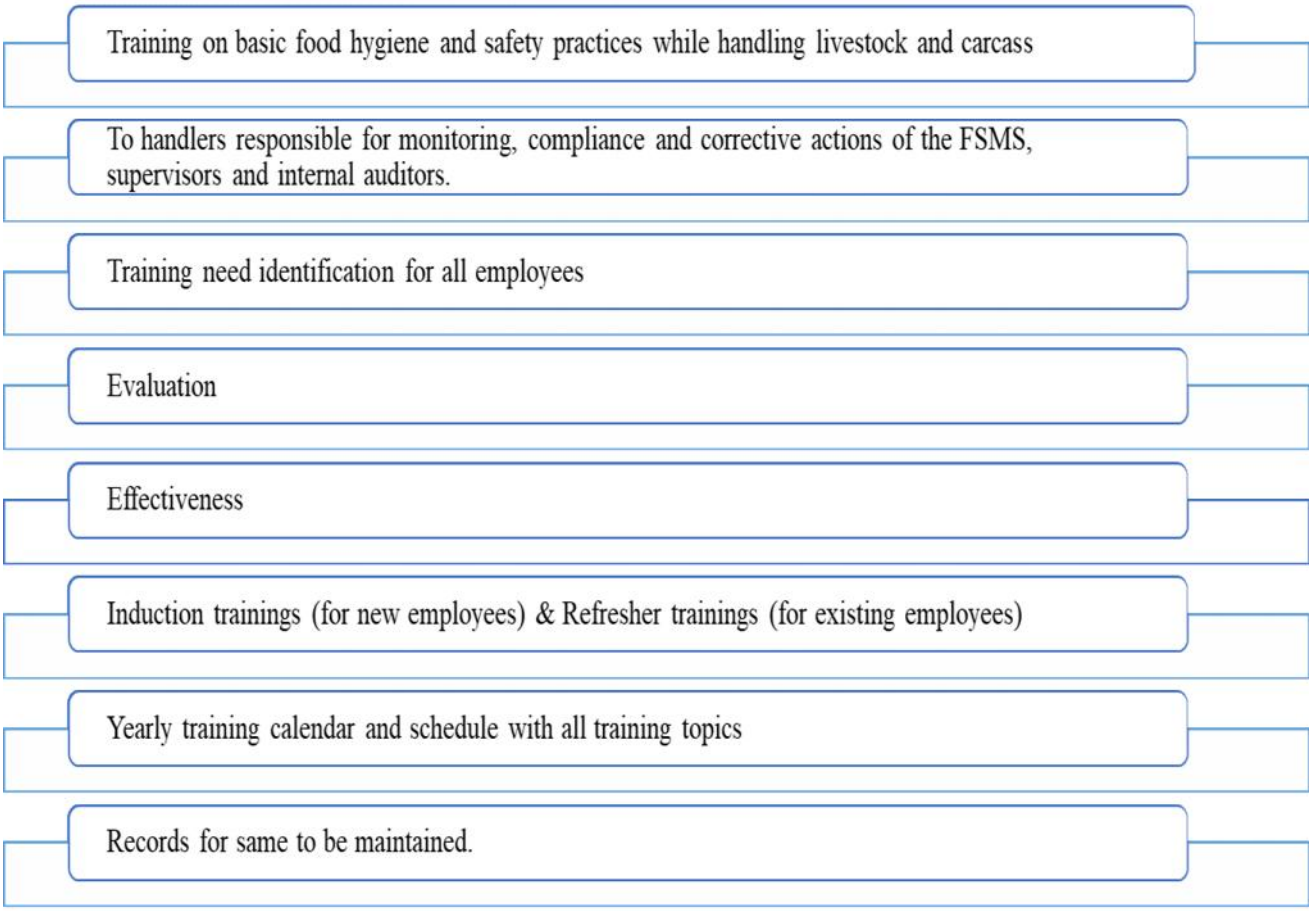
Drainage systems

5.4.2 Waste Disposal

- Waste Disposal in accordance with State Pollution Control Norms and local rules which are enforced time to time.
- Waste removed at regular intervals and at least daily.
- Hazardous waste disposal records maintained
- Waste to be handled so as to exclude contamination of food or potable water
- Segregate wet and dry garbage waste separately and remove periodically.
- Receptacles used should be with fitted covers.
- Separate and sufficient trolleys / crates for slaughter hall, deboning hall and packing area to avoid contamination and easy identification
- After removal of waste, receptacles and any equipment which has come in contact with the waste should be cleaned.
- Provision for scientific disposal of refuse like rendering plant, ETP etc.
- Colour coding for different type of waste e.g. wet, dry, organic, metal, etc.

5.5 TRAINING AND MANAGEMENT

5.5.1 Training



- All personnel shall be aware of their role and responsibility to ensure food safety. The establishment shall ensure that all employees working in production area / meat processing area shall have the necessary knowledge and skills to enable them to handle the products hygienically to ensure the food safety and food quality.
- The establishment shall ensure that all the food handlers are instructed and trained in food hygiene and food safety aspects along with personal hygiene requirements commensurate with their work activities, the nature of food, its handling, processing, preparation, packaging, storage, service and distribution.
- Periodic assessments of the effectiveness of training, awareness of safety requirements and competency level shall be made, as well as routine supervision and checks to ensure that food hygiene and food safety procedures are being carried out effectively.
- Training programmes shall be routinely reviewed and updated wherever necessary. Systems shall be in place to ensure that meat handlers remain aware of all procedures necessary to maintain the safety and quality of food.
- Food safety supervisors be deployed for proper supervision and control over all the activities and operations in the establishment for producing safe and hygienic meat and meat products

- All licensed food businesses shall have at least one trained and certified food safety supervisor under FoSTaC for every 25 food handlers in each premise.

5.5.2 Management and Supervision.

- The FBO management should lead establishment of Food Safety Management Systems in their premises.
- Documented procedure: The FBO management shall provide and maintain documented standard operating procedure for FSMS system compliance and its supervision at site through records/checklists on routine basis to control any possible hazards throughout supply chain.
- Food safety trainings & skills: The FBO management shall appoint trained and competent managers and supervisors. All technical managers and supervisors should have appropriate qualifications, experience, adequate knowledge, induction and refresher food safety trainings and skills on food hygiene principles and practices. This will enable them to:
    - ensure food safety and quality of its products,
    - judge food hazards,
    - take appropriate preventive and corrective action, and
    - to ensure effective monitoring and supervision.

5.6 AUDIT, DOCUMENTATION AND RECORDS

5.6.1 Self-Evaluation and Review

5.6.2 Audit, Documentation and Records

5.6.1 Self-Evaluation and Review

- An establishment shall undertake regular internal audits with a defined frequency at least once a year, in order to check the implementation and compliance with GMP and GHP principles and to propose necessary preventive and corrective action to remedy deficiency.
- Complete review of the system including self-evaluation results, customer feedback, complaints, new technologies and other regulatory updates at periodic intervals, at least once in a year for continual improvement.

Self Evaluation and review of the system by team members

5.6.2 Audit, Documentation & Records

- A periodic audit of the entire system according to the SOP be done to find out any fault / gap in the GMP / GHP system.
- Appropriate records of animal received, packing material, processing, preparation, storage, distribution, service, food quality, laboratory test results, cleaning and sanitation, pest control and product recall shall be kept
- Retained for a period of one year or the shelf-life of the product, whichever is more.
- Following records should be maintained, kept and retained for a period of one year or the shelf life of the product, whichever is more:
    - Live animal received,
    - Packing material,
    - Processing, preparation, storage, transportation, distribution, service,
    - Food quality,
    - Training,
    - Calibration,
    - Complaints and customer feedback,
    - Corrective and preventive actions,
    - Laboratory test results,
    - Cleaning and sanitation,
    - Pest Control
    - Medical examination and health status
    - Product recall and traceability
    - Self-Evaluation



Record Keeping and Documentation

5.7 PRODUCT INFORMATION AND CONSUMER AWARENESS

5.7.1 Product Information and Labelling

5.7.2 Consumer Awareness

5.7.3 Complaint Handling

Consumer Awareness

5.7.1 PRODUCT INFORMATION AND LABELLING

- All packaged meat products shall carry a label and requisite information as per provisions of Food Safety and Standards Act, 2006 and Regulations made there under so as to ensure that adequate and accessible information is available to next person in the food chain to enable them to handle, store, process, prepare and display the food products safely and correctly and that the lot or batch can be easily traced and recalled if necessary.

5.7.2 CONSUMER AWARENESS AND COMPLAINT HANDLING

- Information shall be presented to consumers in such a way so as to enable them to make informed choices. Information may be provided by labelling or other means, such as company websites, education programmes and advertisements, and may include storage, preparation and serving instructions applicable to the product.
    - For e.g. in order to carry out correct processing of product, it must be mentioned on the label that minimum thermal core temperature of 75°C to be maintained during cooking.
- The establishment shall have a system to handle and address consumer complaints.
- Systematic approach with identified person or people responsible for receiving, evaluating, categorizing, investigating and addressing complaints
- Investigated by appropriately-trained technical personnel.
- **Complaint handling system :**
    - Policy and complaints handling procedure
    - Clear identification of all possible complaint sources
    - Complaint capturing and categorizing based on the health and safety risk
    - Investigation and root cause analysis (RCA)
    - Corrective action
    - Complaint trending and analysis
    - Continual improvement

5.8 FOOD TRACEABILITY AND RECALL

- The food business operator shall have a system for assigning codes or lot numbers to incoming materials, packaging materials and finished products, etc. This will help to identify products and its lot numbers for ease of traceability of raw & packing material beside process and storage conditions that it has been subjected to.
- The slaughterhouse / establishment shall have a documented and effective product recall plan in place in accordance with the Food Safety & Standards (Food Recall) Regulations. Such a plan shall allow the slaughter houses to effectively locate all affected products that may cause a potential threat to public

health and enable the complete, rapid recall of the affected lot of the product from the market.

- Where a product has been recalled because of an immediate health hazard, products which are produced in the same batch shall be evaluated for safety and the batch needs to be recalled if found unsafe.
- Recalled products shall be held under supervision until they are destroyed or used for purposes other than human consumption or determined to be safe for human consumption, or reprocessed/reworked in a manner to ensure their safety.

SECTION C – IMPLEMENTATION OF HAZARD ANALYSIS AND CRITICAL CONTROL POINT SYSTEM

C1 Introduction of FSMS:

Internationally and even in India, there are many Food Safety Certifications which meets these requirements. These are Hazard Analysis and Critical Control Point (HACCP), ISO 22000, Food Safety System Certification (FSSC) 22000 and many more. These are voluntary certifications to strengthen the food safety system.

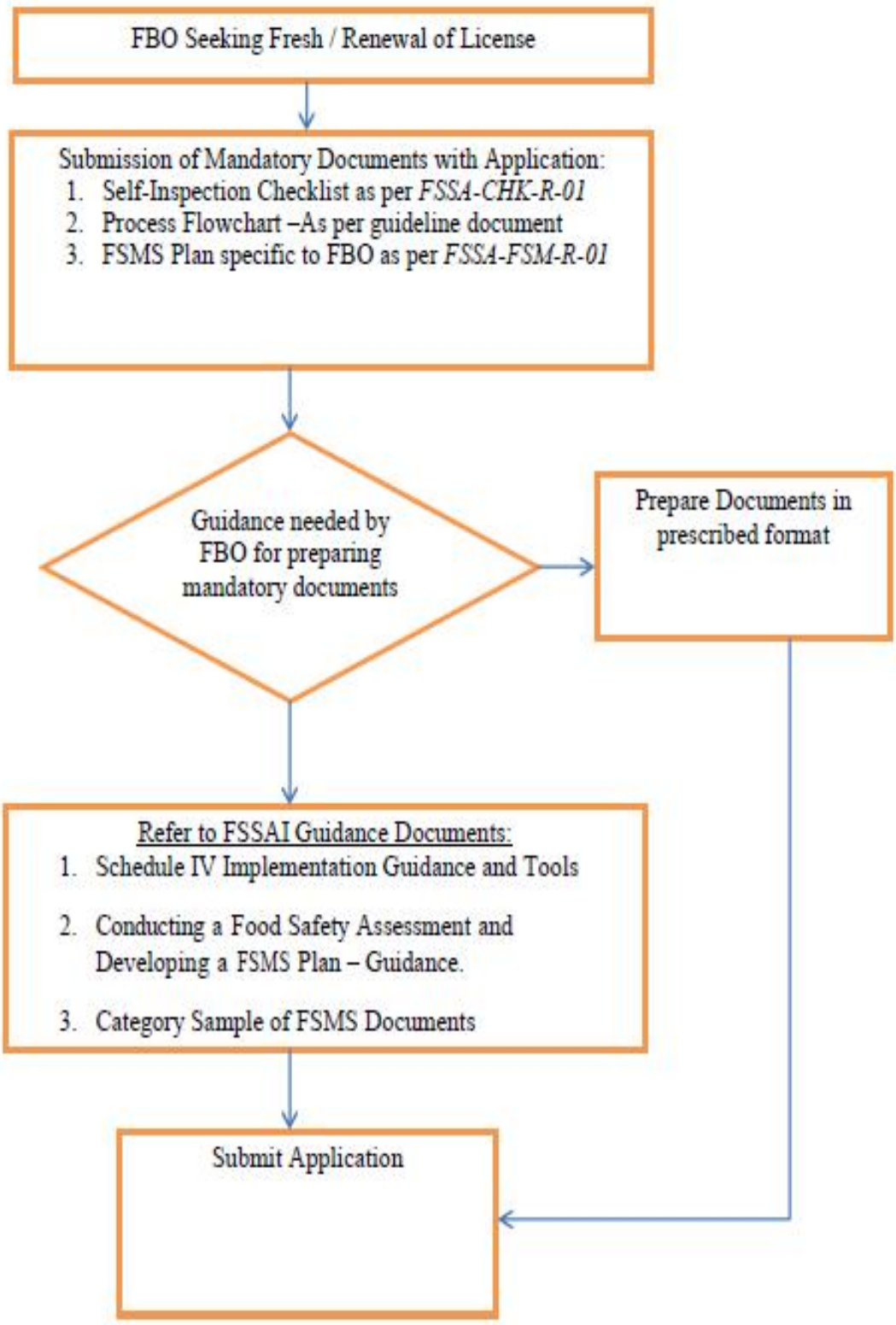
A Food Safety Management System (FSMS) is a network of interrelated elements that combine to ensure that food does not cause adverse human health effects. These elements include programs, plans, policies, procedures, practices, processes, goals, objectives, methods, controls, roles, responsibilities, relationships, documents, records, and resources. The purpose of FSMS is to ensure the manufacture, storage, distribution and sale of safe food.

However, under current Indian regulation defined by the FSS Act 2006, Food Safety Management System (FSMS) means the adoption Good Manufacturing Practices, Good Hygienic Practices, Hazard Analysis and Critical Control Point and such other practices as may be specified by regulation, for the food business.

The Key elements of FSMS:

Good Practices/ Pre-Requisites Programmes
Hazard Analysis /HACCP
Management Element / System
Statutory and regulatory requirements
Communication

FSMS Documentation by FBO



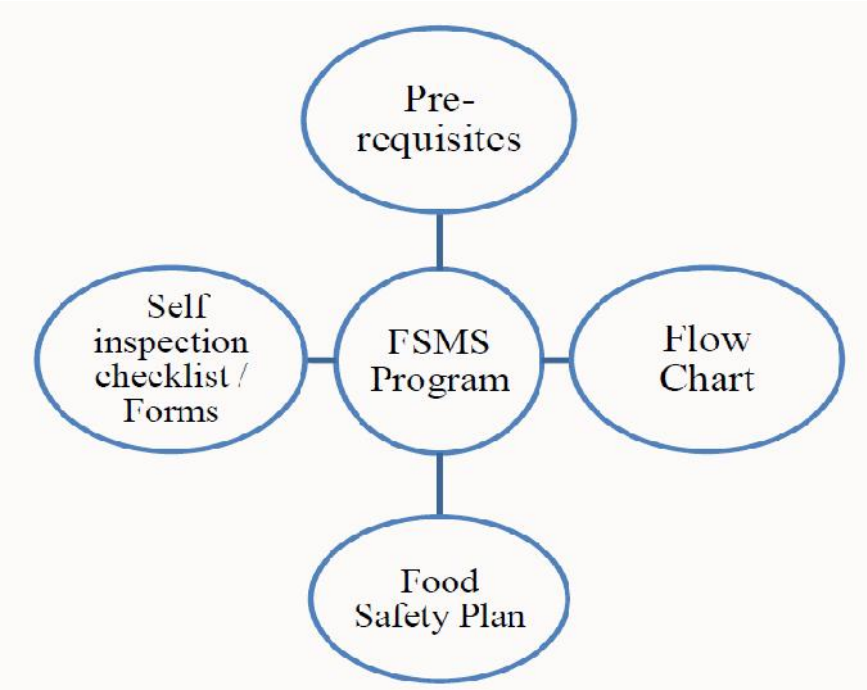
FSMS plan

Structure of the FSMS Program

FSMS Program will cover following documents

1. The FSMS Plan (samples are provided as guidance) and
2. Flow chart of for the Process
3. A self-inspection checklist, which is to be submitted as an annexure to the plan.

Note: These documents will need to be submitted by the FBO as part of application for new license or renewal of license. Also, the FSSAI approved audit agency may inspect the FBOs on basis of this scope.



Parts of FSMS program

FSMS Plan

Every manufacturing / processing unit should submit a Food Safety Management System Plan. It has to be developed based on Schedule – 4 of Food Safety and Standards Regulation, 2011 in which general hygienic and sanitary practices to be followed by food business operators have been elaborated. Along with sanitation and maintenance of establishment premises, personal hygiene of workers as well as personal cleanliness is also to be ensured by the FBO's.

The Food Safety Plan shows:

Hazard	What problems could happen?
Control measures	What you do to stop problems
Critical Limits	What are the critical limits set for each control measure
Monitoring method	How do you make sure that what you are doing stops the problem
Corrective Action	What you do if something goes wrong
Records	What records you keep

Food Safety Plan

Note: *Flow Chart & Sample FSMS Plan for Meat & Meat Products are covered below in HACCP Module.*

C2 Hazards Associated with Manufacturing & HACCP Implementation For Important Control Measures

Implementing Hazard Analysis and Critical Control Point (HACCP) is crucial for any food manufacturing process. A HACCP plan covers the total supply chain, from inbound logistics, through raw material storage, processing, packing, storage, sanitation and maintenance to the final use by the consumer. Across the operations, it must be ensured that procedures are available for internal logistics, processing specifications, working instructions, hygiene procedures and preventive maintenance plans. These procedures must cover start-ups, shutdown and unexpected stoppages during processing.

Brief Introduction of HACCP:

Hazard Analysis Critical Control Point (HACCP) is essential to carry out to identify the weak links of the production line and to suggest critical limits in compliance with legislation and therefore the preventive and corrective measures.
Though HACCP system was designed to aim zero defect products, yet it is not feasible to achieve 100% defect free products. However, it sets a goal to minimize the associated risks during production and subsequently reduce unacceptable unsafe products.

During implementation of HACCP, it is imperative to set controls at each point of the production line at which safety problems (physical, chemical and microbiological) are likely to occur.

A HACCP plan is required to be in place before initiating the HACCP system. A HACCP plan consists of 5 initial steps and 7 major HACCP principles.

HACCP- is Hazard Analysis Critical Control Point. It is a Science Based System

DESIGNED TO

Identify & Assess hazards

Establish Measures for the Control of Hazards

FOCUSED ON PREVENTION

CAPABLE OF

Accommodating changes (process, equipment…)

Being applied throughout the food chain

Being Operated in a Quality Management System

REQUIRING

Full Commitment of Management & Work Force

Multidisciplinary Approach

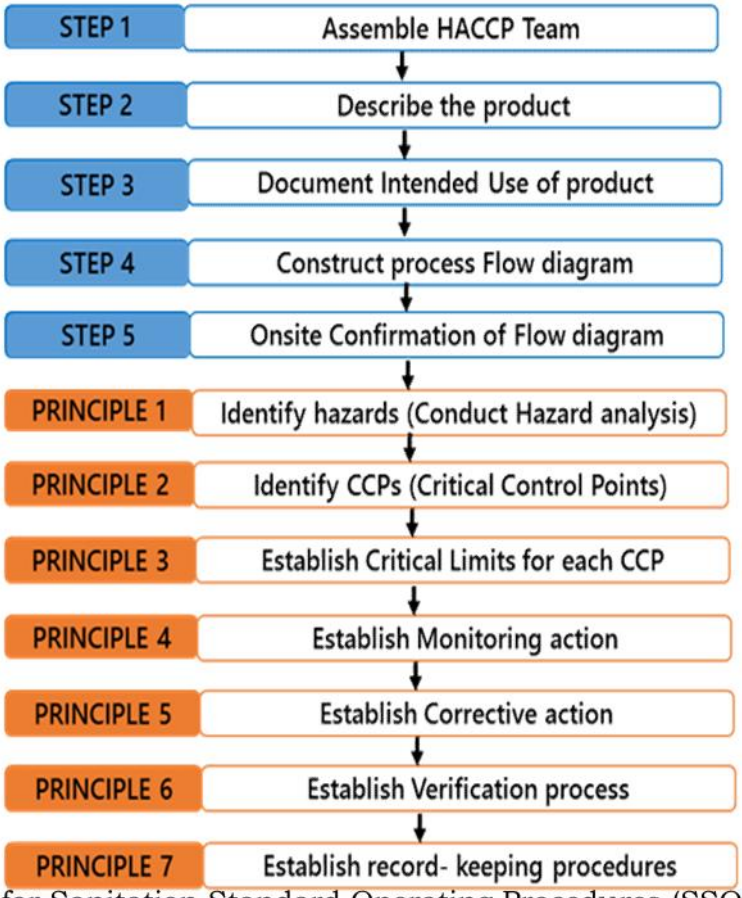
HACCP

When to use HACCP :

- Design of new product
- Design of new manufacturing process
- Modification of process or product &
- On existing process

} Choice of best options for product safety

A HACCP plan consists of 5 initial steps and 7 major HACCP principles.



The requirements for Sanitation Standard Operating Procedures (SSOPs) along with Good Manufacturing Practices (GMPs) should be considered as Pre-Requisite for HACCP

Risk assessment is a critical step in a HACCP plan. Below is a template to determine what severity and probability a processing step is involved with and therefore what level of criticality it holds in the processing line.

			Consequence/ Severity				
			How severe could the outcome be if the risk event occurs?				
			Severe	**Major**	**Significant**	**Minor**	**Insignificant**
Probability/ Likelihood	What's the chance of the risk occuring?	**Frequent**	Extreme	Extreme	Very High	High	Medium
		Likely	Extreme	Very High	High	Medium	Medium
		Occasional	Very High	High	Medium	Medium	Low
		Seldom	High	Medium	Medium	Low	Very Low
		Unlikely	Medium	Medium	Low	Very Low	Very Low

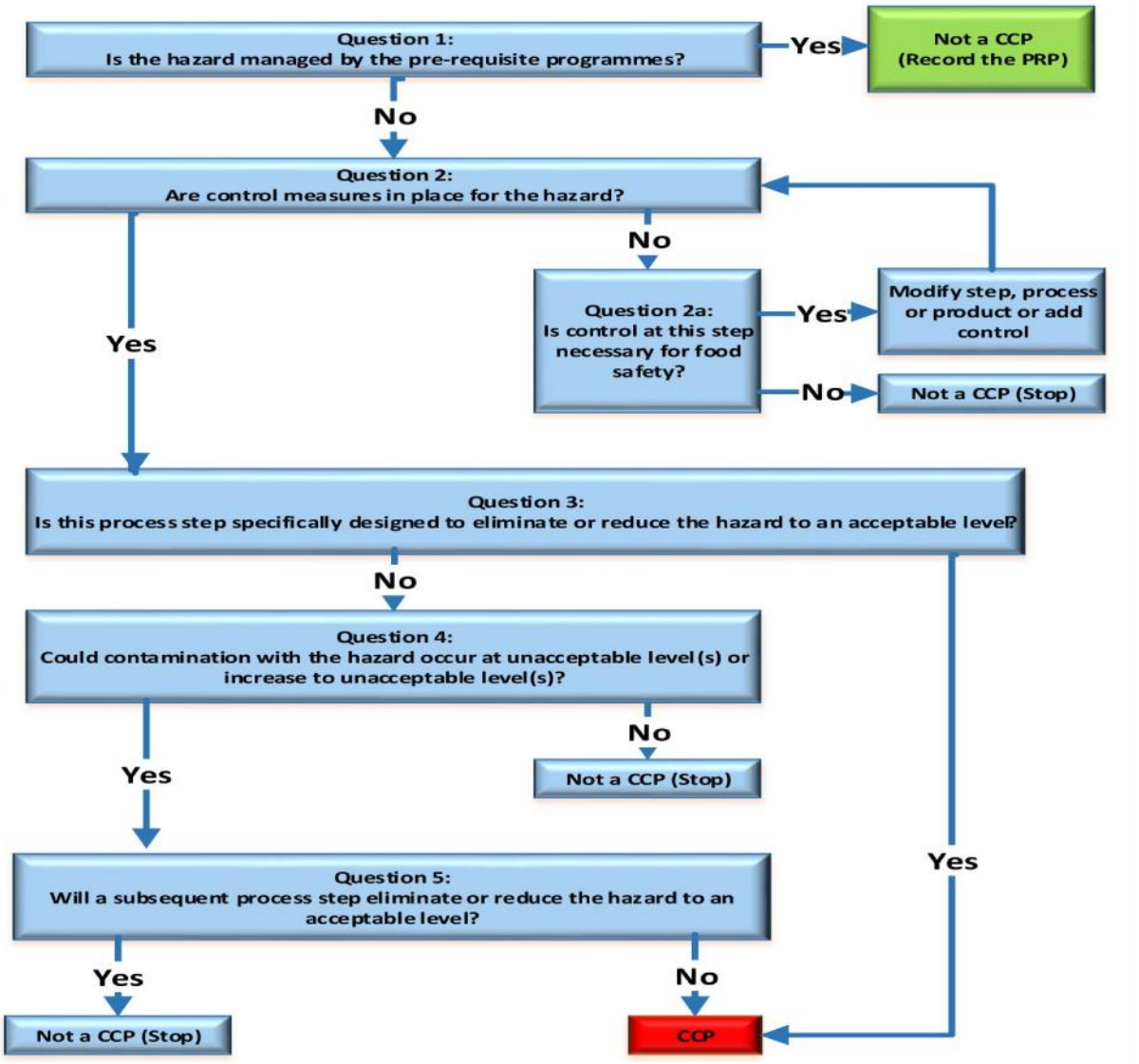
Fig. 135 Risk Assessment

Introduction to Decision Tree

Hazard Analysis and Critical Control Point (HACCP) decision trees are tools that can be used to help you decide whether a hazard control point is a critical control point (CCP) or not. A CCP is a step at which control can be applied. However, it is not always possible to eliminate or prevent a food safety hazard, so this allows you to reduce it to an acceptable level.

The purpose of a decision tree is to support the judgement of the team and help you to confirm whether the hazard needs more food safety controls. Decision trees are not mandatory elements of HACCP but they can be useful in helping you determine whether a particular step is a CCP.

It is vital that you determine the correct CCPs to ensure that food is managed effectively and safely. The number of CCPs in a process will depend on how complex the process is and how many hazards are present.



Decision Tree of FSMS

Possible hazards in Meat Processing (Goat, Sheep, Buffalo, and Pig)

Possible Hazard Type: P: Physical; C: Chemical; B: Biological

S. No.	List of Manufacturing/ Process Steps / (sequential)	Possible Hazard Type:	Possible Hazards	Source	Hazard Adverse Impact	Control Measures
1.	Procurement and Quality inspection of Raw Material (Animals)	P	NA	NA	-	-
		C	Antibiotic /Pesticide residues	Veterinary treatment; Environment pollution	Adverse Health impacts	Procurement from farm/market through approved vendors taking into account withdrawal period at farm level.
		B	Pathogens	Diseased Animals	Adverse Health impacts	Ante-mortem inspection
2.	Holding/Resting Area	P	NA	NA	-	-
		C	NA	NA	-	-
		B		1. Chances of getting infection from other diseased Animals 2. Physical stress during transport 3. Unhygienic conditions at holding	Adverse health impacts	Ante-mortem inspection

				place.		
3.	Ante-mortem inspection	P	NA	NA	-	-
		C	NA	NA	-	-
		B	Fungal, Bacterial and viral growth - Chances of production of toxin or chances of direct infection to end user.	Diseases Animal	Adverse health impacts	Inspection of Animal by veterinarians.
4.	Animal Washing	P	NA	NA	-	-
		C	Pesticide Residue	Water	Health impact	Water testing in every six months as per IS10500
		B	Microbial Load	Water	Health Impact	Water testing in every six months as per IS10500 Weekly microbiological testing internally Water dosed with chlorine to reduce the microbial load.
5.	Stunning	P	NA	NA	-	-
		C	NA	NA	-	-
		B	NA	NA	-	-
6.	Slaughtering and Bleeding	P	Extraneous matter	Cutting knives, tools, hooks	Health problem	Stringent GMP followed. Inspection of knives, hooks and tools to be done at prescribed frequency.

		C	NA	NA	-	-
		B	Microbial Contamination	Knife and Personal	Health Problem	Regular SWAB testing to conform Hygiene states.
7.	Scalding (In case of Pigs)	P	Extraneous matter	Scalding barrels, tanks, scrapers, hooks etc	Carcass contamination	Stringent GMP followed.
		C				
		B	Microbial Contamination	Equipment and Personal	Health Impact	Regular Swab testing to confirm hygiene states.
8.	Receiving of Carcass (Evisceration)	P	NA	NA	-	-
		C	NA	NA	-	-
		B	Microbial contamination	i.) Some internal pathogenic lesions may not be screened at ante mortem stage. ii.) Accidental puncturing of food pipe/ stomach/intestine leading to contamination	Health problem	Inspection of all carcass by veterinarians during post mortem inspection.
9.	Post Mortem Examination	P	NA	NA	-	-
		C	NA	NA	-	-
		B	Fungal, Bacterial and viral growth - Chances of	Diseased carcass	Adverse health impacts	Inspection of carcass by veterinarians.

			production of toxin or chances of direct infection to end user.			
10.	Washing of Carcass	P	NA	NA	-	-
		C	Pesticide Residue	Water	Health impact	Water testing in every six months as per IS10500
		B	Microbial Load	Water	Health Impact	Water testing in every six months as per IS10500 Weekly microbiological testing internally Water dosed with 20-50ppm chlorine to reduce the microbial load.
11.	Storage in Chillers	P	Extraneous material	Chillers	Carcass Contamination	Adhering to GMP-GHP
		C	NA	NA	-	-
		B	Growth of microbes, pH	Carcass	Unsafe food	Controlled Temperature/ humidity and records maintained
12.	Deboning/ portioning (12-15 degree Celsius)	P	Extraneous material including feathers, hides metal, hooks etc	Trays, knives and other food contact accessories	Health problem	Adhering to GHP and GMP Adhering to pest control activities.
		C	NA	NA	-	-
		B	pH, e-coli, TVC, salmonell	Carcass	Health problem	Adhering to GHP and GMP; and Inspection.

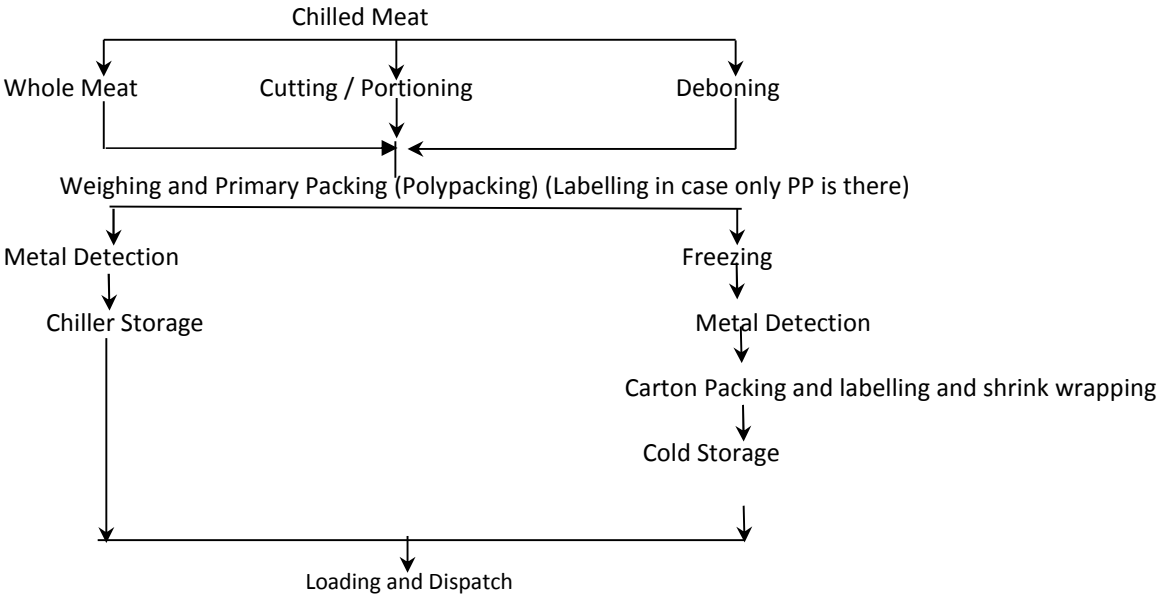
			a			SWAB testing of personnel and equipment's.
13.	Weighing and Packing	P	Extraneous material	Food Contact accessories	Carcass contamination	Adhering to GHP and GMP Adhering to pest control activities.
		C	Chemicals	Primary Packing	Unsafe food	Use of food grade primary packing.
		B	NA	NA	-	-
14.	Freezing	P	Metal /plastic contamination, other extraneous material	Freezer/chillers	Carcass contamination	Adhering to GMP-GHP.
		C	Cleaners, sanitizers	Walls, trays	Carcass contamination	Adhering to GHP & GMP
		B	Growth of microbes	From trays, storage area	Unsafe food	Controlled Temperature and records maintained
15.	Passing through Metal Detector	P	Bones, Metals	From processing	Heath problem	Adhering to GHP & GMP
		C	NA	NA	-	-
		B	NA	NA	-	-
16.	Shrinkage and Final Packing	P	NA	NA	-	-
		C	NA	NA	-	-
		B	NA	NA	-	-
17.	Cold storage/Chiller Storage	P	NA	NA	-	-
		C	NA	NA	-	-
		B	Growth of microbes	From trays, storage area	Unsafe food	Controlled Temperature and records maintained
18.	Loading	P	NA	NA	-	-

	and Dispatch	C	NA	NA	-	-
		B	Growth of microbes	Pest infestation. Temperature may rise lead to growth of micro organisms	Carcass Contamination	Controlled temperature and records maintained Adhering to GMP-GHP.

MANUFACTURING PROCESS FLOW CHART OF BUFFALO/ GOAT/SHEEP/PIG ABBATOIR

Procurement & Quality inspection of animal
↓
Holding/ Resting area
↓
Ante-mortem Examination → Condemned animals to be disposed
↓
Animal Washing
↓
Stunning
↓
Slaughtering & Bleeding (for 5-6 minutes for sheep, for 6-7 min for pigs and goat and 15-20 minutes for Buffalo) → Blood for disposal
↓
Scalding and dehairing (in case of Pigs only)
↓
Evisceration → Non-edible offal's for disposal & Water for ETP
↓
Post-mortem Examination → Rejected Carcass send to rendering
↓
Inner & Outer Washing → Water to ETP
↓
Carcass Chilling → Water to ETP
(Core temperature should be less than or equal to 7^{O}C[2])
↓
Weighing & Grading
↓
Chilled Meat

MANUFACTURING PROCESS FLOW OF PORTIONING, DEBONING & PACKING OF MEAT



[2] http://www.fao.org/docrep/004/T0098E/T0098E02.htm

Hazard and CCP Identification- Example

Note: This is only a reference model for hazard analysis example. These may vary from manufacturing plant to plant depending on risk assessment and process controls

Process Step	Hazard Type	Potential hazard	Like-lihood	Sev erit y	Ris k	Preventive Measure	Q 1	Q 2	Q2A	Q 3	Q 4	Q 5	CCP Y/N	Remarks
Procurement and Quality Inspection of raw material	**Physical**	**NA**	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	-
	Chemical	**Antibiotic /pesticide residue**	**L**	**H**	**LH**	Animal to be procured from approved farms/vendors from market taking into account withdrawal period at farm level.	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	Assurance animal procured from approved farms/vendor from market
	Biological	Diseases animal	L	H	LH	Inspection by veterinarians Suspected animal kept in separate area for final judgement	**N**	**Y**		**N**	**Y**	**Y**	N	Inspection carried out for all animal in subsequent step
Holding/ Resting Area	Physical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	-
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	-
	Biological	Diseases animal	L	H	LH	Inspection by veterinarians	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**Standard Sanitation procedures as per GMP Ante mortem**

															inspection at next step
Ante-Mortem Inspection	Physical	**NA**	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**-**
	Chemical	**NA**	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**-**
	Biological	Diseases animal . Chances of production of toxin or chances of direct infection to end user.	**M**	**H**	**MH**	**1.Inspection by veterinarians. Report of the confirmatory test of suspected animal. 2.Rejection of diseased animal 3.Suspected animal kept in separate area for final judgement. 4.Online training of personnel to identify and segregate such animal .**	Y	-	-	-	-	-	**N**	**Inspection of all animal. Rejection of diseased animal**
Animal Washing	Physical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**-**
	Chemical	Pesticide residue	**L**	**M**	**LM**	**Water testing**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**Water testing done at frequent intervals as per IS10500.**
	Biological	Microbial	**L**	**M**	**LM**	**Water testing externally as**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**Water testing**

		Load in water				**well as internally. Water dosed with chlorine to reduce the microbial growth.**									**done at frequent intervals as per IS10500**
Stunning	Physical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**-**	
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**-**	
	Biological	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**-**	
Slaughtering and bleeding	Physical	Extraneous Matter	**L**	**M**	**LM**	**GMP to be followed.**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**Standard sanitation procedures at set intervals followed.**	
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**-**	
	Biological	Microbial Contamination	**L**	**H**	**LH**	**SWAB testing of equipment's as well as personnel to conform hygiene states**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**SWAB testing to conform hygiene at frequent intervals.**	
Scalding (in case of pigs)	Physical	Extraneous Matter	**M**	**M**	**MM**	**GMP-GHP activities followed**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**Adhering to GMP-GHP activities**	
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**-**	

	Biological	Microbial Contamination	**M**	**M**	**MM**	**SWAB testing of equipment's as well as personal**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**SWAB testing to conform hygiene at frequent intervals.**
Evisceration	Physical	Extraneous matter	**L**	**M**	**LM**	**GMP to be followed**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**Standard sanitation procedures at set intervals followed.**
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**-**
	Biological	Microbial Contamination	**M**	**M**	**MM**	**Inspection of carcass.**	**N**	**Y**		**N**	**Y**	**Y**	N	**Inspection of all carcasses by veterinarian during post mortem inspection**
Post Mortem Inspection	Physical	**NA**	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**-**
	Chemical	**NA**	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**-**
	Biological	Diseased animal. Chances of production of toxin or chances of	**M**	**H**	**MH**	**1.Inspection by veterinarians. Report of the confirmatory test of suspected Carcass. 2.Rejection of diseased Carcass. 3.Suspected carcass kept in separate area for final**	Y	-	-	-	-	-	**N**	**Inspection of all carcasss. At this step carcasses carrying the disease can be eliminated.**

		direct infection to end user.				**judgement. 4.Online training of personnel to identify and segregate such carcasses.**									
Washing	Physical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
	Chemical	Pesticide residue	**L**	**M**	**LM**	**Water testing**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**Water testing done at frequent intervals as per IS10500.**
	Biological	Microbial Load in water	**L**	**M**	**LM**	**Water testing externally as well as internally. Water dosed with 20-50 ppm chlorine to reduce the microbial growth.**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**Water testing done at frequent intervals as per IS10500**
Carcass Chilling	Physical	Extraneous Matter	**L**	**M**	**LM**	**Follow GMP-GHP**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**Follow GMP-GHP Practices at frequent intervals.**
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
	Biological	Microbial load	**M**	**H**	**MH**	**Temperature of the chillers to be maintained to maintain the core temperature of the carcass as less than or equal to 7°C.GMP-GHP to be maintained**	N	Y	-	Y	-	-	**Y CCP-1**	**At this step, fast growth of micro organism can be prevented.**
Weighing	Physical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**

	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
	Biological	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
Deboning /Portioning	Physical	Extraneous material-like feathers, metal pieces, plastics, hides/hairs etc.	**M**	**M**	**MM**	**Adhering GMP and GHP (Issuance of knife under controlled monitoring). Effective Pest Control Activities**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**Metal detector placed at subsequent step**
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
	Biological	Contaminated Carcass (microbial load)	**M**	**M**	**MM**	**Regular sterilization of equipment's. Trimming and rejection of portions of carcass contaminated by rumen contents.**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**Implementation of the standard as well as sterilization of knives done at regular intervals.**
Weighing and Packing (Fresh /Chilled Meat)	Physical	Extraneous material-metal etc.	**L**	**M**	**LM**	Adhering to GMP-GHP	Y	**-**	**-**	**-**	**-**	**-**	**N**	**Metal Detector placed at subsequent step**
	Chemical	Chemicals	**L**	**L**	**LL**	**Food Grade primary packing to be used**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**Monitoring and records to be maintained**

														for all packing material.
	Biological	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
Freezing (in case of Frozen Meat)	Physical	Extraneous material-metal etc.	**L**	**M**	**LM**	Adhering to GMP-GHP	N	Y	-	N	**Y**	**Y**	**N**	**Metal Detector placed at subsequent step**
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
	Biological	Microbial Load	**M**	**H**	**MH**	**Temperature to be maintained- Freezers- core temperature of product to be less or equal to -18 degree Celsius**	N	Y	-	N	**Y**	**N**	**Y (CCP 2)**	**At this step growth of microorganism can be prevented**
Carton Packing and labelling and shrink wrapping	Physical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
	Biological	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
Metal Detector For Frozen as well as chilled meat	Physical	Metal Contamination	**M**	**H**	**MH**	**Metal detector monitoring and records to be maintained.**	N	Y	-	N	**Y**	**N**	**CCP 3a and 3b**	**After this step physical hazard cannot be eliminated**
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**

	Biological	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
Cold Storage (in case of Frozen Meat) Chiller Storage (in case of Chilled Meat)	Physical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
	Biological	Microbial Load	**M**	**H**	**MH**	**Temperature to be maintained- Freezers- core temperature of product to be less or equal to -18 degree Celsius Chillers- core temperature of product to be less or equal to 4 degree Celsius)**	N	Y	-	Y	**-**	**-**	N	Finished Product Storage done makes hazard unlikely to occur.
Loading and Dispatch	Physical	NA	NA	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
	Chemical	NA	**NA**	**NA**	**NA**	**NA**	**-**	**-**	**-**	**-**	**-**	**-**	**NA**	**NA**
	Biological	Microbial Load	**L**	**H**	**LH**	**Container monitoring as per GMP-GHP**	**Y**	**-**	**-**	**-**	**-**	**-**	**N**	**SOP for finished product storage makes hazard unlikely to occur**

HACCP Plan: (Example)

Note: This is only a reference model of HACCP Plan. CCPs may vary from manufacturing plant to plant depending on hazard analysis, risk assessment and process control of respective plant

Sr. No.	CCP			Critical limit	Monitoring	Corrective Action		Verification	HACCP Record
						Immediate	Long Term		
1	**CCP No. 1**	**Process Step-** Chilling	**Hazard Addressed-** Biological (Pathogenic Microbes)	**Critical Limit (CL)-** Core temperature less than or equal to 7°C. Carcass pH 5.8±0.2 after complete chilling (Documentation of Validation of Critical Limit to be made available)	**What:** Temperature and pH of carcass **How:** By probe thermometer and pH meter **When:** Two-hour basis product temperature and pH of each and every carcass while unloading **Where:** Chiller **Responsibility:** In charge chilling and QA	Increase hold time at temp. 2-4°C	Proper maintenance of chiller temperature.	**What:** Core temperature and pH **How:** Probe type thermometer and pH **When:** Once per shift **Responsibility:** QC/QA Supervisor/Manager	1.Hazard Analysis records with justification for CCPs. 2. CL Validation Records 3.pH monitoring Records 4. Temperature Monitoring Records at Chiller. 5. Correction and corrective action record. 5.Daily Verification records. 6. Audit Records, 7. Calibration records of Probes and chillers.

2	**CCP No.2**	**Process Step-** Freezing	**Hazard Addressed-** Biological (Pathogenic Microbes)	**Critical Limit-** Core temperature less than or equal to -18°C (frozen). (Documentation of Validation of Critical Limit to be made available)	**What:** Frozen carcass Temperature **How:** Check the frozen product core temperature with probe type thermometer **When:** Hourly basis **Where:** Freezer **Responsibility:** In charge Freezing	Increase holding time till product attains core temperature below –18°C	Proper maintenance of Freezer	**What:** Frozen product temperature **How:** with probe type thermometer **When:** Once per shift **Responsibility:** QC/QA Supervisor/Manager	1.Hazard Analysis records with justification for CCPs. 2. Critical Limit Validation records 3.Core Temperature Monitoring Records at Freezer. 5. Correction and corrective action record. 5.Daily Verification records. 6. Audit Records, 7. Calibration records of Probes for Product Temp and Freezers.
5	**CCP No. 3a and 3b**	**Process Step-** Metal Detection	**Hazard Addressed-**Physical (Metal Particles)	**Critical Limits-** Metal detector should able to detect test stripes of 1) In Frozen Products 1.5 mm Ferrous, 2.5 mm SS & 2.0 mm Nonferrous 2)In Fresh & Chilled products 1.5 mm Ferrous, 2.5 mm SS & 2.0 mm Nonferrous (Documentation of Validation of Critical Limit to be made available)	**What:** Metal Detector sensitivity **How:** by passing the all three test stripes (metal detector probe) from the metal detector **When:** before start of each shift and every hour **Where:** Metal Detector Point **Responsibility:** Production Supervisor/Manager	Supervisor to hold previous production back to last "passed" calibration check. Re pass product after proper calibration	Periodic Maintenance of metal detector	**What:** Metal detector operation **How:** by passing test stripes **When:** At least two times per shift **Responsibility:** QC/QA Supervisor/Manager	1. Hazard Analysis Records 2. CCP 3a and 3b-Metal detector validation record. 3. Monitoring Records 4. Correction and corrective action records 5. Daily Verification Records. 6. Internal Audit Records 7. Calibration records


Thank
You