

GUIDANCE DOCUMENT

FOOD SAFETY MANAGEMENT SYSTEM (FSMS)

FOOD INDUSTRY GUIDE TO IMPLEMENT GMP/GHP REQUIREMENTS



PROCESSED FRUITS AND VEGETABLES

Food Industry Guide to implement GMP/GHP requirements

FRUITS AND VEGETABLES PROCESSING

Based on Schedule 4 of Food Safety & Standards (Licensing & Registration of Food Businesses) Regulation, 2011

First Edition March 2019
Online available at www.fssai.gov.in

Disclaimer:

It is to be noted that this guidance document does not intend to replace any legal provision of Food Safety & Standard Act, 2006 & regulations there under. Further, wherever the provision of this document conflicts with Part IV of Schedule 4 of Food Safety & Standard (Licensing and Registration of Food Businesses) Regulation, 2011 or any other regulation under Food Safety & Standard Act, 2006 for that matter, the provision given in the Regulations shall prevail.

PREFACE

India's diverse climate ensures availability of all varieties of fruits & vegetables. It is now the second largest producer of fruits and vegetables in the world and is the leader in several horticultural crops, namely mango, banana, papaya, cashew-nuts, areca nut, potato and okra. Fruits and vegetables account for nearly 90% of total horticulture production in the country.

Though India's share in the global market is still nearly 1% only, there is increasing acceptance of horticulture produce from the country. Capacity building initiatives at the farmers, processors and exporters' levels will contribute towards this effort.

It is projected that implementation of this guidance document on **Food Safety Management System (FSMS) for Fruits and Vegetables Processing** will assist the manufacturers that wish to adopt a Hazard Analysis Critical Control Point (HACCP) approach thereby minimizing hazards associated with unhygienic conditions such as microbial contaminations. In addition, the Industry level users are expected to use/implement the product specification as well as the labeling standards of FSSAI so as to achieve wholesome products.

This guidance document should be read with the Food Safety and Standard Act 2006, Rules and Regulations; 2011 in force and as amended from time to time.

The Manual has been developed keeping the requirements of Industrial sectors in mind and will be a dynamic one requiring changes on a regular basis depending on the situation. The Manual has been prepared by a team of experts from FSSAI, the fruits and vegetables Industry; and we acknowledge their contributions in its creation.

The said document have also made wide reference to Codex codes of hygienic practices for dried fruits, dehydrated fruits and vegetables, canned fruit and vegetable products and was developed into single user friendly document for the industry.

Pawan Agarwal – CEO, FSSAI

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SCOPE

This guidance document is intended to provide guidance for the processing and handling of processed fruits and vegetables products so as to ensure that they are safe and of good quality. It applies to the receiving, processing, handling, storage, transport and distribution of processed fruits and vegetables products. The document should apply to the following processed fruits and vegetables products such as Juices, Dried or Dehydrated, Aseptically processed, Canned/bottled, Frozen and Minimally processed.

The document is divided into four main sections. The first section gives an overview of the fruits and vegetables processing industry in India. The second section contains guidance for implementation of good manufacturing practices and good hygiene practices as outlined in the Schedule 4 of Food Safety & Standard (Licensing & Registration of Food Businesses) Regulation, 2011, which are required to be followed at each step in the supply chain, to ensure food safety.

The third section of this document is recommendatory in nature and incorporates Hazard Analysis and Critical Control Point (HACCP) approach while emphasizing on the application of both prerequisite and operation prerequisite programs so as to achieve food safety and quality. This section includes the detailed manufacturing process with a process flow chart and relevance of main processing steps & two to three tables: Risk Assessment, Hazard Analysis and HACCP Plans. Tables of Hazard Analysis is expected to help the industry to identify the food safety risks related to each processing step, to identify the Critical Control Points (CCPs), recommended corrective actions and other related information. The sample HACCP Plans could be used as reference by the industry and modified or altered based on their operations.

The fourth or the last section provides an inspection checklist for food business operator to audit their facility & operations. The FBOs can evaluate themselves based on the indicative scoring. Further this section also gives important templates and forms which will be required by FBOs to maintain the records. This includes mandatory forms as prescribed by FSSAI & few templates for maintaining records of processes critical for food safety.

A. OVERVIEW OF FRUITS AND VEGETABLES INDUSTRY IN IND

OVERVIEW OF FRUITS AND VEGETABLES INDUSTRY IN INDIA

India is considered as the fruit and vegetable basket of the world. It being a home of wide variety of fruits and vegetables holds a unique position in production figures among all countries. India is the second largest producer of the Fruits and Vegetables in the world with a production of 259 million MT

India is the world's largest producer of bananas, papaya, mangoes and guavas. It ranks second in the production of potatoes, green peas, tomatoes, cabbage and cauliflower.

India's exports of Processed Food was Rs. 27,257.69 Crores in 2017-18, including the share of products like Mango Pulp (Rs. 673.92 Crores/ 104.54 USD Millions), Dried and Preserved Vegetable (Rs. 944.65 Crores/ 146.54 USD Millions), Other Processed Fruit and Vegetable (Rs. 3404.70 Crores/ 528.22 USD Millions and others.

In India, there is an overall increase in demand of fruits and vegetables, both in fresh and processed form, thus, the food processing industry in India became a sunrise sector that has gained prominence in the recent years. Availability of raw materials & changing lifestyles has given a considerable push to the industry's growth.

However, processing levels in fruits & vegetables currently stand at close to 2%. India witnesses nearly 4.6-15.9% wastage in fruits and vegetables annually, due to lack of modern harvesting practices and inadequate cold chain infrastructure.

Further, there is an opportunity to invest in initiatives that help to reduce wastage levels including adequate infrastructure (cold chain, processing infrastructure), R&D for processed food & packaging, innovative farm preservation systems etc.

PROCESSED FRUITS AND VEGETABLES

DEFINITIONS

Aseptically Processed & Packed

processing and packaging of a commercially sterile product into sterilized containers followed by hermetic sealing with a sterilized closure in a manner which prevents viable microbiological recontamination of the sterile product.

Adulterant

Any material which is or could be employed for making the food unsafe or sub-standard or mis-branded or containing extraneous matter.

Allergen

Any substance that causes allergic reactions in individuals who are sensitive to it.

Blanching

A heat process typically applied to a food for the purpose of inactivating enzymes and/or fixing the product colour.

Blanching is the heating of fruit or vegetables for a short time with either steam or water, and is an essential step before canning, drying or freezing of food. This heating process is not meant to cook the food but to inactivate substances that would otherwise adversely affect the nutrient content, colour, flavour or texture during subsequent processing and storage.

Best before

The date which signifies the end of the period under any stated storage conditions during which the product shall remain fully marketable and shall retain any specific qualities for which tacit or express claims have been made. Beyond that date, the food may still be perfectly safe to consume, however, its quality may have diminished. However, the food shall not be sold if at any stage the product becomes unsafe.

Cut or minimally processed and packaged including juices

Means fruits, vegetables including their products which are washed or sanitized or peeled or cut up and packed.

Cleaning

The removal of soil, food residues, dirt, grease or other objectionable matter.

Critical Control Point (CCP)

A step at which control can be applied (and is essential) to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

Consumer

persons and families purchasing and receiving food in order to meet their personal needs.

Contamination

Unintended ingress of microbial pathogens, chemicals, foreign bodies, spoilage agents, objectionable taints and unwanted matter, into the product and/ or process.

Commercial sterility

absence of micro-organisms/spores capable of growing in the food at normal non-refrigerated conditions at which the food is likely to be held during manufacture, distribution and storage.

Contaminant

biological, chemical, physical (foreign matter) agents not intentionally added to the product which may compromise food safety.

Canned food

Is commercially sterile food in hermetically sealed containers

Dehydration

removal of moisture by natural or artificial means and in some cases in combination.

Dehydrated or dried

Means fruits, vegetables including their products which are preserved by removing most of their water content following an appropriate dehydrating process.

Date of Manufacture

the date on which the food becomes the product as described.

Date of Packaging

the date on which the food is placed in the immediate container in which it will be ultimately sold.

Disinfection

reduction, without adversely affecting the food, by means of hygienically satisfactory chemical agents and/or physical methods, of the number of microorganisms to a level that

will not lead to harmful contamination of food.

Food

Any substance, whether processed, partially processed or unprocessed, which is intended for human consumption and includes primary food, genetically modified or engineered food or food containing such ingredients, infant food, packaged drinking water, alcoholic drink, chewing gum, and any substance, including water used into the food during its manufacture, preparation or treatment but does not include any animal feed, live animals unless they are prepared or processed for placing on the market for human consumption, plants, prior to harvesting, drugs and medicinal products, cosmetics, narcotic or psychotropic substances, provided that the Central Government may declare, by notification in the Official Gazette, any other article as food for the purposes of this Act having regards to its use ,nature, substance or quality.

Food additive

Any substance not normally consumed as a food by itself or used as a typical ingredient of the food, whether or not it has nutritive value, the intentional addition of which to food for a technological (including organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food results, or may be reasonably expected to result (directly or indirectly), in it or its by-products becoming a component of or otherwise affecting the characteristics of such food but does not include "contaminants" or substances added to food for maintaining or improving nutritional qualities.

Food business

Any undertaking, whether for profit or not and whether public or private, carrying out any of the activities related to any stage of manufacture, processing, packaging, storage, transportation, distribution of food, import an includes food services, catering services, sale of food or food ingredients.

Food business operator

A person by whom the business is carried on or owned and is responsible for ensuring the compliance of this Act, rules and regulations made there-under.

Food hygiene

All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.

Food safety

is assurance that food shall not cause harm to the consumer when it is prepared and/or eaten according to its intended use.

Food Safety Management System

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

Fermented or pickled or acidified or with preservatives

Means fruits, vegetables and including their products which are preserved using living ferments like yeast, bacterium, mold, enzyme or in brine to produce lactic acid or marinating and storing it in an acid solution, usually vinegar (acetic acid).

Fresh means the whole fruits and vegetables that are sold fresh.

Frozen

Means fruits and vegetables including their products, subjected to a freezing process and maintained at temperature of -180C.

Food handler

Any person who directly handles packaged or unpackaged food, food equipment and utensils, or food contact surfaces and is therefore expected to comply with food hygiene requirements.

Hazard

A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect to people or to the environment.

Hazard Analysis Critical Control Point(HACCP)

HACCP is a system, which identifies, evaluates, and controls hazards which are significant for food safety.

Hermetically sealed containers

containers which are designed and intended to protect the contents against the entry of viable microorganisms after closing.

Ingredient

Any substance, including a food additive used in the manufacture or preparation of food and present in the final product, possibly in a modified form.

Label

Any tag, brand, mark, pictorial or other descriptive matter, written, printed, stencilled, marked, embossed, graphic, perforated, stamped or impressed on or attached to container, cover, lid or crown of any food package and includes a product insert.

Lot number" or "code number" or "batch number"

The number either in numerical or alphabets or in combination thereof, representing the lot number or code number or batch number, being preceded by the words "Lot No" or "Lot" or "code number" or "Code" or Batch No" or "Batch" or any other distinguishing prefix by which the food can be traced in manufacture and identified in distribution.

Low-acid food

Any food, other than alcoholic beverages, where any component has a pH value greater than 4.6 and a water activity greater than 0.85.

Micro-organisms

microscopic living organism that can cause disease or food spoilage.

Manufacture

A process or adoption or any treatment for conversion of ingredients into an article of food, which includes any sub-process, incidental or ancillary to the manufacture of an article of food.

Manufacturer- FSSA

A person engaged in the business of manufacturing any article of food for sale and includes any person who obtains such article from another person and packs and labels it for sale or only labels it for such purposes.

Operational Prerequisite Programme (OPRP)

PRP identified by the hazard analysis as essential in order to control the likelihood of introducing **food safety hazards** to and/or the contamination or proliferation of food safety hazards in the product(s) or in the processing environment.

Prerequisite programme (PRP)

Food safety basic conditions and activities that is necessary to maintain a hygienic environment throughout the food chain suitable for the production, handling and provision of safe end products and safe food for human consumption.

Potable water

Safe and clean water which is suitable for direct human consumption.

Pasteurized Juices

Means fruit and Vegetable Juices that are subjected to standard process of pasteurization to destroy or inactivate harmful organisms.

Package

A pre-packed box, bottle, casket, tin, barrel, case, pouch, receptacle, sack, bag, wrapper or such other things in which an article of food is packed.

Quick freezing process

A process which is carried out in such a way that the range of temperature of maximum ice crystallization is passed as quickly as possible within a specified time and temperature.

Quick frozen food

Food which has been subjected to a quick freezing process, and maintained at -18°C or colder at all points in the cold chain, subject to permitted temperature tolerances.

Risk

In relation to any article of food, means the probability of an adverse effect on the health of consumers of such food and the severity of that effect, consequential to a food hazard.

Retort processed

Means fruits and vegetables including their products that are canned or flexible packaged, processed by retorting at pressure of 1.1 kg/Cm^2 (121°C) for a minimum of 15 minutes.

Regulation: The Food Safety and Standards Regulations, 2011

Sanitation

Also called Disinfection, is the reduction, by means of chemical agents and/ or physical methods, of the number of microorganisms to a level that does not compromise food safety or quality.

Sterile

Free from bacteria or any other living micro-organisms.

Thermally processed (other than pasteurization and less than 100°C)

Means fruits, vegetables and including their products processed by heat in an appropriate manner before or after being sealed in a container so as to prevent spoilage.

Unsafe

An article of food which is injurious to health:

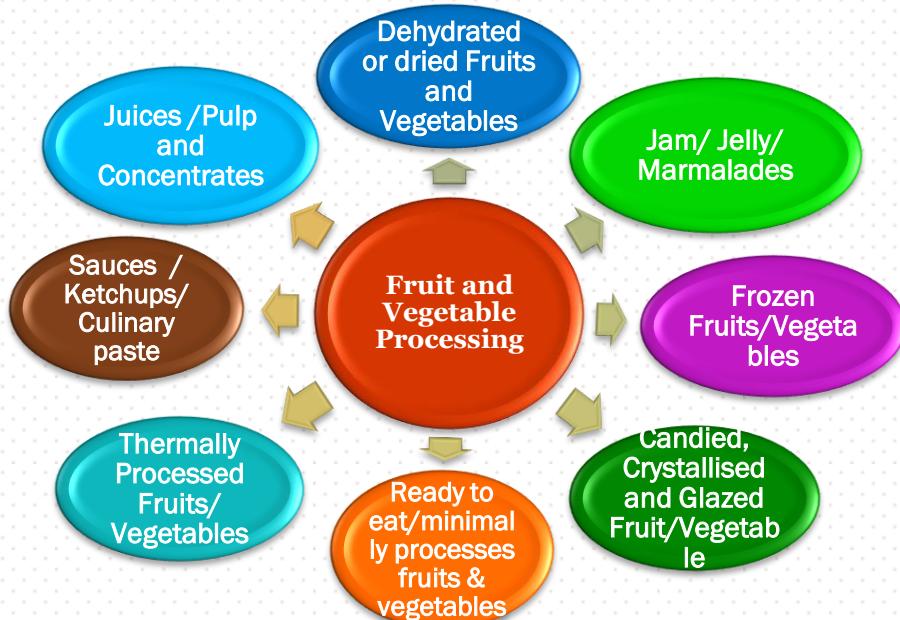
- a) By the article, itself, or its package thereof, or
- b) Consists wholly or in part, any filthy, putrid, rotten, decomposed or diseased animal substance or vegetable substance; or
- c) Is processed unhygienically or the article of food has harmful substance in it or is infected or infested with worms, weevils or insects; or
- d) Has been substituted by inferior or cheaper substance whether wholly or in part; or
- e) uses a substance directly or as an ingredient or as additive which is not allowed under the law; or
- f) By virtue of its being prepared, packed or kept under unsanitary conditions; or
- g) By virtue of its being misbranded or sub-standard or food containing extraneous matter; or
- h) By virtue of containing pesticides and other contaminants in excess of quantities specified by regulations.

Waste

Any substance or object that the organization discards or intends or is required to discard.

INTRODUCTION

Types of Fruits & Vegetable Products



Although there are many similarities between fruits and vegetables, there is one important difference that affects the way that these two types of crop are processed:

"Most fruits are more acidic than most vegetables!"

This is important because food poisoning bacteria may not grow in more acidic fruit products. Vegetables are less acidic than fruits and food poisoning bacteria are able to grow in many vegetable products. Some types of bacteria produce poisons in the food without signs of spoilage and consumers may be unaware of the contamination and eat the poisoned food. It is therefore especially important that vegetable processors carefully follow the correct processing methods and pay strict attention to hygiene and sanitation to reduce the risk of harming their customers.

After harvest, micro-organisms and naturally occurring enzymes rapidly change the colour, flavour and texture of fruits and vegetables. The speed varies with different types of crop but, compared to other crops (such as cereals), there is a limited amount of time available before they must be processed.

Fresh fruits and vegetables may be contaminated in the field due to overuse of fertilizers and pesticides, during or after harvesting, during storage or transport. Further, food adulteration is also a concern in India as fruits and vegetables are sometimes adulterated with unauthorized harmful chemicals (including artificial ripening and colouring agent, hormones and antibiotics) to attain the desired characteristics and to gain profit. It is therefore equally important for the processor to examine the incoming fresh fruits and vegetables carefully & thoroughly to stop the entry of adulterated/contaminated raw material.

B. PRE-REQUISITE PROGRAM

B.PRE-REQUISITE PROGRAMS

The operations conducted in the processing of fruits and vegetable should be supported by prerequisite programmes based on good hygienic practice and good manufacturing practice in combination to the HACCP application.

Prerequisite programmes should be specific within an individual establishment, and should be periodically evaluated to ensure their continued effectiveness.

While prerequisite programmes are usually associated with food safety, properly operating prerequisite programmes will also contribute to product quality.

Prerequisite programs will mainly include requirements for:

I. Establishment—Design and Facilities

1. Location and Surroundings

- Food Establishment shall ideally be located away from environmental pollution and industrial activities that produce disagreeable or obnoxious odour, fumes, excessive soot, dust, smoke, chemical or biological emissions and pollutants, and which pose a threat of contaminating food areas that are prone to infestations of pests or where wastes, either solid or liquid, cannot be removed effectively.
- In case there are hazards of other environmental pollution, appropriate measures shall be taken to protect the food establishment from any potential contamination.
- Food Establishment shall be located away from areas subject to flooding unless sufficient safeguards have been provided.
- The manufacturing premise should not have direct access to any residential area. In case that cannot be achieved, sufficient measures shall be demonstrated to show that it is not posing any threat to food safety.
- The surrounding areas of the establishment shall be kept clean maintained in good order and adequately drained to minimize any potential contamination from pests, water, debris etc.

- The site boundaries shall be clearly identified with access controlled.
- Specific requirements for **quick frozen foods**: Processing facilities should, to the extent possible, be located close to the source of raw materials so as to minimize changes that might lead to quality or safety concerns for raw materials of quick frozen foods prior to freezing.

2. Premises & Rooms

2.1 Construction, Design and Layout

General Requirements

The building should be of sufficient size for the purpose intended without crowding of equipment or **personnel**.

- As far as possible, the layout of the food establishment shall be such that the movement patterns of materials, products and people, and the layout of equipment, shall be designed to protect against potential cross contamination between and during operations by foodstuffs.
- The construction, design & layout of food premises shall be to the extent that is practicable, neither permit the entry of pests nor provide harbourage for pests.
- Adequate drainage facilities shall be provided for grounds, roofs and other areas to avoid stagnant water. Adequate control measures should also be in place to prevent insects and rodents from entering the processing area from drains.
- It should be so designed as to permit easy and adequate maintenance, cleaning &/or disinfection, prevent any potential contamination, and provide adequate working space to allow good manufacturing and hygienic practices for all operations;
- In areas experiencing high concentration of air- borne pollutants, equipment should be used to remove pollutants from the air blown across or through the product.
- **Process Flow Separation:** It should be designed to facilitate hygienic operations according to the one-way flow direction, without back tracking from the arrival of the raw materials at the premises to the finished product, and should provide for appropriate temperatures condition for the process and the product.
- The premises should have separate :
 - Raw material receiving area b) Inspection area and c) finished product dispatch area :
 - Designated areas for storing raw materials, packaging materials, finished products, processing chemicals, and cleaning and sanitization chemicals.
 - Designated waste treatment & garbage disposal area: controlled.

➤ **Specific requirements for low moisture foods**

- In establishments processing and packing low-moisture foods, dry processing areas should be designed to exclude moisture from the environment to the extent possible, in order to prevent growth and minimise the likelihood of a pathogen becoming established in the environment.
- Raw material handling, pre-processing and other areas (e.g maintenance areas, waste areas, and toilet facilities) should be separated from post-processing handling areas. Additionally, physical separation within the low moisture food establishment based on hygienic requirements will help minimize pathogen transfer from one area to another. Where an establishment uses a pathogen reduction step, the area following that step should be physically separated from other parts of the operation in order to implement different hygiene measures based on the type of production and the risk for pathogen introduction.
- Separation of one hygiene area from another and the control of dust can be achieved using physical barriers, such as walls, doors, split conveyors, etc. Alternatively, separation of areas and control of dust can also be achieved by the appropriate design of ventilation systems and air flow.
- In the low-moisture food establishments, there may be areas that only require **dry cleaning and other areas where water is appropriately used**. It is important that the layout and the hygienic design of the establishment ensure that areas intended for **dry cleaning remain in a dry state** and receive only dry cleaning and disinfection. If these sites are intended to be wet cleaned even occasionally, then the hygienic design should accommodate water while preventing the establishment of microbial harbourage sites.
- To limit the introduction of water in the processing areas requiring stringent hygiene controls, hand washing and footbath (if used) stations should be located outside, at the entrance of this area, and to the extent possible, water distribution systems (e.g. piping) should be located outside the high hygiene area. Additionally, the infrastructure (e.g. ventilation, physical structure) should be designed to prevent entry of unwanted water from the surrounding processing area, as a result of processing activities or from cleaning and disinfected activities or from outside the establishment.

➤ **Specific requirements for quick frozen**

- **Process Plant Design:** The food processing facility should be designed for the rapid processing, freezing and storage of food products. The processing facility should include a product flow that is designed to minimize process delays and prevent cross-contamination that could affect food quality and safety.
- **Cold Store Design:** The cold store walls, floor, ceiling, and doors should be properly insulated in order to help maintain appropriate product temperatures. It is important that the design of the cold store ensures that:
 - adequate refrigeration capacity

provides and maintains a product temperature of -18°C or colder; • there is adequate air flow around the stored foods; • storage areas are provided with a capability to control and record temperatures on a regular basis; • loss of cold air and introduction of warm and humid air are avoided; and • leaks of any refrigerant are prevented. In case of a leak, immediate corrective action ought to be applied in order to eliminate the problem.

2.2 Internal Structure

This requirement applies to areas used for food handling, cleaning, sanitizing & personal hygiene.

- All interior structures (including floors, walls, ceilings, doors, windows, partitions, overhead fixtures, working surface, stairs, elevators, etc.) shall be soundly constructed of materials that are durable, impervious to food particles, grease and water, with no toxic effect in intended use, shall be unable to provide pest harbourage, as far as practicable; and be easily and effectively cleaned and where appropriate, disinfected.
- Where appropriate, all junctions and corners should be rounded in processing areas to facilitate effective cleaning.
- Structures where glass breakage could result in the contamination of food shall be constructed of alternative materials or be adequately protected.

In addition, following specific conditions are necessary to be met to protect the safety and suitability of food:

i. Walls and partitions

- shall be provided where they are necessary to protect food from contamination.
- Walls shall have a smooth surface upto a height appropriate to the operation
- sealed to prevent the entry of dirt, dust and pests;
- shall be free from flaking paint or plaster, finished and maintained to prevent the accumulation of dust, minimise condensation, and shedding of particles

ii. Ceilings and overhead fixtures

- ceilings shall be provided where they are necessary to protect food from contamination
- sealed to prevent the entry of dirt, dust and pests.
- **ceiling surfaces as well as other overhead equipment, e.g. ventilation units, light fixtures, conveyors and pipes** shall be free from flaking paint or plaster, finished and maintained to minimize the accumulation of dust, condensation, mould growth, and shedding of particles

iii. Floors

- shall be sloped appropriately, to allow adequate drainage and cleaning, and non-slippery;

- shall be maintained in good repair and facilitate cleaning
- shall withstand operations, cleaning materials and methods.

iv. Windows

- shall be constructed to minimize the accumulation of dirt
- Windows, roof vents or exhaust fans that open to the external environment shall be fitted with removable and cleanable insect-proof screens;
- Where open windows would result in contamination, windows must remain closed and fixed during operations.

v. Doors

- shall have smooth, non absorbent surfaces
- Entry and exit doors from basic (general) hygiene areas to areas of more stringent hygiene control should be tightly fitted and, if necessary, equipped with self-closing devices.
- Doors shall be close-fitting and with suitable precautions to prevent entry of pests.

3. Equipment & Containers

3.1. General requirements

- Proper hygienic equipment design is essential to prevent contamination of the product with a pathogen from the processing environment and to ensure that if a pathogen is introduced, it remains transient and does not become established in areas of the equipment that could serve as a source of product contamination.
- A written document should be developed for equipment acceptance, as well as for cleaning, disinfecting and drying of equipment prior to allowing entry into the processing area. This is particularly important for used equipment, which may have been contaminated during its prior use.

3.1.1 Materials

- Equipment, containers and other food contact surfaces that come in direct contact with food shall be made of suitable material that is corrosion resistant non-toxic, impervious to grease, water and intended products as well as to cleaning or flushing agents.
- Surfaces should be smooth and free from pits and crevices. The use of wood and other materials which cannot be adequately cleaned and disinfected should be avoided except when their use would clearly not be a source of contamination.

3.1.2 Design, Construction and Installation

- Equipment, containers and other food contact surfaces that come in direct contact with food and used for food handling, storage, preparation, processing, packaging and serving shall be hygienically designed, constructed, located and, if necessary, installed to ensure that they can be adequately cleaned, if necessary, disinfected and maintained to avoid contamination of food.
- Equipment, containers and other food contact surfaces that come in direct contact with food should be, where necessary, durable, movable or capable of being disassembled to allow maintenance, cleaning, disinfection, monitoring for effective cleaning, pest control. Stationary equipment should be installed in such a manner as will permit easy and thorough cleaning.
- Equipment & containers shall be kept in good order, repair and condition as to minimize any risk of contamination, shall be placed to achieve easy and effective cleaning of adjacent areas like floors, walls, ceilings and other surfaces.
- The equipment should be designed and constructed in such a manner that physical damage to the raw materials and product is minimized, e.g. by ensuring there are no sharp inside corners or projections and that physical, chemical or biological hazards are not introduced into the product.
- Appropriate facilities for the cleaning and disinfecting of equipments and instruments and wherever possible cleaning in place (CIP) system shall be adopted.
- Equipment and containers for waste, by-products and inedible shall be specifically identifiable and suitably constructed. If required, a waste water disposal system / effluent treatment plant shall be put in place.
- In order to minimize the potential for harborage sites, hollow areas of equipment should be eliminated whenever possible or permanently sealed. Push buttons, valve handles, switches and touch screens should be designed to ensure product and other residues (including liquid) do not penetrate or accumulate and become a harborage site.
- The risk of contamination from equipment should be assessed and controlled. Wherever possible, forklifts, utensils, and maintenance tools for the finished product and packaging areas should be different from those used in the "raw" material area.
- **Food control and monitoring equipment :**
 - Equipment used to cook, heat treat, cool, store or freeze food shall be designed to achieve the required food temperatures as rapidly as necessary to meet the food safety requirements, and maintain them effectively.

- Such equipment shall also be designed to allow temperatures to be monitored and controlled. Where necessary, such equipment should have effective means of controlling and monitoring humidity, air-flow and any other characteristic likely to have a detrimental effect on the safety or suitability of food.

➤ **Containers for chemicals and hazardous substances :**

- Containers for chemicals (eg. cleaning materials, lubricants, fuels, boiler chemicals etc.) or hazardous substances, shall be specifically identifiable and suitably constructed, closable, made of impervious material, be easy to clean, and where necessary to disinfect.
- Containers holding hazardous substances shall be closed when not in use, stored separately and lockable to prevent malicious or accidental contamination of food.

➤ **Specific requirements for low-moisture foods:**

Equipment should be designed to facilitate cleaning with little or no water and, when controlled wet cleaning is required, to allow thorough drying before reusing the equipment for low-moisture foods. Alternatively, equipment should be designed for easy disassembly such that parts can be removed from the stringent hygiene area for wet cleaning in a separate location outside the area.

➤ **For Quick Frozen foods,** freezers should be designed and constructed so that, when properly operated, they meet the requirements of a quick freezing process.

3.1.3 Preventive Maintenance

- Preventive maintenance program documented and verified by a designated person shall be available which shall include all equipment within the facility and should prescribe the frequency at which the preventive maintenance should be carried out.
- All equipment should be inspected for hygiene and damage on a regular basis. A line start-up check is suggested and immediate corrective or preventive actions are taken in case of requirement.
- On completion of maintenance/repair cleaning of equipment, the supervisor must ensure that all tools and other materials have been removed and returned to their appropriate places as and when equipment is cleaned, prior to releasing the equipment for production.
- If outside contractors are required for preventive maintenance or equipment repair, there should be a formalized system for the management of food safety. The contractors shall be requested to follow the instructions given to them and once all the work is completed, the area in question should be inspected and cleaned.

- Repairs to or servicing of equipment shall be done by trained employees or approved contractors or the equipment manufacturer. Calibration of instruments should be done by appropriately trained personnel.
- Leaks and excess lubrication shall be identified and eliminated. Lubricants, heat transfer fluids or any other similar material used shall be of food grade where there is risk of direct or indirect contact with the product.
- The procedure for releasing maintained equipment back to production shall include clean up, sanitizing, where specified in process sanitation procedures, and pre-use inspection and approval by both Production and Quality Assurance QA.

The following are some examples of instrumentation that may be required to control factors significant to the process:

Metal Detectors

Metal detection equipment should be designed, constructed, installed, calibrated and maintained in a manner to ensure effective removal of metals such as ferrous, non-ferrous & SS (stainless steel). This may include adjustment for product effect, selection of target metal and size, timing of the reject mechanism and suitability for environmental conditions.

Magnets

- Magnets should be used in such a manner so that it effectively removes ferrous metal prior to, or after, certain operations. The strength and type of magnets should be appropriate for use.
- Magnets should be monitored to ensure effective operation and surface exposure (e.g. adequately cleaned, metal particles removed).

Scales/Metering Devices

- Scales are designed and installed to withstand the environmental conditions or are adequately protected (e.g. away from drafts, rust, corrosion, etc.).
- Scales and meters are calibrated in accordance to the equipment manufacturer's manual to ensure accuracy and compliance to the legal meteorology rules & regulations at all times.

Non-Contact Thermometers

- These devices measure the temperature of the food by sensing the infrared radiation emitted by the food. The amount of radiation varies with different materials, which absorb and reflect and transmit radiation differently. Infrared thermometers can be portable and are usually "pistol shaped" sometimes with a laser sighting aid. Target size can be important, since the instrument averages all the radiation in its field of vision. Care must be taken in interpreting results from these devices with quick frozen foods because

a package rapidly picks up radiation from its surroundings, there can be a difference between surface temperature and interior temperature.

➤ In addition the type of packaging will affect the radiation. Laminated foil packaging in particular can give large errors because it reflects radiation more efficiently than cardboard. Also available are devices which compensate for this type of error and measure the radiation through a window. Fixed video camera-type infrared thermometers are also used. These can give thermal images, which permit industrial control of heating or cooling processes to ensure even processing. This is also true of the freezing process. Therefore it is possible to scan large numbers of products and pick out "hot-spots", followed up by more accurate temperature measurements.

Other Instrumentation

Other specialized instrumentation necessary for the control of factors significant to food safety is in place and calibrated as necessary.

4. Facilities/Utilities

The facilities are essential services that play a vital role to industry. Quality facilities and utilities provided like water, light, hygiene facilities etc. are prerequisite for an effective food safety and are explained below:

4.1 Lighting

Adequate natural or artificial lighting shall be provided throughout the factory to enable personnel to operate in a hygienic manner. Further, the light produced shall not distort colours and be shadow free at the inspection area. The intensity should not be less than:

1. 540 lux (50 foot candles) at all inspection points or points requiring otherwise close examination
2. 220 lux (20 foot candles) in work rooms
3. 110 lux (10 foot candles) in other area

➤ Lighting fixtures & light bulbs must wherever appropriate shall be protected to ensure that food is not contaminated by breakages of electrical fittings. The fixtures should be designed to avoid accumulation of dirt & be easy to clean.



Fig: Protective covering on tube lights and bulbs

4.2 Air Quality & Ventilation

- Food premises shall have adequate natural and/ or mechanical ventilation including air filters, exhaust fans to effectively remove fumes, smoke, dust, condensation, steam and vapours from the premises
- Ventilation system natural and/or mechanical including air filters, exhaust fans, wherever required, shall be designed and constructed so that air does not flow from contaminated areas to clean areas and can be adequately maintained and cleaned.
- Where temperature and/or humidity are deemed critical to ensure safety and suitability of food, a control system shall be put in place and monitored.
- Filters (e.g. filters for intake air and compressed air) are cleaned or replaced at least as often as the manufacturer specifies, or more frequently if a problem is indicated, such as evidence of filter fouling or perforation.
- Air used as a processing technique (e.g. pneumatic conveying, air agitation, air blowers, air dryers, etc.) is appropriately sourced and treated (e.g. air intakes, filters and compressors) to reduce any source of contamination.
- The organization shall establish requirements for filtration, humidity (RH%) and microbiology of air used as an ingredient or for direct product contact.
- The quality of air shall be ensured through regular monitoring and records shall be available.
- Ventilation fans in walls should be screened so that there is no insect ingress when fans are turned off. Turbo ventilators in roofs should be protected to prevent rain access and should not be located above any open processing or storage areas. If this is unavoidable, catch trays should be located below the vents.
- Maintain critical processing areas under positive air pressure to prevent dust, flying insect entry, and cross-contamination of unfiltered air. (Air curtains or strip curtains at all entry levels exposed to outside be recommended).

4.3 Water/Steam

Water

- Adequate supply of potable water (for example volume, temperature and pressure) shall be available to meet operational and clean up needs.
- Water including ice or steam (including culinary steam) used as a product ingredient or in contact with food or food contact surfaces or used for equipment and plant cleaning shall be potable.

- Potable water quality shall be as specified in the latest edition of BIS standard on drinking water (IS 10500). Potable water shall be analysed at least semi annually/ once in every 6 months in an NABL accredited laboratory, as per the FSSAI requirement to confirm that it meets the requirements of this standard and the reports shall be maintained.
- Where it is necessary to store water, storage facilities shall be adequately designed, made of food grade material, cleaned periodically and maintained to prevent contamination. Records of the same shall be maintained.
- Recycled water used in processing or as an ingredient shall not present risk of contamination. It shall be of the same standard as potable water.
- Where water filters are used, they shall be regularly changed or effectively maintained.
- Non potable water (for use in, for example, steam production, fire fighting & refrigeration equipment and other similar purposes where it will not come in direct contact with food) shall have a separate system.
- Non-potable water systems shall be identified and shall not connect with, or allow reflux into, potable water systems.
- The water pipes & all connectors shall be made of material that is non-toxic, corrosion resistant, free from cracks, impervious & should be sealed.

Ice & Steam

- Ice and steam used in direct contact with food shall be made from potable water. Ice and steam shall be produced, handled and stored in such a manner that no contamination can happen
- Steam purity is a quantitative measure of the dissolved solids, volatiles or other particles in the vapour that may remain in the steam following primary separation in the boiler.
- When using plant steam in direct contact with the process, boiler treatment chemicals that are not food approved should not be used. Non-approved chemicals used and found within the steam can potentially contaminate any foodstuff in contact with the steam. The residual compounds of these chemicals may be long lasting.
- Regular steam quality checks should be carried out to ensure both the quality and purity is maintained at an acceptable level for the process
- The steam coming in direct product contact should be free of the following:
 - High levels of Total Dissolved Solids (TDS)

- Rust and other particulate matter

4.4 Cleaning

- Adequate facilities, suitably designated shall be provided for cleaning food, utensils and equipments.
- These facilities are to be constructed of corrosion resistant materials, be easy to clean and shall have an adequate supply of hot and cold potable water, where appropriate.
- Utensil and equipment cleaning and sanitizing facilities should be separated from food processing, storage, distribution and handling areas to prevent contamination.

4.8 Personnel Facilities and Toilets

Personnel hygiene facilities shall be available to ensure that an appropriate degree of personal hygiene can be maintained and to avoid contaminating food such facilities shall be suitably located & designated.

- Adequate number, size and means of hygienic washing, drying and where required, sanitizing hands facility (including wash basins and a supply of hot and cold or suitable temperature controlled water and/or sanitizer) shall be provided.
- Where necessary, the facilities designated for hand washing should be separate from facilities for washing food. They should ideally be located at the entrance of the food processing, storage, distribution and handling areas.
- An adequate number of toilets separately for males and females, of appropriate hygienic design each with hand-washing, drying and, where required, sanitizing facilities; shall be available and connected to an effective drainage system.
- Adequate changing facilities for personnel shall be provided. Toilets and change rooms shall not open directly into rooms in which food is handled and shall be maintained in a clean condition.
- Hand-washing notices should be posted in appropriate areas. Generally and preferably, hand driers are considered better than paper towels based on cost efficiency and effectiveness. The dust bins used to throw the used-paper towels should be foot-operated. This avoids any direct hand contact (washed hands) to open the dust bin.
- Rest & refreshments areas, where provided and designated areas for storage and consumption of food by personnel shall be situated away from the production area so that the potential for cross-contamination is minimized.

- A display board mentioning do's & don'ts for the workers shall be put up inside at a prominent place in the premise in English or in local language for everyone's understanding.

4.9 Storage

- Fruits & vegetables are susceptible to mould contamination and/or growth if storage conditions are not appropriate. Finished food, packaging materials, ingredients and non-food chemicals storage areas shall be dry and well ventilated.
- Where necessary, adequate facilities for the storage of food, ingredients, packaging, non-food chemicals and hazardous substances (e.g. cleaning materials, lubricants, fuels) shall be provided. The food storage facilities shall be designed and constructed to:
 - Provide protection from dust, condensation, waste, pest access and harbourage and other sources of contamination.
 - Be dry, well ventilated and enable monitoring and control of temperature and humidity in storage areas where specified.
 - Be easy to maintain and clean. All materials and products shall be stored off the floor and away from the walls to allow inspection and pest control activities to be carried out.
- Raw material like sugar, pectin, Iodised salt, spices, should be kept on plastic or metal pallets. All pallets should be away walls and off the floor for easy and adequate cleaning and inspection; and to avoid any pest harborage.
- Flavours, if used, should be kept on pallets or in racks in cold room at appropriate temperature specified by the supplier.
- Separate secure storage facilities for non-food chemicals and hazardous substances shall be provided. Such facilities shall be located where there is no possibility for cross contamination of food or food contact surfaces.

4.10 Food Testing Facilities

- A well equipped, laboratory for testing of food materials/food for physical, microbiological and chemical analysis in accordance with the specification/standards laid down under the rules and regulations should be in place inside the premise for regular/periodic testing and whenever required. If there is no in house laboratory facility, then regular testing shall be done through an accredited lab notified by FSSAI.
- In case of any suspicion or possible contamination, food materials/food shall be tested before dispatch from the factory.

- In case of complaints received and if so required, the company shall voluntarily do the testing either in the in-house laboratory or a lab notified by FSSAI.

4.8 Drainage and waste disposal

- Containers for holding waste should be of adequate size, made of impervious material, leak-proof, clearly identified, easy to clean, and where necessary to disinfect shall be provided in the premises for collection of waste material.
- Waste shall be segregated into wet and dry garbage and shall be removed periodically.
- It shall be kept closed, preferably foot operated or arrangements shall be made to prevent cross contamination like removal of waste after each cycle of processing to prevent microbial degradation.
- Drains shall be designed to meet expected flow loads, constructed so as to prevent accumulation or back flow of waste water. Drains should be located so that they can be easily and effectively cleaned and inspected.
- Drainage shall be equipped with appropriate traps to effectively capture contaminants.
- Wherever existing, refuse stores shall be designed and managed in such a way as to enable them to be kept clean and free from animals and pests.
- Disposal of waste shall be done in a hygienic way in accordance with local rules which are enforced from time to time.
- The disposal of sewage and effluents (solid, liquid and gas) shall be in conformity with requirements of Factory / Environment Pollution Control Board.

4.9 Compressed air & other gases

Compressed air, carbon dioxide, nitrogen & other gas systems wherever required used in manufacturing &/or packaging shall be constructed & maintained so as to prevent contamination.

- Gases intended for direct or incidental product contact (including those used for transporting, blowing or drying materials, products or equipment) shall be from a source approved for food contact use, filtered to remove dust, oil & water.
- Requirements for filtration, humidity (RH %) and microbiology shall be specified. Filtration of the air should be as close to the point of use as is practicable.

- Quality of compressed air that comes into direct contact with the product or equipment shall be checked at regular frequencies & shall:
 - have a filtered air intake located in a clean place;
 - contain no oil or substances hazardous to health
- Where oil is used for compressors and there is potential for the air to come into contact with the product, the oil used shall be food grade. (Use of oil free compressors is recommended).
- When air comes in contact with the food, the safety of the air shall be ensured through sampling and testing in a microbiology laboratory.

4.10 Temperature control

Depending on the nature of the food operations undertaken, adequate facilities shall be available for heating, cooling, cooking, refrigerating and freezing food, for storing refrigerated or frozen foods, monitoring & recording food temperatures, and when necessary, controlling ambient temperatures to ensure the safety and suitability of food.

4.11 Others

- For quick frozen food, In the case of power losses or equipment failure, a contingency plan should be in place in order to maintain the product temperature.

II. Establishment—Control of Operations

Appropriate measures should be taken at each step in the food chain to minimize the potential for contamination of fruits and vegetables by biological, chemical & physical agents/hazards.

1. Management of Raw Material/Packaging Material

1.1 Selection of Suppliers

Fruits and vegetables should be obtained from approved suppliers. There shall be a defined process for the selection, approval and monitoring of suppliers. The process shall include an assessment of the supplier's ability to meet quality and food safety expectations, requirements and specifications.

Because of the diversity in production practices, it is important to understand the controls in place for production of the incoming material. When control measures used to produce are not known, verification activities such as inspection and testing should be increased.

1.2 Supplier Monitoring

- Monitoring of the supplier should be conducted for all the fruits and vegetables supplied as raw material. Supplier sites need to be audited at regular frequencies and ensured that they have enough systems in place to control the chances of contamination;
- The manufacturer should ensure that Good Agricultural Practices (GAP) is followed at the farm level by the fruits and vegetables growers.

1.3 Raw Material Receipt

- Materials shall be inspected, tested or covered by COA to verify conformity with specified requirements prior to acceptance or use. The method of verification shall be documented;
- The reception area should be protected from the weather, have sufficient lighting to allow for accurate inspection, and have good pest protection devices. During the inspection and unloading procedure, systems should be in place to prevent birds, insects and other pest gaining entrance to the facility;
- Delivery vehicles shall be checked prior to, and during, unloading to verify that the quality and safety of the material has been maintained during transit (e.g. integrity of seals, freedom from infestation, existence of temperature records etc.);
- Fruits and vegetables or any other raw material or ingredient or any other material used in processing products shall be accepted by a food business operator, if it is known to contain contaminants, undesirable micro-organisms, extraneous matter, which cannot be reduced to an acceptable level by normal sorting and/or processing;
- The FBO shall have procedures in place to confirm that the incoming food materials meet the documented specifications. This may be ensured through supplier control, certificate of conformity, incoming inspection, testing, review of label for allergens etc.
- All packaged raw materials shall be checked for 'expiry date'/'best before'/'use by date', packaging integrity and storage conditions; before accepting them and stored accordingly.
- Based on the inspection results incoming materials need to be categorized as Accepted or Rejected
- Packing material which comes in direct contact with food shall be of food grade quality and the food grade certificate shall be available. It is recommended to have food grade certificates for applicable food ingredients /processing aids from suppliers;

- Records of incoming materials as well as their source of procurement shall be maintained in a register for inspection & traceability.
- Raw materials should be purchased in quantities that correspond to storage/preservation capacity. Receiving temperature of potentially high risk food should be at or below 5°C or below; or 60°C or above.
- Receiving temperature of frozen food should be -18°C or below. Records of the receiving temperatures of potentially hazardous and frozen foods must be maintained.
- Ingredients containing allergens should be clearly identified and stored to prevent cross-contamination with ingredients and products not containing allergens and with other material and products.
- RFID (Radio-frequency identification) Tags: In order to maintain proper traceability from farm side, new technology like RFID may be used.

1.4 Storage

Food storage shall be designed and constructed to enable food to be effectively protected from dust, condensation, drains, waste and other sources of contamination during storage and permit adequate maintenance and effective cleaning.

- A food business shall store food and packaging materials in appropriate areas for effective protection from dust, condensation, drains, waste and other sources of contamination during storage.
- Storage areas should be designed or arranged to allow segregation storage of raw, processed, rejected, recalled or returned materials or products which will be distinguishably marked and secured. All Raw materials, food additives and ingredients shall be stored in separate areas from printed packaging materials, stationary, hardware and cleaning materials/chemicals.
- Storage areas shall be dry and well ventilated. When storing potentially hazardous food, a food business must store it under temperature control (and humidity control where necessary) and if the food is intended to be frozen, ensure that the food remains frozen during storage. Monitoring of temperature and/or humidity shall be applied in such cases.
- The Storage of raw materials, ingredients, work-in-progress and processed/packed food products shall be subject to FIFO (First in, First out), FEFO (First Expire, First out) stock rotation system as applicable. To meet this, adequate stock rotation systems should be in place.
- All materials and products shall be stored off the floor and with sufficient space between the material and the walls to allow inspection, cleaning and pest control activities to be carried out.

- Ingredients and products containing allergens should be clearly identified and stored to prevent cross-contamination with ingredients and products not containing allergens.
- Storage of packaging material in hygienic condition.

2. Fruits and vegetables processing

Food processing operations flow diagram and **standard operating procedures** shall be documented and implemented. Also, standard operating procedures for process changeover from one kind of product to another shall be maintained, implemented and should be accessible at the operation site.

- Food processing daily process **critical parameters like temperature** / vacuum etc. records shall be maintained with appropriate coding for traceability.
- **Intermediate in-process samples** should be taken and tested for critical parameters and test results records should be maintained.
- The Food Business shall develop and maintain the systems to ensure that time and temperatures are controlled effectively where it is critical to the safety and suitability of food. Such control shall include time and temperature of receiving, processing, cooking, cooling, storage, packaging, distribution upto the consumer, as applicable. Such systems shall also specify the tolerable limits for time and temperature variations. Temperature shall be appropriately monitored with temperature recording devices and records thereof shall be maintained.
- Whenever frozen food / raw materials are being used / handled / transported, proper care should be taken so that defrosted / thawed material are not stored back after opening for future use. If thawing is required then only required portion of the food should be thawed at a time. Wherever cooking is done on open fire, proper outlets for smoke/steam etc. like chimney, exhaust fan etc. shall be provided.
- **Cleaning schedule for equipment** in the food processing sections should be maintained to ensure entire operations are carried out in hygienic conditions.
- Systems shall be in place to prevent contamination of foods by foreign bodies such as glass, metal shards from machinery and dust. In manufacturing and processing, suitable detection or screening devices should be used where necessary.

- Procedures shall be in place to be followed by food handlers in the case of breakage. Equally, systems shall be in place to prevent contamination of foods by harmful chemicals.
- **Access to processing area by outsiders should be restricted or controlled.**
- In case steam is used directly on food during processing, the steam shall be made from potable water or micron filter fitted in line.

2.1 Zoning of the Establishment:

- Zoning is the physical separation or demarcation of areas within a food factory to prevent potential cross-contamination of food and to adequately control the access of personnel to production and laboratory areas.
- Depending on the risk assessment of the activities at the establishment, separate the establishment into Low, Medium and High food safety risk zones.

2.2 Plant traffic flow:

Traffic patterns should be established with respect to movement of personnel and materials according to the one way flow direction, without backtracking, criss-crossing, and with partitioning for separation of operations **e.g. the raw material area to the finished product area, in order to prevent cross-contamination.**

2.3 Allergen Control & Allergenic material storage

- **Allergens** are a major concern today for all food manufacturers. Since very small amounts of an allergen are capable of causing reaction in sensitive individuals, the control of potential allergic ingredients and the possibility of cross-contamination are essential in all manufacturing facilities.
- **The ultimate goal** of the Allergen Control Program is to protect consumers with food related allergies. - This is accomplished through, but not limited to: ingredient review, labeling, rework, storage & segregation, scheduling, sanitation and training. - Procedure(s) outlining allergen ingredient review, labeling, rework, segregation, scheduling, sanitation and training should be documented.
- All materials that are allergens (Raw Material, RM/SFG, Semi Finished Goods/FG, and Finished Goods) should be labeled with a tag that **states "Allergen."** and should separately be kept. The label can be made Bold and with Bright colour for quick identification.
- Presence of allergens listed in the Food Safety and Standards (Labelling) Regulations, 2017 must be identified in food ingredients and products and controls shall be put in place to prevent their presence in foods where they are not labelled.

- **The common allergens are Crustacean & Shellfish** (Shrimp, lobster, and crab), Peanuts; Walnuts, Almonds and other tree nuts; Fish; Eggs; Milk; Soybeans; Wheat.
- Controls to prevent cross contact of foods containing allergens with other foods shall be implemented e.g. separate storage facilities. Where cross-contact cannot be guaranteed, consumers shall be informed.

2.4 Hygiene control in Specific Process steps :

Preparatory operations leading to the finished product and the packaging operations should be so timed as to permit expeditious handling of consecutive units in production under conditions which would prevent contamination, deterioration, spoilage, or the development of pathogenic or toxicogenic microorganisms. The processing methods should ensure compliance to the relevant standard.

- **Sorting & Grading**

Fruits and vegetables should be cleaned properly to remove physical hazards (such as presence of animal and plant debris, metal and other foreign material) through manual sorting or use of equipments. While sorting, the undesirable type of fruits & vegetables i.e. diseased, damaged, deformed, and deteriorated are removed.

During **the grading process**, the categorization of fruits and vegetables on the basis of physical characteristics such as weight, size, colour, maturity etc are done.

- **Cleaning**

Fruits & vegetables should be washed as needed to remove soil or other contamination. Water used for washing, rinsing, or conveying final food products should be of potable quality. Fruits and vegetables that are already cleaned & sanitized for microbial reduction should be stored separately from untreated fruits and vegetables.

Same equipment should not be used for both treated and untreated products without adequate cleaning and disinfection before use with treated products.

- **Pre-treatment for minimally processed Fruits & Vegetables:**

Disinfection is one of the most critical processing steps in fresh-cut fruits and vegetable production. Washing need to be designed to remove dirt, dust and reduce microorganisms, whereas, sanitization is to be done to kill the contaminated microorganisms after washing. Washing may be done with Potable water/by Ozonated Water and chlorinated water.

- **Size reduction**

Shredding, cutting, crushing, blending, pulping, pitting, coring shall be done in a manner to avoid product contamination and minimize deteriorative reactions such as browning.

➤ **Heat processing**

The application of heat or removal of heat through processes such as blanching, pasteurization, sterilization, chilling or freezing should archive the objectives of fruit and vegetable processing. During such treatments, the temperature and time combinations will be guided by the safety and quality criteria desired for the final product.

➤ **Dehydration**

The application of physical and or artificial dehydration (sun drying, solar drying, mechanical or cabinet drying, freeze drying or osmotic dehydration) either singly or in combination should be done according to the dehydration requirements for the particular fruit or vegetable product.

➤ **Concentration**

The application of partial removal of water with simultaneous concentration of soluble solutes and organic acids shall be done to achieve preservation.

3. Packaging and Warehousing

3.1 Packaging & Labelling

1. Packaging Requirements

- 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 & regulations there under.
- Only Food grade packaging materials shall be used. Packaging materials like aluminium, tin and plastic shall conform to the Indian standards as mentioned under the FSS Regulations.
- Wrapping and packaging operations shall be carried out so as to avoid contamination of the products.
- The food packaging materials shall be inspected before use to prevent using damaged, defective or contaminated packaging, which may lead to contamination of the product.
- The food business operator shall have effective procedures in place to confirm that contaminated, damaged or defective reusable containers are properly cleaned and sanitized, repaired or replaced, as appropriate, before re-use.

- The packaging materials or gases where used, shall be non-toxic and shall not pose threat to the safety and suitability of food under the specified conditions of storage and use.
- All packaging equipment like weighing scale shall be calibrated on daily basis against certified standards & their records should be maintained.
- Filling and packaging shall be under hygienic environment in a separate designated area that should be closed from all sides to restrict entry of flies, rodents, birds and pests.
- Only packaging materials required for immediate use are kept in the packaging or filling area.

2. Labeling

Control of labeling is important to ensure that the correct label is applied to each product. Use of incorrect labels could mislead the consumer and could pose a potential health hazard to segments of the population with allergies.

The manufacturer should have procedures in place to ensure that the correct label is applied to the correct product. Typical controls are listed below.

- Product types are effectively separated during changeovers (e.g. appropriate breaks between products, visual inspection to ensure products are not mixed prior to labeling).
- Different product labels or pre-labelled packaging should be effectively separated, and the number of product label types should be kept to a minimum.
- During storage, care is to be taken to prevent mixing of individual labels or bundles of labels (e.g. labels are stored in separate boxes, no labels are loose and unused labels are returned to the correct boxes).
- Procedures should be in place to ensure the product being supplied or added to the labeling operation corresponds to the labels in use (e.g. on-line checks to ensure that products are correctly labeled).

Minimum Mandatory labeling of pre-packaged foods must have the following details

- a. Name
- b. Name of the product
- c. Net weight
- d. Name and address (manufacturer, packer, distributor, importer, exporter or vendor)
- e. Batch number
- f. Date manufacturing /packing
- g. Best before use date
- h. Veg /non-Veg Logo
- i. FSSAI registration number

- j. Ingredient declaration
- k. Nutritional value

Note: For details please refer FSS (Packaging & Labeling) Regulations, 2011 and amendment there under.

3.2 Warehousing

- The warehouses should be kept clean, ventilated and under hygienic condition to avoid pest infestation, dirt, dust, smells.
- Finished products shall be kept at appropriate height to avoid damages at bottom boxes.
- Where dried fruits are stored under conditions in which they may become infested by insects and mites, appropriate methods of protection should be used regularly.

Process Step	QC/QA Check Points
Receiving	<ul style="list-style-type: none"> ✓ Specifications of fruits and vegetables required; ✓ Establishing inspection procedures for receipt of correct specified product; Correct sampling methods for inspection; ✓ To ensure testing equipment is calibrated to ensure accurate test results; ✓ Vehicle inspection ✓ Rejection of damaged/mouldy materials; ✓ Checks for foreign Material such as wood, glass and other non-metallic substances; ✓ Visual display of defects at the receiving point,
Storage	<ul style="list-style-type: none"> ✓ Avoid contamination by sanitation chemicals & pests; ✓ Control of store room temperature & humidity; ✓ Stock rotation procedure supervision; ✓ Implementing cleaning schedules. ✓ Supervision of allergen management. ✓ Fumigation of wooden pallets
Sorting & Grading	<ul style="list-style-type: none"> ✓ Checks for physical hazards foreign matter such as stones, dirt, wire, string, sticks, excreta, other animal contamination; ✓ Checks for rotten/damaged part of the F& V.
Cleaning &	<ul style="list-style-type: none"> ✓ Correct handling to minimize loses. ✓ Concentration of chlorine in water to avoid

Washing	overdose.
Pre-Treatment for minimally processed (F& V)	<ul style="list-style-type: none"> ✓ Ozone conc, ✓ Reduction of microbes, dirt & dust ✓ UV intensity
Blanching	<ul style="list-style-type: none"> ✓ Time & temp of blanching
Drying	<ul style="list-style-type: none"> ✓ Adequate drying (Time & Temperature checks); ✓ Moisture content after drying; ✓ Avoid cross contamination; ✓ Record maintenance of batches; ✓ Recording procedures.
Heat processing	<ul style="list-style-type: none"> ✓ Adequate temperature and time combinations;
Steam Treatment	<ul style="list-style-type: none"> ✓ Steam temperature ✓ Potability of water used for steam
Preservation (Natural & Artificial preservatives)	<ul style="list-style-type: none"> ✓ Sugar & Salt concentration ✓ Permitted preservative & its Conc. CONC.
Concentration	<ul style="list-style-type: none"> ✓ TSS
Freezing	<ul style="list-style-type: none"> ✓ Rate and temperature of freezing
Dehydration	<ul style="list-style-type: none"> ✓ % Moisture ✓ Rate of drying
Packaging	<ul style="list-style-type: none"> ✓ Correct handling to minimize loses ✓ Check for packaging/labelling defects. ✓ Checking for physical appearance of container/package
Metal Detection	<ul style="list-style-type: none"> ✓ Checks for presence of metal pieces in product; ✓ Establishing recording procedures ✓ Record maintenance of batches
Shipping/ Distribution	<ul style="list-style-type: none"> ✓ Inspection of container for seal & tamper-proof prior to stuffing ✓ Vehicle inspection

Some of the common microorganisms, source and the control measures:

Sl.No.	Microorganisms	Source	Control Measure
1	Coliforms, E.Coli, Staphylococci, Yeast, Molds, Aspergillus sp.	Rotten & Damaged fruits	Proper sorting, Inspection & washing the fruit in chlorinated water.
2	Coliforms & E.Coli,	Process water	water treatment
3	Mold	Conveyor, crates	Proper equipment cleaning & sanitation
4	Staphylococci, E.Coli	Humans	Personnel hygiene, Use of hand dip solution, use of protective clothing
5	Thermophiles & Mesophiles	Fruit, Soil	Proper chlorination of Fruits, sterilization of product.
6	Anaerobic microbes	Fruit, water, equipments	Proper chlorination of Fruits, , water treatment,, equipment sanitation
7	Fungi, molds, aerobic microbes	Fruits, Air	Proper chlorination, sterilization & Fumigation

4. Rework & Control of Non-Conforming Products

4.1 Rework

- Handling of Rework/Add-back –to be done in such a way to avoid cross contamination during processing, handling and storage.
- Rework shall be clearly identified and/or labelled to allow traceability. All traceability records for rework shall be maintained. (e.g. product name, production date, shift, line of origin, shelf-life).
- Stored rework materials shall be protected from exposure to microbiological, chemical or extraneous matter contamination.
- All rework should be certified by QA department before reincorporating. The rework classification or the reason for rework designation shall be recorded.

- Where rework is incorporated into a product as an “in-process” step, the acceptable quantity, the process step and method of addition, including any necessary pre-processing stages, shall be defined.
- Where 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 materials and to avoid contamination of the product with extraneous matter.
- Segregation requirements for rework shall be documented and met.

4.2 Control on Non – Conformance products

The organization shall establish and maintain documented procedures that specify appropriate actions to identify and eliminate the cause of detected nonconformities, to prevent recurrence, and to bring the process or system back into control after non conformity is encountered. These actions include:

- a. Reviewing non conformities (including customer complaints),
- b. Reviewing trends in monitoring results that may indicate development towards loss of control,
- c. Determining the cause(s)of nonconformities
- d. Evaluating the need for action to ensure that nonconformities do not recur,
- e. Determining and implementing the actions needed,
- f. Recording the results of corrective actions taken,
- g. Reviewing corrective actions taken to ensure that they are effective.
- h. Corrective actions shall be recorded.

5. Food Transportation and Distribution

- Vehicles of only FSSAI registered transporters shall be used for transportation.
- The dispatches of finished goods must follow FIFO or FEFO (First Expiry First Out) system.
- Conveyances and/or containers used for transporting shall be kept clean and maintained in good repair and condition to protect from contamination and shall be designed and constructed to permit adequate cleaning and/or disinfection. Where direct contact with food may occur, materials used in carrier construction should be suitable for food contact.
- Food products in conveyances and/or containers are to be so placed and protected as to minimize the risk of contamination.

- Where conveyances and/or containers are used for transporting anything in addition to foodstuffs or for transporting different foods at the same time, there shall be, where necessary, effective separation of products to prevent cross-contamination.
- 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.
- Bulk foodstuffs in liquid, granulate or powder form shall be transported in receptacles and/or containers/tankers reserved for the transport of foodstuffs. Such containers are to be marked in a clearly visible and indelible fashion, to show that they are used for the transport of foodstuffs.
- Wherever necessary, conveyances and/or containers used for transporting foodstuffs shall capable of maintaining foodstuffs at appropriate temperatures and allow those temperatures to be monitored. For example Ingredients and products requiring refrigeration shall be transported and stored at 5°C or less but not frozen.
- Frozen ingredients and products shall be transported and stored at temperatures which do not permit thawing (for example, below 0°C).
- Finished product boxes are kept at prescribed max. height to avoid damages.
- Care should be taken to prevent condensation when unloading fruits and vegetables from a refrigerated vehicle or while taking out of a cold storage.

6. Food Traceability and Recall

- A recall may be initiated after the initial investigation of reported incident at manufacturing unit or complaints/received from consumers or customers or any other sources.
- The FBO shall have a documented and effective product recall plan in place in accordance with the Food Safety & Standards (Food Recall) Regulations, 2017.
- Such a plan shall allow the FBO to effectively locate all affected food products that may cause a potential threat to public health and enable the complete, rapid recall of the implicated lot of the product from the market.

Note: In some instances, the establishment may initiate a voluntary recall of a product because of the use of a raw ingredient or packaging material which has been determined to be unsafe. By linking raw ingredient lot codes to the finished product code, your establishment will be able to identify which of your finished products need to be recalled

- The food business operator shall have traceability system shall be in place for assigning codes or lot numbers to incoming materials, packaging materials and finished products, etc. This will help to identify products. All records are to be maintained.
- Where a product has been recalled because of an immediate health hazard, other products which are produced under similar conditions which may also present a hazard to public health shall be evaluated for safety and may need to be recalled.
- Recalled products shall be held under supervision until they are destroyed, used for purposes other than human consumption, determined to be safe for human consumption, or reprocessed/reworked in a manner to ensure their safety.

Suggested Reading: Product recall procedure shall be as per FSSAI recall protocol mentioned in Food Safety and Standards (Food Recall Procedure PART III Section 4) Regulations.

7. Quality Control

- The FBO shall have a quality control programme in place to include inspection and testing of incoming fruit/fruit pulp/fruit Juice /fruit peel/ food additives/flavours/food colours/sugar etc., in process and finished product.
- Adequate infrastructure including a laboratory facility and trained and competent testing personnel should be available for carrying out testing.
- All incoming raw materials/packaging materials/Food additives/Ingredients test records or Certificate of Analysis (COA) shall be maintained. Adulteration tests should be performed. Testing shall be done as per the approved method.
- Each category or type of finished food product shall be tested as per FSS standards & regulations 2011 at least once in six months from an NABL Accredited or FSSAI notified laboratory. It is recommended to retain the control samples, till the end of shelf life. Refer to the approved laboratory list by FSSAI.
<http://www.fssai.gov.in/home/food-testing/fssai-notified-labs.html>.
- In case adequate in-house test facilities are not available, a system shall be in place for testing these materials in an NABL accredited external laboratory/ laboratory notified by FSSAI. In case of complaints or feedback on the product, the food business operator shall carry out the testing either through their in-house/ external accredited laboratories notified by FSSAI to ensure product compliance to standards. End product specifications: The processed product shall comply with the specific national standards for that product.

Suggested Reading: Food Safety and Standards (Food product standards & food additives) Regulations, 2011 & its amendments.

- If pathogen testing is conducted in-house, the microbiology laboratory shall not open directly into process area. The tested sample and remnant should be autoclaved before disposing off.
- Calibration of laboratory equipment shall be done periodically.

III. Establishment–Maintenance& Sanitation

1. Cleaning and Sanitation

It is desirable that each plant in its own interest designates staff, whose duties are preferably separated from production, to be held responsible for the cleanliness of the plant. The staff should be well trained in the use of special cleaning tools, methods of disassembling equipment for cleaning, and in the significance of contamination and the hazards involved. Critical areas, equipment and materials should be designated for specific attention as part of a sanitation schedule.

- 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 shall remove food residues and dirt which may be a source of contamination. The necessary cleaning methods and materials will depend on the nature of the food business. Disinfection may be necessary after cleaning.

1.1 Cleaning and sanitizing agents and tools

- Cleaning and disinfection chemicals shall be food grade, handled and used carefully and in accordance with manufacturers' instructions, for example, using the correct dilutions, and stored, where necessary, separated from food, in clearly identified containers to avoid the risk of contaminating food. Material Safety Data Sheet for cleaning and sanitizing agent should be maintained.
- Tools and equipment's like scrubbers, brushes, plastic brooms, vacuum cleaners etc. should be of hygienically designed and robust, so that they pose no threat to food safety of product. Further, they should be dedicated to specific areas.



Fig: Cleaning brushes



Fig: Cleaning mops



Fig: Cleaning Tools with scrubber

1.2 Cleaning Methods and programs

- A cleaning and disinfection programmes shall be drawn up, observed 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.
- The cleaning programmes shall specify:
 - areas, items of equipment and utensils to be cleaned;
 - responsibility for particular tasks;
 - cleaning method and frequency of cleaning; and
 - monitoring arrangements for checking effectiveness of cleaning (eg. through audits or microbiological sampling and testing of the environment and food contact surfaces)
- The sanitation program is adjusted as necessary to incorporate new cleaning procedures (new equipment, new chemicals, etc.).The sanitation program may be used to provide control over cross-contamination issues associated with the production of non-allergenic and allergenic products. Equipment is cleaned in a manner to prevent cross-contamination between allergen containing products and non-allergen containing products.

- Operations should begin only after sanitation and drying requirements have been met.

1.2.2 Cleaning Procedures and methods

- Cleaning can be carried out by the 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.
- Cleaning procedures should generally involve:
 - removing gross visible debris from surfaces;
 - applying a detergent solution to loosen soil and bacterial film (cleaning);
 - rinsing with water (hot water where possible) to remove loosened soil and residues of detergent;
 - dry cleaning or other appropriate methods for removing and collecting residues and debris (may be needed in some operations where water enhances the risk of microbiological contamination); and
 - where necessary, cleaning should be followed by disinfection with subsequent rinsing.

The cleaning methods that are mostly done in food establishment are: **Wet Cleaning, Controlled Wet Cleaning** and **Dry Cleaning** depending on the type of products.

Requirements for cleaning should be detailed in documented procedures and shall be readily available for people involved in cleaning. Instructions shall include:

- a) Frequency of cleaning
- b) Equipment disassembly and re-assembly instructions
- c) Cleaning methodology such as CIP or COP (Cleaning Out of Place system)
- d) Cleaning chemicals concentration
- e) Contact time and temperature

Potable water shall be used for cleaning of food contact surfaces.

1. Dry cleaning & disinfection:

Dry cleaning should be used as the routine cleaning practice for the area that requires the most stringent hygiene control. The objective of dry cleaning is to remove product residues without the use of water by using tools or cleaning aids that do not involve the application of water or other aqueous solutions. Where appropriate, dry abrasives can be an effective method of removing persistent product residues on equipment or surfaces without introducing water.

Following should be considered when establishing:

Dry Cleaning procedures:

- Compressed air can be used for dry cleaning in special situations (e.g. to dislodge dust from inaccessible points) but when compressed air is used, it should be dried and filtered to exclude micro organisms and moisture prior to use.
- Separate tools should be provided for the dry cleaning of floors. Tools and vacuums that are used for cleaning food contact surfaces should not be used to clean non-food contact surfaces. Well-designated portable vacuum cleaners or similar tools are recommended to remove residues.
- Where filters are part of dry cleaning tools, they should be properly maintained on a regular basis and replaced when necessary.
- Alcohol- based disinfectants provide a means to disinfect equipment with a very minimal introduction of water, but water should be avoided as much as possible.
- Cleaning and disinfectants programs should be monitored for their effectiveness and verified by visual observations and, where applicable, environmental monitoring.

2. Controlled wet cleaning :

- As much product residue as possible should be removed by dry cleaning.
- Only the minimum amount of water needed should be used. Procedures should be in place to collect water spreading on the floor or to other non-wet cleaned areas.
- Complete drying of all areas and components involved (e.g equipment parts, floor) should be done after controlled wet cleaning.
- Controlled wet cleaning should be monitored and verified by visual inspection that the area is dry. **If necessary, production should be stopped while controlled wet cleaning is taking place and only restarted once the area is dry.**

3. Wet cleaning :

- Wet Cleaning can be done by using potable water or steam
- The amount of water should be minimised and its use should be limited to specific areas where possible.
- Excessive use of water and high pressure hoses should be avoided.
- Care should be taken to prevent tracking water into areas intended to remain dry.
- Complete drying of all areas should be done after wet cleaning.

1.2.3 Verification as to the effectiveness of cleaning should include;

- a) Visual inspection
- b) Analytical methods like: -
 - i. Check pH of rinse water to confirm removal of chemicals residue
 - ii. Swabbing using conventional microbiological swabs or rapid methods based on ATP Bioluminescence technology.
- c) Cleaning record shall be maintained for the same period as manufacturing records

2. Maintenance

- A maintenance schedule should be developed and maintained for the facilities, machinery and equipment;
- Preventive maintenance of equipment and machinery shall be carried out regularly as per the instructions of the manufacturer. Preventive maintenance programs 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;
- A preventive maintenance (including calibration) 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.
- 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 recorded. Internal &External calibration schedule for critical food safety equipment's should be maintained.
- Lubricants, heat transfer fluids or any other similar material used shall be food grade where there is a risk of direct or indirect contact with the product.
- It is recommended as best practice to maintain plant equipment's breakdown records.
- Temporary fixes when used shall not put product safety at risk and should be removed / permanently fixed in a timely manner.
- 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.

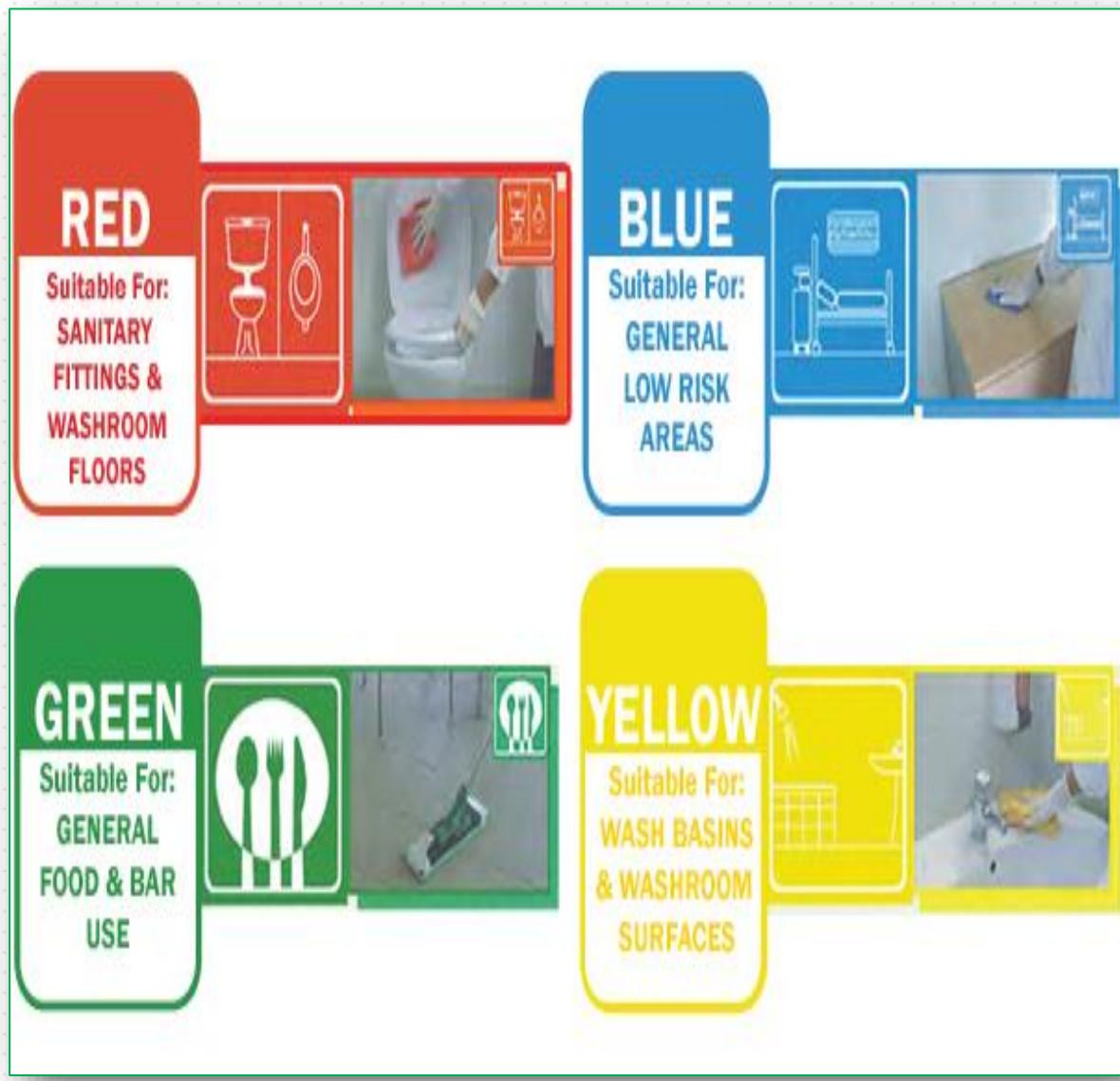


Fig: Colour coding system for cleaning different area.

3. Pest Control System

3.1 Pest control programs

Good sanitation, inspection of incoming materials and good monitoring can minimize the likelihood of infestation and thereby limit the need for pesticides.

- Pest management programs shall be documented and shall identify target pests and address plans, methods, schedules, control procedures and where necessary, training procedures.

- Establishment shall have a nominated person to manage pest control activities and/or deal with external appointed contractors. Records of pest management shall be maintained.
- Treatment with permissible chemicals, physical or biological agents, within appropriate limits, shall be carried out without posing a threat to the safety or suitability of food.
- Food materials shall be stored in pest-proof containers stacked above the ground and away from walls.

3.2 Preventing access

- Food Establishment, including equipment and building shall be kept in good repair to prevent pest access and to eliminate potential breeding sites.
- Holes, drains and other places like external doors, windows, ventilation openings where pests are likely to gain access shall be kept in sealed. Wire mesh screens, for example on open windows, door and ventilators, will reduce the problem of pest entry.
- Site external and internal environment, storage facilities, equipment and associated ancillary areas (including waste handling areas, drainage and overheads) shall be kept clean and free of product accumulations to prevent pest infestations.

3.3 Harborage and Infestations

- Storage practices shall be designed to minimize the availability of food and water to pests. Potential pest harbourage (e.g. burrows, holes, crevices) shall be removed.
- Material found to be infested shall be handled in such away to prevent contamination of other materials, products or the establishment.
- Food materials shall be stored in pest-proof containers and/or stacked above the ground and away from walls. Where outside space is used for storage, stored items shall be protected from weather or pest damages (e.g. rodent damages, bird dropping);
- Where appropriate, refuse shall be stored in covered, pest-proof containers. Any potential harbourage, such as old, unused equipment shall be removed.



Fig: Rodent Box Sample



Fig: Glue Traps

3.4 Monitoring and detection

- Pest monitoring programmes shall include the placing of detectors and/or traps in key locations to identify pest activity. It shall be tamper resistant and shall not be blocked to enable pest activity routine inspections.
- A map of detectors and/or traps shall be maintained. Detectors and/or traps shall be designed and located so as to prevent potential contamination of materials, products or facilities.
- Glue traps may be used in manufacturing areas and Rodent baits outside in premises shall be inspected daily so that captured pests may be removed. Use of UV light traps (Electronic fly killers) is used where applicable and shall be emptied regularly.
- External bait stations shall be positioned to keep pest away from building entrances. It is recommended that bait station be placed at regular intervals around the perimeter of the building.

3.5 Eradication

- Pest infestations shall be dealt with immediately by a competent person and without adversely affecting food safety or suitability. Eradication measures shall be put in place immediately after evidence of infestation is reported.
- Treatment with permissible chemical, physical or biological agents, within the appropriate limits, shall be carried out by trained operatives without posing a threat to the safety or suitability of food.
- The cause should be identified and corrective action taken to prevent a recurrent problem.

- The use of insecticide within food factories shall be kept to minimum or avoided.
- Records of pesticide used shall be maintained to show the type, quantity and concentration used; where, when and how applied, and the target pest. All chemicals used for pest control measures, shall be accurately labelled and stored securely away from raw materials. MSDS should be available/accessible for all the chemicals used.

4. Exclusion of Domestic Animals

Animals, birds and pets shall be excluded from the food premises.

5. Waste Disposal Management

Systems shall be in place to ensure that waste materials are identified, collected, removed and disposed of in a manner which prevents contamination of products or production areas.

6.1 Waste Collection

- Facilities shall be designed to prevent access to waste or inedible material by pests and avoid contamination of food, potable water, equipment, buildings or roadways in the premises.
- The waste shall be collected in identifiable containers with lid and shall be removed from the processing areas either at the end of the operations or when the container is full.
- Waste storage facilities shall be:
 - away from the processing area;
 - designed to prevent access to waste by pests;
- Waste containers shall be kept in designated area and constructed of impervious material which can be readily cleaned and sanitized (Foot operated bins are recommended).

6.2 Waste Disposal

- Accumulation of waste, non-edible by products and other refuse shall not be allowed in food-handling or storage areas. Removal frequencies shall be managed to avoid accumulations and over flow in food handling, food storage, and other working areas and the adjoining environment except so far as is unavoidable for the proper functioning of the business, with a minimum daily removal.
- No waste shall be kept open inside the premise and shall be disposed as per local rules and regulations including those for plastics and other non-environment friendly materials. Records for the disposal shall be available.

- Waste stores must be kept appropriately clean and free of pests. If the waste disposal is outsourced, it has to be done through approved contractors only and the records shall be maintained.
- The disposal of sewage & effluents (solid, liquid & gas) shall be in conformity with standards laid down under Environment Protection Act, 1986 & the local rules, wherever prevalent.



Fig : Colour coded bins/containers for Wet and dry disposable.

6.3 Drainage System

- Drains shall be designed, constructed and located so that the risk of contamination of materials or products is avoided. Drainage direction shall not flow from a contaminated area to a clean area.
- In general, if drains are present, the surrounding floor should be **properly sloped for effective drainage** and kept dry under normal conditions.
- Drainage & sewage system should be equipped with appropriate traps and vents to effectively capture contaminants such as sewer gases, pests etc.

III. Establishment-Personal Hygiene

Personal hygiene plays an integral part to safeguard the food produced from any sort of cross contamination. A good personal hygiene and behavior prevents the food from contamination and subsequently hazards in the product and hence illnesses to the consumers.

Personal hygiene can be taken care by main aspects like-**health and hygiene of food handlers, duties of employers as equal to employees** in the area of personal hygiene by providing the **appropriate environment and facilities**.

1. Health Status and Illness Injury

- A person known, or suspected, to be suffering from, or to be a carrier of a disease or illness likely to be transmitted through food, shall not be allowed to enter into any food handling area.
- The Food business shall develop system, whereby, any person affected by illness (jaundice, diarrhoea, vomiting, fever, sore throat with fever, visibly infected lesions and discharges from ear, eye or nose etc.), **shall immediately report illness or symptoms of illness** to the management for possible exclusion from food handling area. Medical examination of the food handler shall be carried out apart from the periodic check-ups, if clinically or epidemiologically indicated.
- **Medical examination of all food handlers/** employees of the establishment shall be **done once in a year** by a registered medical practitioner to ensure that they are free from any infectious, contagious and other communicable diseases. A record of these examinations shall be maintained for inspection purpose.
- The employees in the food premises shall be inoculated against the enteric group of diseases as per recommended schedule of the vaccine and a record shall be maintained. In case of an epidemic, all factory staff including workers shall be **vaccinated irrespective of the early vaccination**.
- In food handling area, personal with open cuts, wounds or burns shall be required to cover them with suitable water proof dressing before starting operations. Any lost dressing must be reported to supervision immediately. The dressings should preferably be **brightly coloured and metal detectable**.

	<p><input checked="" type="checkbox"/> PERFORMA FOR MEDICAL FITNESS CERTIFICATE FOR FOOD HANDLERS (FOR THE YEAR _____)</p> <p>(See Para No. 10.1.2, Part- II, Schedule - 4 of FSS Regulation, 2011)</p> <p>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.</p> <p>Name and Signature with Seal of Registered Medical Practitioner / Civil Surgeon</p>
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Fig: Medical Check-up and Medical certificate

a. Protective Clothing/Work wear:

- The Food business shall provide to all food handlers adequate and suitable clean protective clothing, head covering, face mask, gloves and foot wear and the food business shall ensure that the food handlers at work wear only clean protective clothes, head covering and footwear every day.
- Clothing mandated for food protection or hygiene purposes shall not be used for any other purpose.
- 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.
- Laundry facility shall be provided for washable garments in the establishment but where this facility is not available, outside contractors should be engaged.
- Shoes for use in processing areas shall be fully enclosed and made from non-absorbent materials.
- Boots or foot wears shall be cleaned inside and outside, kept in inverted position to maintain them dry and free of any foul odour or slime. Shoes worn outside food handling area shall not be allowed to enter food handling area.
- Other persons entering into the plant (customers /visitors/contractors/calibration agencies /maintenance persons etc.) shall be provided with hair nets, beard nets (if necessary) masks, aprons and shoe covers while entering in to the plant.



Fig: Different Personal hygiene wears.



Fig: Storage of Personal hygiene Clothing

2. Personal Cleanliness

Food handlers shall maintain a high degree of personal cleanliness and shall wear work clothing, head covering, and footwear that is fit for purpose, clean and in good condition (eg. free from tears, rips or fraying material). Work wear shall provide adequate coverage to ensure that hair, beards, moustaches, perspiration, etc. cannot contaminate the product.

- Where gloves are used for product contact, they shall be clean and in good condition.
- Protective clothing mandated for food protection areas or hygiene purposes shall not be used for any other purposes.
- Food handlers engaged in food handling activities shall refrain from smoking, spitting, chewing, sneezing or coughing over any food whether protected or unprotected.
- Fingernails shall be kept clean without nail polish and trimmed.

- They should avoid certain hand habits –e.g. scratching nose, running finger through hair, rubbing eyes, ears and mouth, scratching beard, scratching part of bodies etc. that are potentially hazardous and might lead to food contamination through transfer of bacteria from employee to the product during processing.
- All people entering food processing, storage, distribution and handling areas shall wash their hands with soap and potable water, followed by drying and sanitizing, where required:
 - before starting work;
 - after handling chemicals;
 - after handling incompatible food products (for example, raw versus cooked or ready-to eat) or contaminated materials;
 - after breaks;
 - after coughing or sneezing or blowing their nose; and
 - after using toilet facilities.
 - after using telephone / cell phones,
 - after smoking in designated areas etc.
- Hand washing notices shall be posted at appropriate places.



Fig: Touch free (hands free) tap sat wash basins to avoid cross contamination



Fig: Sequential Steps for washing hands

3. Personal Behaviour

- The FBO shall implement an effective personal hygiene programme that identifies hygienic behaviour and habits to be followed by personnel to prevent contamination of food.
- Any behaviour or unhygienic practices which could result in contamination of food shall be prohibited in food processing, distribution, storage and handling areas. This includes smoking, chewing or eating, sneezing or coughing over unprotected food, spitting etc.
- Personal effects such as jewellery, watches, pins or other items should not be worn or brought into food handling areas if they pose a threat to the safety and suitability of food.
- Should provide **separate lockers/place** provided for persons regularly working food processing areas to keep their personal belongings, tiffin etc. **Food contact tools** and equipment shall not be kept in personal locker.

4. Visitor Control

- Generally Visitors should be discouraged from going inside the food handling areas. Proper care has to be taken to ensure that food safety & hygiene is not getting compromised due to visitors in the floor area.
- **Food Business Operator should implement and display visitor control policy.**
- The Food Business shall ensure that visitors to its food manufacturing, processing or handling areas must wherever appropriate, wear protective clothing, footwear and adhere to all the personal hygiene provisions required for personnel required in the food business.

V. Establishment–Product Information and Consumer Awareness

1. Product information & Labelling

- All incoming, in-process and finished products shall be suitably identified for product identification, stage of processing, inspection and test status etc. so as to avoid their inadvertent use. **Lot identification** shall be done to facilitate traceability, product recall, effective stock rotation etc.
- All packaged food 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, transport, store, process, prepare, display or use the food products safely and correctly and that the lot or batch can be easily traced and recalled if necessary. This should also include information that identifies food allergens in the product as ingredients or where cross-contamination cannot be excluded as per FSS (Food Labelling) Regulations, 2011 & its amendment if any.

2. Consumer awareness and Complaint handling

- Information shall be presented to consumers in such a way so as to enable them to understand its importance and 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.
- The Food Business shall have a system to handle product complaints with identified person or people responsible for receiving, evaluating, categorizing, investigating and addressing complaints. Complaints shall be accurately categorized according to safety concerns and other regulatory concerns, such as labelling and shall be investigated by appropriately-trained technical personnel.
- Regular complaint data analysis can be utilized to reduce future customer complaints.

VI. Establishment–Training and Management

1. Awareness and Responsibilities

- The Food Business shall ensure that all personnel should be aware of their role and responsibility in protecting food from contamination or deterioration.
- They shall also ensure that all food handlers shall have necessary knowledge and skills to enable them to handle food hygienically. Those who handle strong cleaning chemicals or other potentially hazardous chemicals should be instructed in safe handling techniques.

2. Training Programmes

- Factors to be taken into account in assessing the level of training required includes:
 - The nature of the food, in particular its ability to sustain growth of pathogenic or spoilage micro-organisms;
 - The manner in which the food is handled and packed, including the probability of contamination;
 - The extent and nature of processing or further preparation before final consumption;

- The conditions under which the food will be stored; and
 - The expected length of time before consumption.
- The Food Business 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.
- FSSAI has provided an easy solution for training and certification through its initiatives of **Food Safety Training and Certification (FoSTAC) portal**. FSSAI recommends that all licensed food businesses must have atleast one trained and certified Food Safety Supervisor under FoSTaC for every 25 food handlers in each premise.
- Periodic assessments of the effectiveness of training as well as routine supervision and checks to ensure that food hygiene and food safety procedures are being carried out effectively.
- Training program should be developed with training calendar. Such training shall also include personnel who enter areas on a temporary basis (e.g maintenance workers, contractors).
- Systems should be in place to ensure that food handlers remain aware of all procedures necessary to maintain the safety and suitability of food. Records of training shall be kept.

3. Instruction and Supervision

- Routine supervision and checks to ensure that food hygiene and food safety procedures are being carried out effectively.

4. Refresher Training

- Training programmes shall be routinely reviewed and updated wherever necessary.

5. Management & Supervision

- The Food Business Operator shall supervise and monitor all operations appropriately. The type of supervision needed will depend on the size of the business, the nature of its activities and the types of food involved.

- FBO shall appoint a food safety team leader who, irrespective of other responsibilities, shall have the responsibility and authority.
- FBO shall appoint trained & competent managers and supervisors for management and supervision of food safety systems. Managers and supervisors should have the necessary knowledge and skills of food hygiene principles and practices to be able to judge potential hazards and take the necessary preventive and corrective action to remedy deficiencies.
- The FBO management shall provide and maintain documented standard operating procedure for FSMS systems compliance and its supervision at site through records/checklists on routine basis to control any possible hazards throughout supply chain.

VII. Audit, Documentation and Record Keeping

1. Self-Evaluation and Review

- A periodic audit of the whole system according to the written SOP of the FBO shall be done to identify/gaps for further improvement in the GMP&GHP system.
- The FBO shall conduct a self-evaluation process to verify the effectiveness of the implemented food safety system at periodic intervals though internal and external audits or other mechanisms, but atleast once in a year.
- FBO should also undertake a complete review of the systems including self evaluation results, customer feedback, complaints, new technologies and regulatory updates at periodic intervals, but atleast once in a year for continual improvement.
- Necessary corrective actions based on self evaluation results shall be taken.
- The FBO shall analyse the results of verification activities, including the results of internal and external audit and take necessary actions and to provide evidence that any corrections and corrective actions that have been taken are effective.

2. Documentation and Records

- A written food safety plan that includes a description of each of the hazards identified in the hazard analysis process, as well as the control measures that will be implemented to address each hazard, shall be prepared by food business operators.

- Appropriate documentation & records of processing, production and distributions shall be maintained in a legible manner, retained in good condition for a period of one year or the shelf-life of the product, whichever is more.
- The important records that shall be maintained include incoming material checks, inspection and testing, calibration of food safety equipments, water testing, operational controls (such as temperature, pressure, time etc.), product recall and traceability, storage, cleaning and sanitation, pest control, medical examination and health status of food handlers, training etc.

C. HACCP IMPLEMENTATION INCLUDING CRITICAL CONTROL POINTS

C. HACCP IMPLEMENTATION INCLUDING CRITICAL CONTROL POINTS

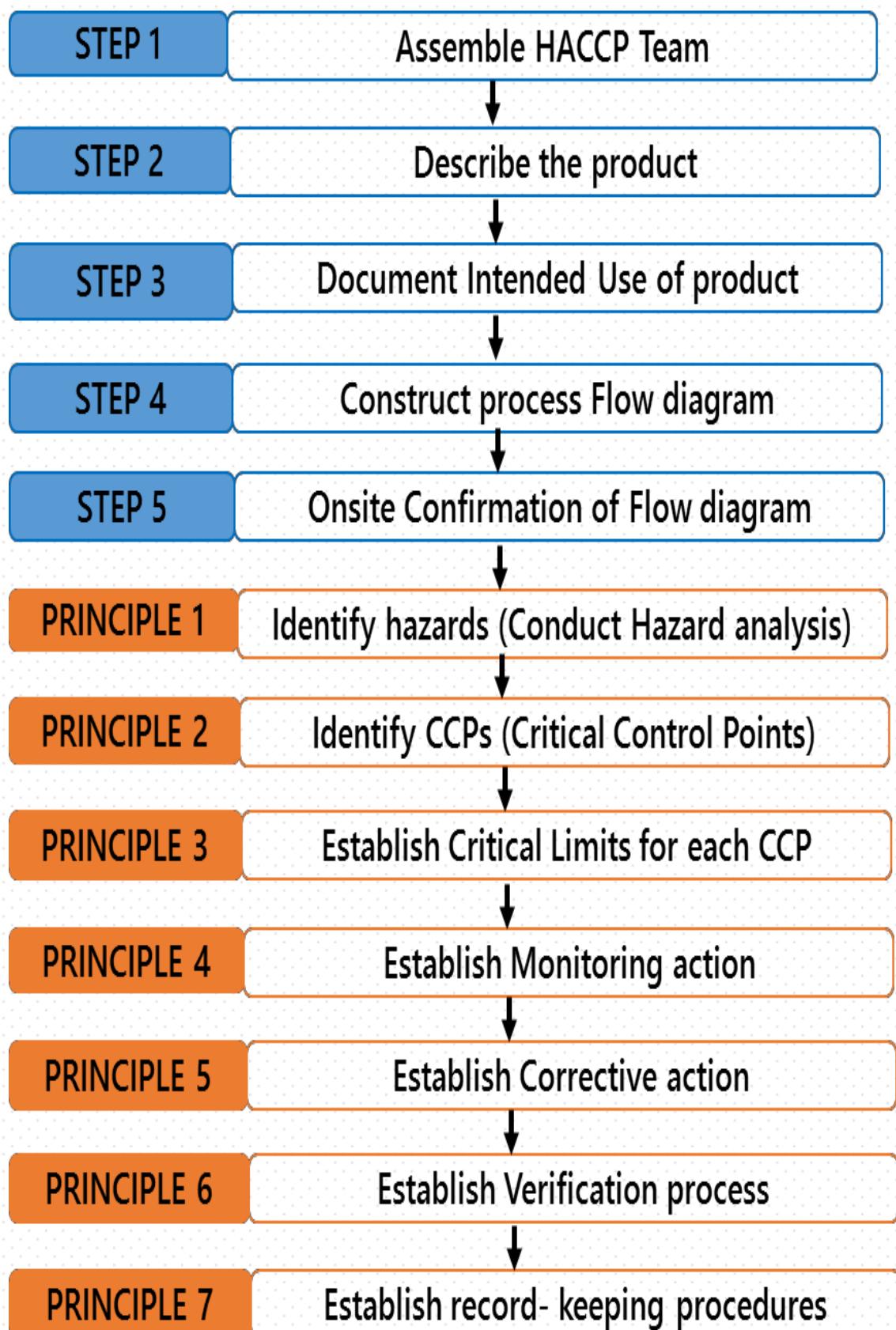
Implementing Hazard Analysis and Critical Control Point (HACCP) is crucial for any food manufacturing process. A HACCP plan covers the total supply chain, from inbound logistics, through storage, processing, sanitation and maintenance to the final use by the consumer. Across the operations, it must be 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. The requirements for Sanitation Standard Operating Procedures (SSOPs) along with Good Manufacturing Practices (GMPs) should be considered as Pre-Requisite for HACCP.

1. Introduction of HACCP

HACCP is not a stand-alone program but is part of a larger control system. HACCP is essential to carry out to identify the weakness of the production line and to suggest critical limits in compliance with legislation and therefore the preventive and corrective measures.

HACCP system was designed to aim zero defect products, 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. HACCP is a system which identifies specific hazard(s) (i.e. any biological, chemical, or physical property that adversely affects the safety of the food) and specifies measures for their control. A HACCP Plan consists of 5 initial steps and 7 major HACCP principles.



1.1 Risk assessment

Risk assessment is a critical step in a HACCP plan. Risk is the combination of the likelihood (probability) of Occurrence & Consequence(s) (sometimes referred as severity) of a specified hazardous event occurring.

So the risk is defined as:

$$\text{RISK} = \text{OCCURRENCE} * \text{CONSEQUENCE}$$

The following scales can be used for the measurement of the likelihood of Occurrence & the consequences; hence the risk as well.

Criteria for Likelihood of Occurrence					
Likelihood of Occurrence	Criteria			Rating	
	Frequency of occurring at least once in		Description		
	Routine job	Irregular job			
Very High	Daily	5 batches	Persistent, will occur if not attended to	5	
High	Fortnightly	50 batches	Frequent chance of occurrence	4	
Moderate	Monthly	100 batches	Occasionally could occur	3	
Low	Yearly	1000 batches	Relatively some chance of occurrence	2	
Remote	In 5 years	5000 batches	Unlikely to occur	1	

Consequence (Severity)		
Rating	Severity	Effect
5	Very High (Catastrophic)	Death
4	High (Critical)	Serious Illness
3	Moderate	Illness/Injuries
2	Low	Un-comfort
1	Remote	No injuries

Nature of Control over Risk

Rank of Risk	Risk Index Value	Level of Control	Significant
R1	16-25	Avoidance/Special Process	Significant Hazard
R2	9-15	Physical Control/Monitoring	Significant Hazard
R3	5-8	Formal Control	Non-Significant Hazard
R4	0-4	Informal Control / Training	Non-Significant Hazard

The level of risk could help to identify the level of control as per the following:-

R1: Avoidance:	Precluding the possibility of a given hazard, it may be the modification of the process if necessary.
R2: Physical Control:	Continuous control & monitoring of the actual physical process.
R3: Formal Control:	It is the management of the conditions of an operation to maintain compliance with documented criteria.
R4: Informal Control and Training:	It is the monitoring/check of the process without formal recording.
	It is the teaching of the staff responsible for the process about what is to be done in order to prevent the hazard.

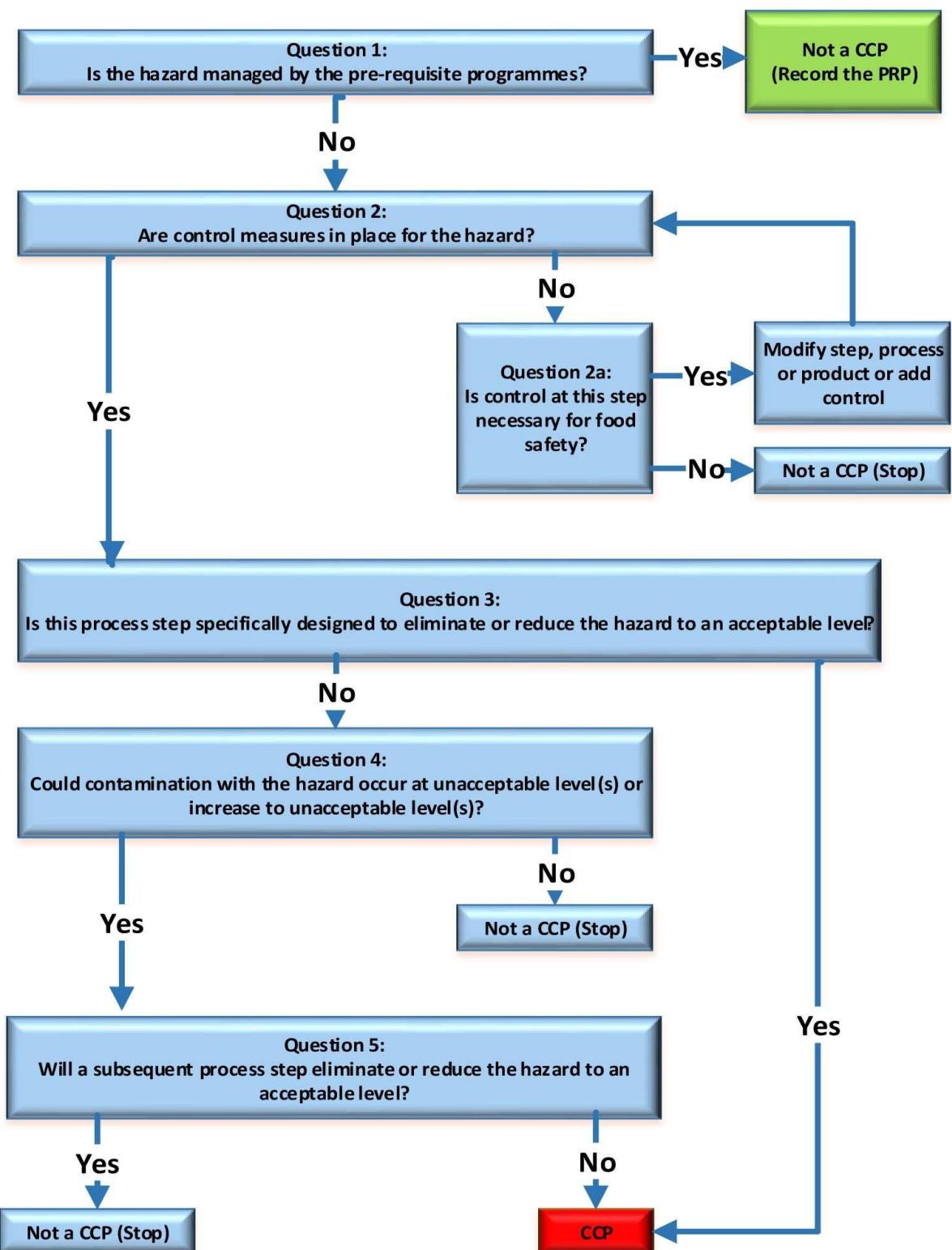
Below is a template to determine what severity and probability a processing step is involved with and therefore what level of criticality is holds in the processing line.

Probability/Likelihood		Consequence/Severity				
		How severe could the outcome be if the risk even to				
		Severe	Major	Significant	Minor	Insignificant
What's the chance of the risk occurring?	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

1.2 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 judgment 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.



2. Possible Hazards in Fruits and Vegetables Processing

Hazard Types

There are three primary types of hazards to consider when conducting a hazard analysis. They include the following: - Chemical Hazards; Physical Hazards & Biological Hazard.

Chemical Hazards

A wide variety of chemicals are used in food production and processing. Some chemicals, such as pesticides used in growing fruits & vegetables, cannot be removed by a subsequent process thus their control needs to be prior to the intake of the facility. This would normally be through controls in GAP (Good Agricultural Practices) or through product testing / rejection upon arrival.

However, there are chemicals in processing facilities and manufacturing plants that should be rigorously controlled. These include such items as **sanitizers, lubricants, pest control chemicals used** within a processing facility and water treatment additives, plus chemicals added to the manufacturing process for a specific process.

Types of chemical hazards found:

- Agricultural products, pesticides, fertilizers, antibiotics, other field chemicals
- Toxic elements, lead, mercury, and other heavy metals
- Added Chemicals
- Food additives, such as preservatives, flavor enhancers, color additives.

Physical Hazards

As the fruits and vegetable processing industries deals with field or comparable materials, one of the objectives for it is to remove physical hazards. Types of physical hazards include glass, wood, metal, plastic, soil and stones, personal items like jewellery, hair clips, other like paint flakes, insulation, sticks, staples, weed seed, toxic weeds.

Physical hazards usually result in personal injuries, such as a cut from glass or a case of choking from foreign materials. Controlling foreign objects in raw materials can be started by specifications, letters of guarantee and vendor inspection and certifications.

Hazards	Causes of Contamination (examples)
Foreign objects from the environment – soil, stones, sticks, weed seeds	<ul style="list-style-type: none"> ▪ Harvesting of ground crops during wet weather ▪ Dirty harvesting and packing equipment, picking containers, packaging materials ▪ Stacking of dirty containers on top of produce ▪ Broken lights above packing equipment and areas where produce is exposed ▪ Damaged picking containers, harvesting and packing equipment, pallets ▪ Inadequate cleaning after repairs and maintenance ▪ Untrained staff or Careless ▪ Inappropriate clothing
Foreign objects from equipment, containers, buildings and structures – glass, wood, metal, plastic, paint flakes	
Foreign objects from human handling of produce – jewellery, hair clips, personal items, staples used for closing packaging	

Biological Hazards

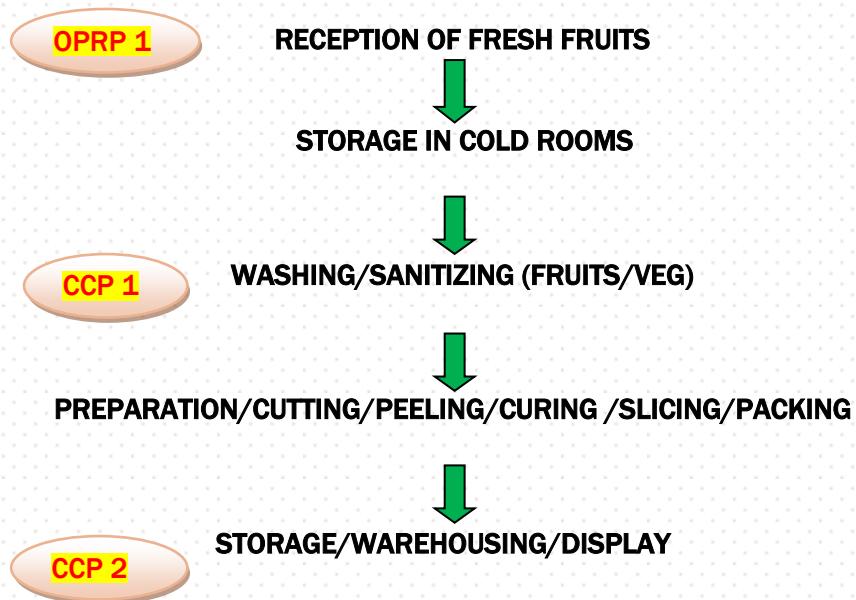
One of the greatest risks for illness or injury from food comes from microbiological hazards. For an illness to occur, the pathogen must be present in the food and must grow to high enough numbers to cause an infection or to produce toxin. The food must be capable of supporting growth of the pathogen and must remain in the growth temperature range long enough for the organism to multiply.

Common pathogenic bacteria that have been linked to contamination of fresh fruits & vegetable are:

Salmonella, Campylobacter species, Listeria monocytogenes, Bacillus cereus, E. coli, Aeromonas species, Clostridium botulinum, staphylococcus, Coliforms, Yeast, Molds, Aspergillus sp., Thermophiles & Mesophiles, Anaerobic microbes.

3. Process Flow Charts-Hazard Analysis

A. Process flow chart of Minimally processed/ Fresh Cut Fruits and vegetables



4. Hazard Analysis and Identification

Table-Hazard Analysis

(Note: This is only a reference model for Risk Assessment example. These may vary from plant to plant depending on risk assessment and process controls).

Process Step	Type of hazard	Description of hazard	Hazard Evaluation/Assessment			Control Measure
			Likelihood	Severity	Significance	
Receiving	P	<ul style="list-style-type: none"> -External contamination from rain water, Dirt/Dust, bird droppings, vermin/rodents and flying insects during in loading process. - Glass contamination from internal light sources. - Pests/rodents and or Flying insects due to poor hygiene/debris build up. -Contamination due to dirty crates. 	3	3	9	<p>Prerequisite programs in place to control all named hazards, include; Daily hygiene schedules and cleaning programs, glass policy and daily audits.</p> <ul style="list-style-type: none"> - External and internal Pest control programmes. - All light fittings covered. - Supplier Q.A.S systems and verified/audited to eliminate/ reduce potential foreign body or Microbiological contamination. Chemical/pesticide used at source in conjunction with Local regulations.
	C	<ul style="list-style-type: none"> - Chemical contamination due to cleaning agents. - Chemical adulteration 	2	3	6	As per SOP
	B	- Fungal growth	4	3	12	Incoming checks and compliance to specification.
Storage	P	<ul style="list-style-type: none"> Physical contamination from operatives. - Glass contamination from 	2	4	8	Prerequisite programs in place to control all named hazards, include; Daily hygiene schedules and cleaning programs, glass policy and daily

		internal light sources. Insects/ Pests/rodents and due to poor hygiene/debris build up.				audits, Pest control programs - Staff awareness/training programs in place with records of training.
	C	--	--	--	--	---
	B	Fungal growth	2	4	8	As per SOP & Routine storage checks of controlled temp condition
Washing and Sanitization of Raw Vegetable, Fruits.	P	Nil				
	C	Excessive chlorine	2	3	6	Training. Checking the chlorine dosage through test strips
	B	Survival of bacterial contamination	3	4	12	--Do--
Cutting	P	Physical contamination from operatives. - Glass contamination from internal light sources. -Insects/ Pests/rodents and due to poor hygiene/debris build up. -Fragment of knife/chopping board.	1	4	4	Prerequisite programs in place to control all named hazards, include; Daily hygiene schedules and cleaning programs, glass policy and daily audits, Pest control programs - Staff awareness/training programs in place with records of training.
	C	-residue of cleaning chemicals	1	3	3	Cleaning as per SOP, Training
	B	-Cross contamination from Knife and Chopping boards	3	3	9	Cleaning as per SOP, Training

Packing	P	Contamination by fragments of packaging. Contamination from dirty baskets/trays and hands. Contamination form air-borne contaminants.	3	3	9	Staff hygiene rules. Control of non food item in food area and storage of primary packaging material under controlled condition.
	C	Nil				
	B	Contamination due to dirty hands	3	3	9	Staff hygiene rules, Hand washing, Correct usage of disposal gloves
Storage/ Warehousing/Display	P	Nil				
	C	Nil				
	B	Bacterial Growth	3	4	12	Holding/Storage temp <5°C

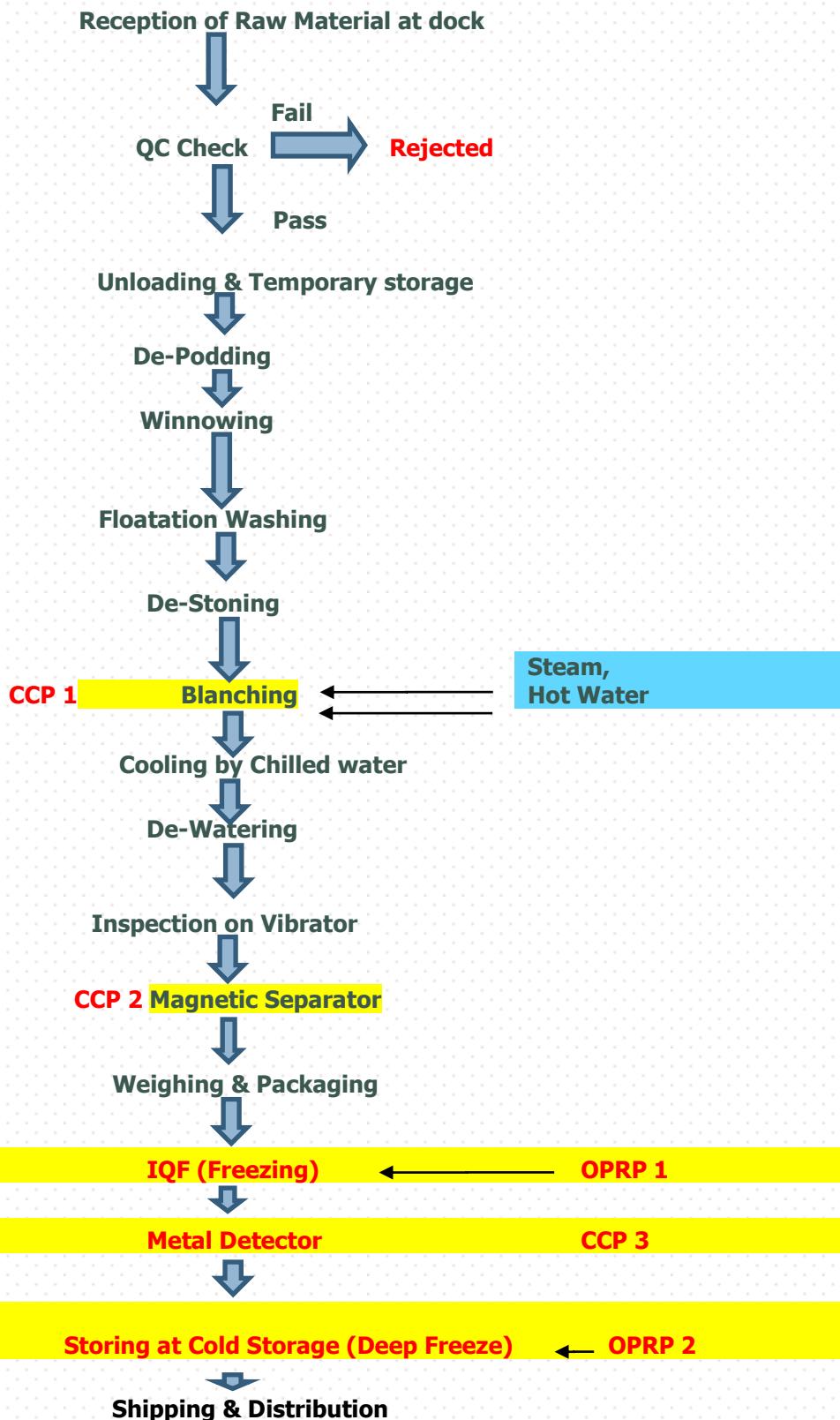
5. HACCP Plan

Table HACCP Plan: (Example for 2 CCP's)

OPRP	Hazard	Control Measures	Critical Limits	Monitoring				Correction	Corrective Action	Verification	Record
				What	How	When	Who				
OPRP 1 Receiving Fresh Fruits and Vegetables	- Microbial contamination. - Bacterial growth in the food.	Incoming checks	<ul style="list-style-type: none"> Approved supplier truck clean No fungus or rotten F&V 	<ul style="list-style-type: none"> Check for rotten or fungal infested F&V. Check condition of truck 	Visual observation	Each delivery	Receiver	Product: Sorting to be done.	Process: Head Receiving will inform to procurement team <ul style="list-style-type: none"> Revisit/inspect supplier Change supplier 	Audit of supplier premises as per risk associated	Receiving/delivery records Form of warranty
CCP 1 Washing & sanitizing fruits & vegetables	Training, Checking the chlorine dosage through test strips	<ul style="list-style-type: none"> Survival of pathogens due to incorrect sanitizer concentrations or inadequate contact time. Chemical contamination 	<ul style="list-style-type: none"> Use correct concentration and contact time <p>F&V products to be washed in 50ppm chlorine and time of 10 min</p>	Chlorine concentration of 50 ppm and time of 10 min	Use test strips	Each batch	QA	<ul style="list-style-type: none"> Rewash and test again if concentration is greater than 50ppm Product: Re-sanitize if concentration is less than 50 ppm 	Re-train staff to correct usage of chemicals	Chlorine concentration tests Internal audit reports	1) Chlorine tests concentration monitoring

		n due to high concentrations of chemical sanitizer.								
CCP 2 Cold holding	Growth of food poisoning bacteria	Holding cut F&V in holding unit maintains temperature 5°C or below. if Holding at ambient temp, then discard the product after 4 hrs if not consumed Storage & display in a clean chilled cabinet & trays	- Use a temperature setting that keeps food 5°C or below. Clean cabinet & trays	Product temperature Product protection and clean, sanitized equipment	Visual inspection Calibrated and sanitized thermometer	Measure product temperature every 4 hours Each batch	QA	<ul style="list-style-type: none"> Discard food that has been exposed to room temperature for more than 4 hours (Cumulative time). Process: If temperature of Cold Cabinet cannot maintain 5°C or below, contact maintenance and / Cooling technique and/or the amount of food in the unit. Inform QA 	Internal audits Microbiological sampling of finished products Calibration of thermometers	1) Temperature records 2) Thermometer calibration records 3) Microbiological test records

B. Process flow chart of Frozen Peas



Hazard Analysis & CCP Determination

(Note: This is only a reference model for CCP determination example. These may vary from plant to plant depending on process controls).

Sr.No	Process Step	Type of Hazard	Hazard Description	Hazard Assessment			Control Measure
				Probability	Severity	SIG.	
1.	Reception of Raw Material	Physical (P)	Frozen Matter & Diseased /Pest infected.	Low	Major	No	Inspection and sorting of foreign matter & diseased / pest infested pods.
		Chemical (C)	Pesticide Residue.	Medium	Major	No	Field staff should educate the producers on good agricultural practices (GAP) Specification control & periodic testing.
		Biological (B)	High pathogenic count.	High	Serious	No	Ensuring strict personnel hygiene. Pea Pods needs to be passed through chlorinated water after de-podding. Process control : Blanching & IQF
2.	Unloading & Temporary Storage	None					
3.	De-Podding	P	Foreign Matter	Medium	Minor	No	Effective cleaning of de-podder.

		B	Pathogenic Count	Medium	Minor	No	Strict plant & personal hygienic conditions are maintained. After de-podding peas should be pass through the chlorinated water
4.	Winnowing	P	Foreign Matter	Medium	Minor	No	Effective cleaning of winnower
5.	Floatation Washing	B	Microbial growth	Medium	Major	No	Chlorine treated water to be use by maintaining 3-5 ppm
6.	Blanching	B	Presence of active enzyme & survival of micro-organisms	High	Major	Yes	Blanching at 90 °C + 2 °C for 3 to 5 mins. Conformance of effective blanching may be done by performing peroxidase test.
7.	Chilling/Cooling	B	Microbial growth	Medium	Major	No	Treated water should be used.
8.	Inspection on Vibrator	P	Foreign matter	Medium	Minor	No	Effective manual sorting
		B	Pathogenic Count	Medium	Minor	No	Strict plant & personal hygienic conditions are maintained.
9.	Magnetic Separator	P	Presence of metallic pieces	High	Major	Yes	Proper maintenance of magnet & periodic checking of activity of magnets.
10.	Weighing & Packing	P	Foreign matter (Dust)	Low	Minor	No	Packing material should be stored hygienically

		C	Chemical (Residual effect of the plastic packaging material.)	Medium	Minor	No	Food grade packaging material should be used.
11.	Metal Detector	P	Metallic Pieces	High	Major	Yes	Proper maintenance of detector Verification need to be done at every 2 hours for effectiveness.
12.	IQF (Freezing)	B	Survival of Microorganisms	High	Major	Yes	Product outlet temp. should not be higher than (-)18°C. Product retention time should be minimum 6 mins.
13.	Cold Storage	B	Survival of Microorganisms	High	Major	Yes	Deep Freeze temp. should be ≤ -18 °C
14.	Shipping & Distribution	B	Rise in product temperature may lead to deterioration due to biological degradation	Medium	Minor	No	Reliable transport system with effective temp control need to be deployed.

Table: CCP Determination for Frozen Peas

(Note: This is only a reference model for CCP determination example. These may vary from plant to plant depending on process controls).

Process Step	Type of hazard	Hazard description	Q1a: Do control preventive measure (s) exist at this step? YES: Go to Q2. NO: Go to Q1b		
			Q1b: Is control at this step necessary for safety?		
			Q2: Is this step specifically designed to eliminate or reduce the likely occurrence of the hazard to an acceptable level?		
			Q3: Could contamination with identified hazard (s) occur in excess of acceptable level (s) or could these increases to unacceptable levels?		
			Q4: Will a subsequent step eliminate identified hazard (s) or reduce likelihood of occurrence to an acceptable level?		

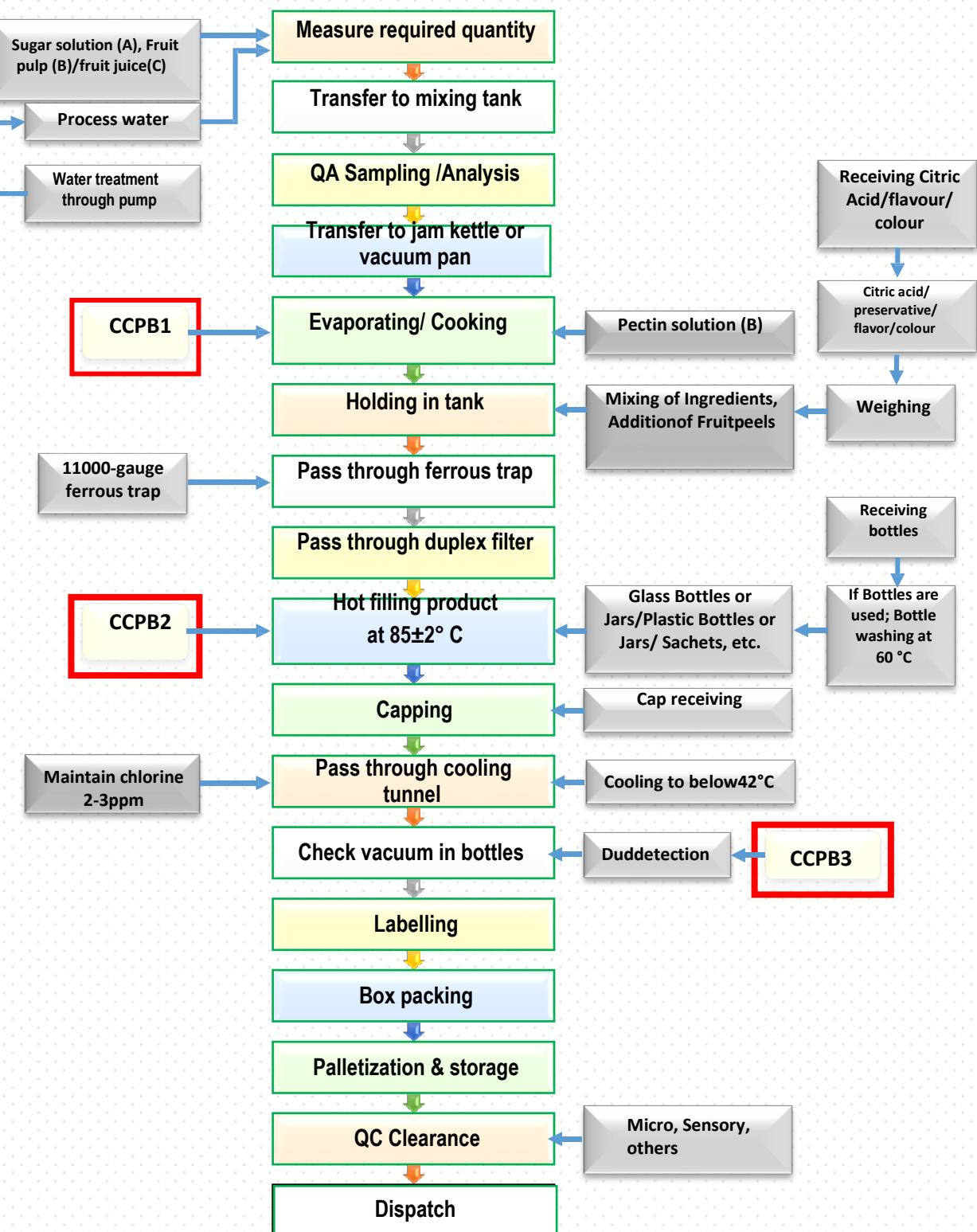
									CCP/OPRP
			Q1a	Q1b	Q 2	Q 3	Q4		
Blanching	B	Presence of active enzyme & Survival of micro-organisms	Yes		No	No	---		CCP 1
Magnetic Separator	P	Metal Objects	Yes		No	No	---		CCP 2
Metal Detector	P	Presence of metallic pieces	Yes		Yes				CCP 3
IQF	B	Survival of micro-organisms	Yes		No	No	---		OPRP 1
Cold Storage	B	Survival of micro-organisms	Yes		Yes				OPRP 2

HACCP Plan

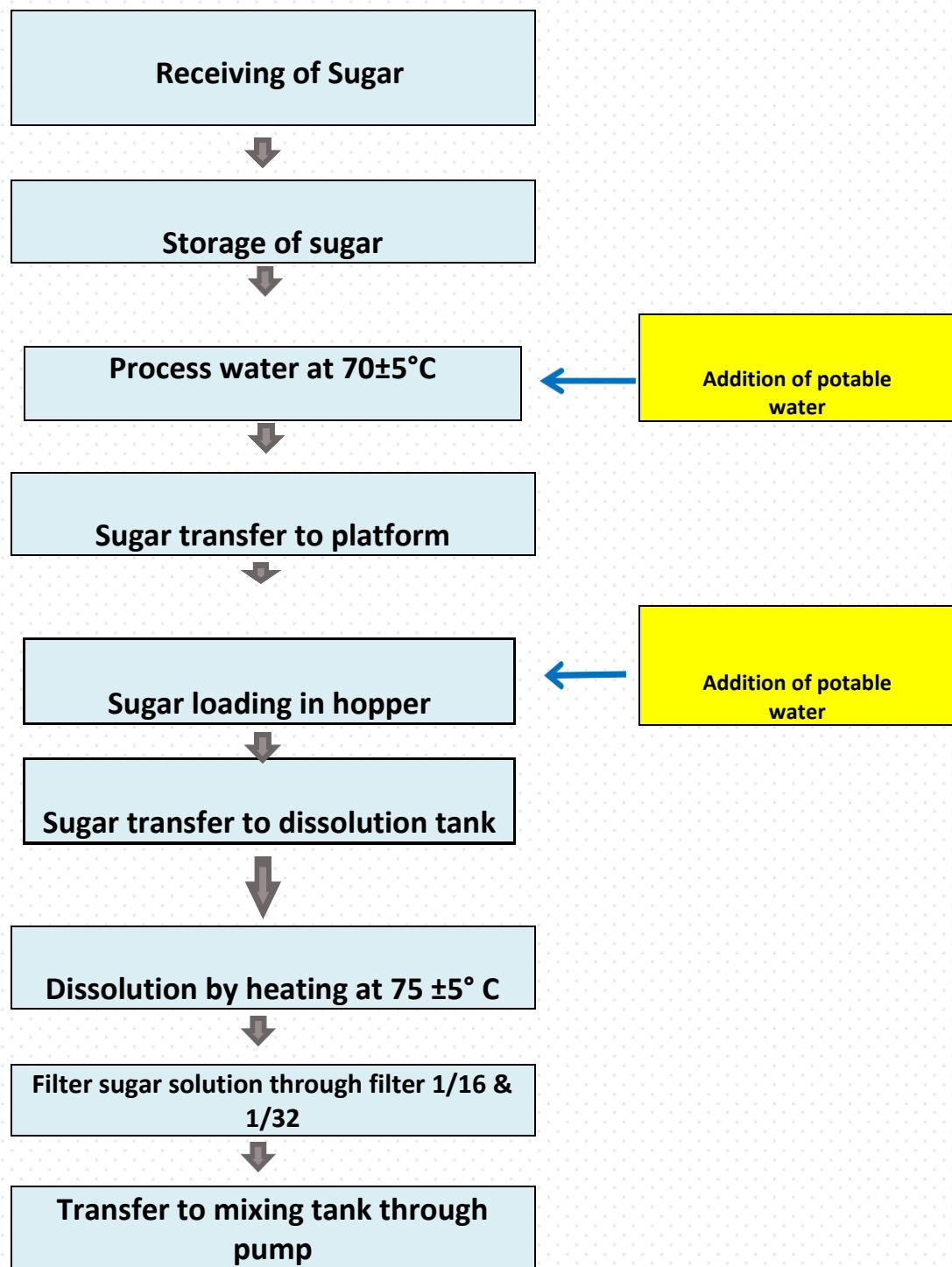
Table HACCP Plan :(Example for 3 CCP's)

CCP No	Activity	Hazard Description	Monitoring parameter	Critical Limits	Monitoring		Corrective actions	Responsibility	Record	Verification
					Procedures	Frequency				
CCP 1	Blanching	Presence of active enzyme & Survival of micro-organisms	Blanching temperature	90 °C + for 3 to 5 mins.	As per SOP		Immediate action to maintain Temp	Quality person	Temperature record sheet.	Monitoring of Temperature record, standard calibration and record of thermometer
CCP 2	Magnetic separator	Presence of metallic pieces	Detection of test metals		By passing the product through the magnetic separator	Every 2 Hours	Isolate lot Re-scan Troubleshoot process line to identify source of metal and address it.	Quality person	Metal detection record book	Screening of test samples
CCP 3	Metal Detector	Metallic Pieces	Detection of test metals	Fe-1.8mm Non Fe-2.2mm S.S-2.8mm	By passing the product through the metal detector	Every 2 Hours	Isolate lot Re-scan through metal detector Troubleshoot process line to identify source of metal and address it.	Quality person	Metal detection record book	Screening of test samples

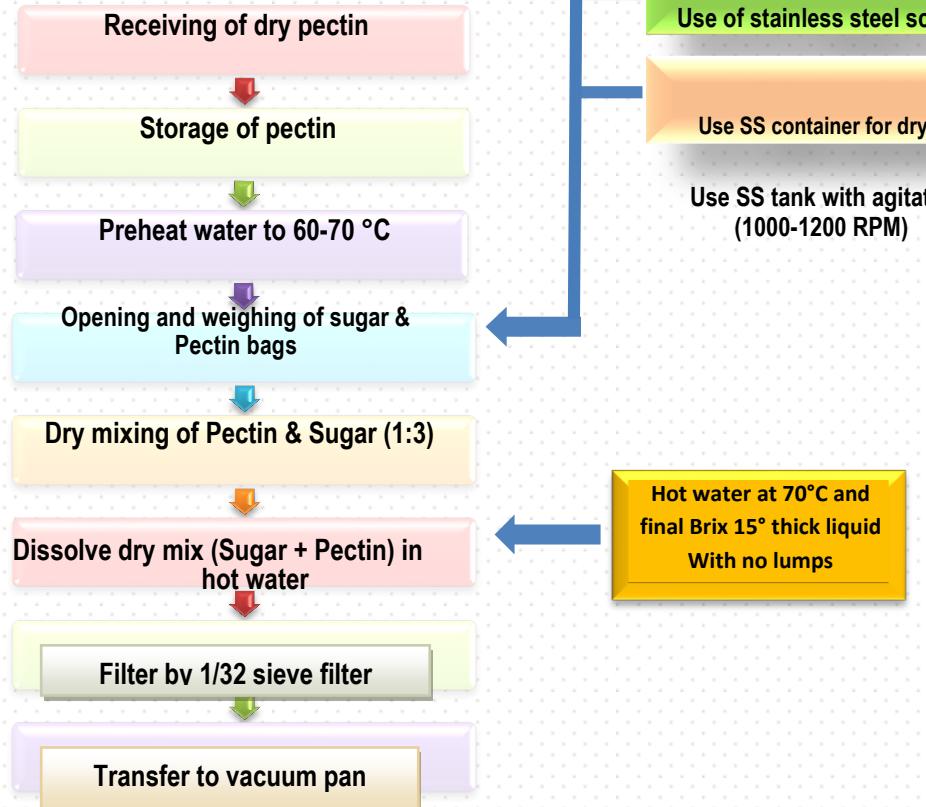
C. Process flow chart of Jam/Jellies/Marmalade preparation



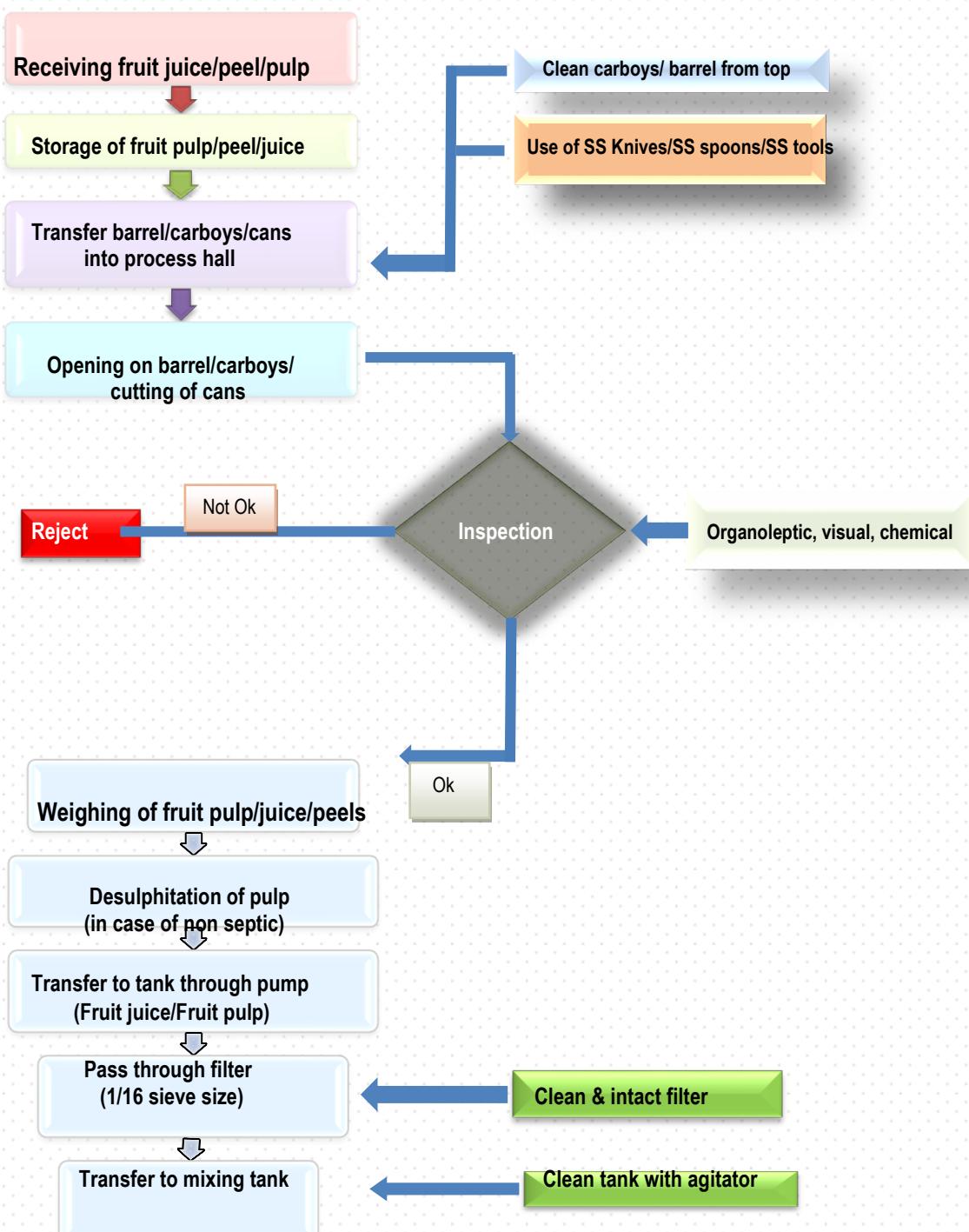
D . I . Sugar syrup dissolution



D.II.Dissolution of dry pectin



D.III. Fruit pulp/fruit juice*/fruit peels*inspection and transfer



Fruit juice*used in jellies
Fruit peels*used in Marmalade

Hazard Analysis and Identification

Table-Hazard and CCP Identification-Example-Sugar syrup dissolution

(Note: This is only a reference model for CCP determination example. These may vary from plant to plant depending on process controls).

Process Step	Hazard Type	Potential hazard	Likelihood	Severity	Risk	Preventive Measure	Q1	Q2	Q2A	Q3	Q4	Q5	CCP Y/N	Reason for decision
Sugar syrup filtration	Physical	Probable come across of extraneous matter, etc. due to damaged filters.	L	H	L* H	Filtration through sparkling filter 1/32&1/16	N	Y	-	N	Y	Y	Not CCP	Ensure intact filter by monitoring at defined frequency
	Chemical	NA	NA	NA	NA	N A	-	-	-	-	-	-	NA	-
	Biological	NA	NA	NA	NA	N A	-	-	-	-	-	-	NA	-

HACCP Plan

Table HACCP Plan: (Example for 2 CCP's)

			Monitoring					Corrective action		Verification	Records
CCP	Hazard Description	Critical Limit	What	How	When	Where	Who	Correction	Long Term Action		
CCP— Evaporating /Cooking	Probable microorganism's contamination due to ineffective cleaning or low cooking temperature. Visual effects are seen like colour deterioration if cooking temp. is very high beyond limits.	Cooking Temp. 87 to 90°C (Documentation of validation of critical limit to be made available)	Temperature	Display at unit and record in log sheet	Every 4 hrs	Production	Supervisor	Stop machine when deviation in cooking temperature parameter is observed. Empty out filler and again heat the Product. Inform QA immediately for segregation of product. Analyse (visual and microbiologically) product for rework or dispose off.	Investigate and detect the cause of temperature of failure. After that again clean unit. Cook and start filling. Responsibility :QA Manager	When: production log sheet on daily basis. How: check log sheet What: Temperature Who: QA Executive Where: Production	QA microbiology records, Calibration Records, Production log sheet

CCP Filling	Probable survival of vegetative pathogens microorganisms due to low filling temperature in glass bottles Visual effects are seen like colour deterioration if cooking temp. is very high beyond limits.	Filling temp. $85\pm2^{\circ}\text{C}$ (Documentation of validation of critical limit to be made available)	Temperature	Display at filling unit and record in log sheet	Every 1 (one) hr.	Packaging	Supervisor	<p>Stop machine when deviation in cooking temperature parameter is observed.</p> <p>Empty out filler and again heat the product.</p> <p>Inform QA immediately for segregaton of product.</p> <p>Analyse (visual and microbiologica l) product for rework or dispose off.</p>	<p>Investigate and detect the cause of temperature of failure.</p> <p>After that again clean unit. start filling.</p> <p>Responsibility :QA Manager</p>	<p>When: production log sheet on daily basis.</p> <p>How: check log sheet</p> <p>What: Temperature</p> <p>Who: QA executive</p> <p>Where: Production dept.</p>	QA microbiology records, Calibration Records, Production log sheet
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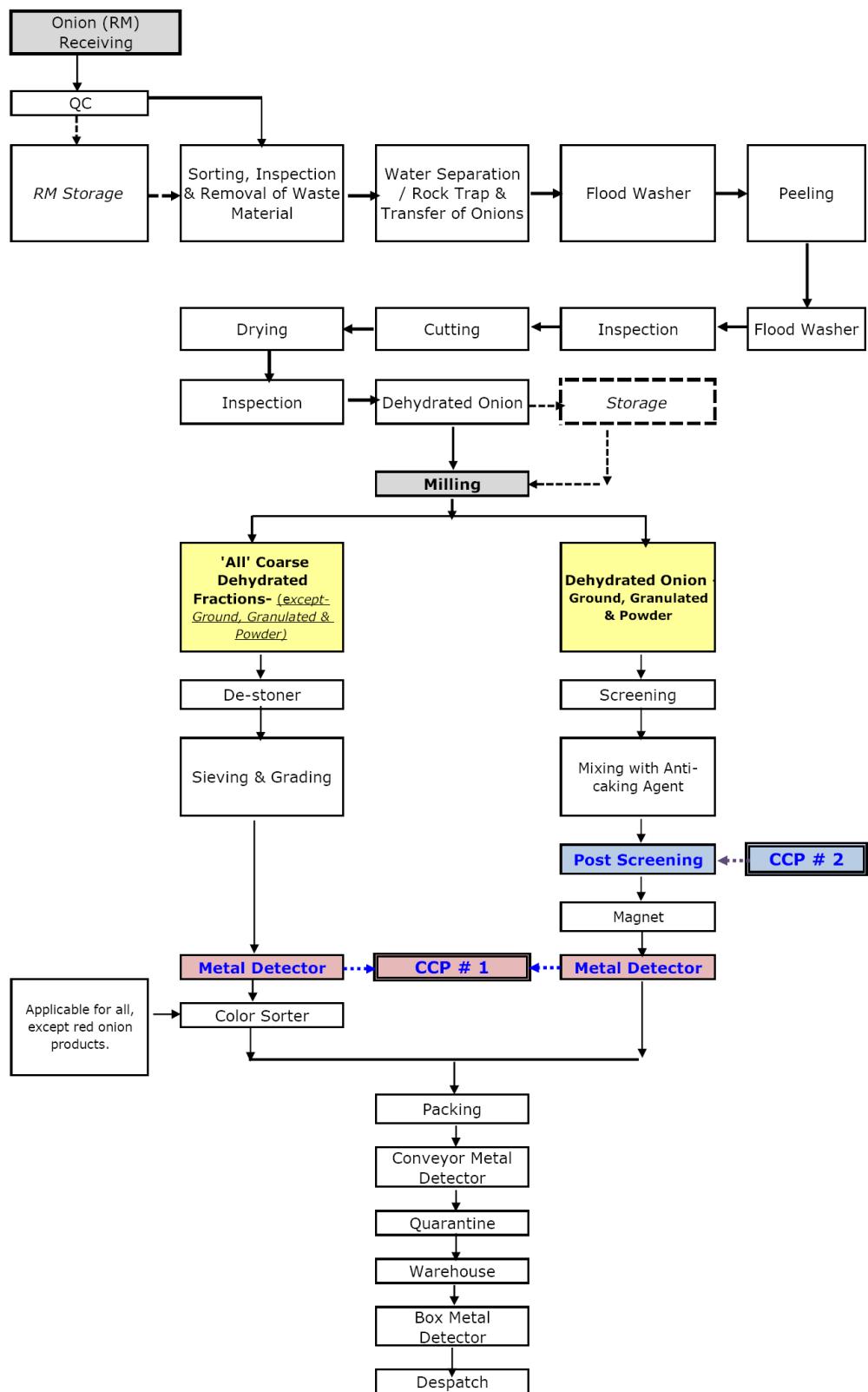
HACCP Plan

Table HACCP Plan: (Example for 2 CCP's)

			Monitoring					Corrective action		Verification	Records
CCP	Hazard Description	Critical Limit	What	How	When	Where	Who	Correction	Long Term Action		
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D. Process flow chart of Dehydrated Onion products



HACCP Plan

Table HACCP Plan :(Example for 2 CCP's)

CCP/Process Step	Hazard Description	Limit(s)	Monitoring				Corrective action	Verification	Records
		Test piece sensitivity	How	Frequency	Where	Who	Corrective action		
CCP 1: Metal Detector. Product passing through Metal Detector	Physical – Metal, Metal dust.	Fe : 0.4 mm, Nfe : 0.5 mm, S.S : 0.7 mm Fe : 1.0 mm Nfe : 1.2 mm S.S : 1.5 mm Test piece must get rejected in all three consecutive attempts of checking.	All these three "Test Pieces" must get rejected in all three consecutive attempts, when passed through metal detector along with the product	During each start and at switch off the unit	Milling	QA	(A) Stop process line & Metal detector. Repair/correct the metal detector then check again with the test pieces. (B) Segregate the material from the last OK-check to immediate next OK-check and Re-Pass the segregated product through repaired/corrected/OK Metal detector.	What: a). Record of checking of metal detector. b) Milling operation log sheet. When: Day to day while milling is running. Who: Incharge milling/Food safety. In case of deviation : Incharge QA	Metal detection record book

CCP 2 : Post Sifter (Integrity of sieves) Post Sifting : After blending	Physical - Foreign matter	Intact and Un-damage sieve(s) of post sifter(s)	Visual	1) Once in shift and 2) During each start and at the switched off the unit.	Milling	Shift In charge/ Supervisor (milling)	(A) Replace the damaged sieve. (B) Product : Segregate the product from last OK status to immediate next OK status of post sifter sieve & repass the segregated material through undamaged post sifter sieve	When: day to day (@plant running) How: check log sheet What: Milling log sheet Who: In charge (milling)/Food Safety/Plant in charge) & In case of deviation: In charge QA, Food Safety/Executive QA, Food safety.	Milling log sheet
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E. Process Flow chart for Aseptic Mango Pulp



HACCP Plan

Table HACCP Plan :(Example for 2 CCP's)

Step	Hazard	CCP	Control Measure	Limit				Monitoring	Corrective action	Verification			
				Fruit	Feed Rate (Mt / Hr)	Temperature Deg. C.							
						Critical Limit	Action Limit						
Sterilization	B Survival of Micro-organisms due to improper sterilization	CCP-A-1	Pre-sterilization of equipment	All fruits	--	121°C Min. Minimum 30 minutes	127°C Min. Minimum 30 minutes	What - Temp & Feed rate	Fresh cycle CIP and Sterilization starts.	1. What - Aseptic System Log sheet & Chart record			
			sterilization of product	Natural Mango	1.5-5.0	Minimum 94°C	98-120°C	Where - Aseptic panel How - From display of temperature and feed rate When - Continuous on chart recorder during processing / production log sheet (recorded every hr). Who - Supervisor, Operator	Product - The product in the sterilizer goes to drain. CIP and resterilization of system will be done For deviation on Action Limit :- Increase temp. or reduce feed rate to maintain the temperature. Who - Supervisor / Shift Incharge Production	Who - In-charge / Shift In-charge (Production) How - Visual Checking of chart / record When - Next day / once every shift 2.What Temperature guage / feed rate controllers calibration. Who - Production / R&D lab. How - Calibration of temp guage / feed rate controllers. When - Every six months. 3. Each batch of every product is tested for various microbiology parameters at R&D lab.			

Filling (Filling Chamber Temperature)	B Post contamination through equipment	CCP-A-2	Sterilization of equipment	Sterilization programme is defined. These temperature and time periods are also documented in the machine manual Temp TP1 : 122°C - 129°C / 251°F - 275°F Temp TP2 : 122°C - 129°C / 251°F - 275°F Time - 30 min.	What -Temperature & time How - Display Where - Machine panel When - Continous display / recording in production logsheet Who - Machine programmed to generate the recording / production log sheet (recorded every hr)	Machine is programmed to: a] Go into auto shut off mode in the event of any of the set parameter not being achieved. b] Start sterilization programme again. Who - Supervior / Shift Incharge (Production)	1. What - Aseptic filler report (CCP-A-2) Who - Incharge / Shift In-charge Production. When - Once every day How - Visual
				Sterilization programme is defined. These temperatures are recommended in the machine manual During production,filling head temperature Temp TP1 : 95°C-102°C / 203°F-216°F Temp TP2 : 95°C-102°C / 203°F-216°F	What -Temperature How - Display Where - Machine panel When - Continuous display / recording in production log sheet Who - Machine programmed to generate the recording / production log sheet (recorded every hr)	Machine is programmed to: a] Stop filling on particular head when temp fall below limit. b] Start Sterilization programme again of the head. Who - Supervior / Shift Incharge (Production)	2. What - Temperature guage / feed rate controllers calibration. Who - Production / R&D lab. How - Calibration of temp guage / feed rate controllers. When - Every six months4. Each batch of every product is tested for microbiology at R&D lab

D. ANNEXURES

Annexure 1: FSMS Related Document & Record Templates

1. MANDATORY

1.1 Medical Fitness Certificate for Food handlers (Template)

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.

1.2 FORM E

Form of Guarantee

(Refer Regulation 2.1.14(2))

Invoice No.

Place:

From:

Date:

To:

Date of sale Nature and quality of article/brand name, if any Batch No or Code No. Quantity Price

1

2

3

4

5

**I/We hereby certify that food/foods mentioned in this invoice is/are warranted to be
Of the nature and quality which it/these purports/purported to be.**

Signature of the manufacturer/Distributor/Dealer

Name and address of

Manufacturer/Packer

(in case of packed article)

License No. (wherever applicable)

2. Recommandatory Performas

2.1 Utensil Monitoring record (Template)

S. No.	Item number	Item placed at	Condition (OK/Not OK)	Correction done	Remarks

2.2 Approved Supplier List (Template)

S. No.	Item/Material Name	Location of Use	Primary Approved Supplier(Name &complete address)					Secondary Approved Supplier (Name &complete				
			Complete Address	Contact Person	Contact No.	Email id	Fax	Complete Address	Contact Person	Contact No.	Email id	Fax

2.3 Incoming Material Inspection Template

Includes all type: Raw materials, Ingredients, Food additives, Processing aids, Packaging materials, Cleaning and sanitation chemicals, etc.

Material Name:		
Supplier Name:		
Identification/Location of Supplier:		
Quantity received:		
Pack size received:		
Material Receipt Date:		
Transport Mode:		
Rejected(Yes/No):		
Reason for Rejection:		
PARAMETER EVALUATED	STATUS/RESULTS	Signature
Temperature (Degree Celsius)		
Visual Inspection Condition(OK/Not OK)		
Packaging &Labelling Condition(OK/Not OK)		
Production Date/Shelf Life Date/Expiry Date		
Vehicle Inspection Condition (OK/Not OK)		
Quality Lab Results (Ifapplicable)		
Certificate Of Analysis(COA) received (Yes/No)		
Remarks		
ClearanceDate		
Authorized Signatory		

2.4 Incoming Vehicle Inspection Record (Template)

Date of Incoming Vehicle:	Vehicle Type:	Material in Vehicle received:	Number of Persons accompanying Driver:
PARAMETER	EVALUATED	REMARKS	
Security lock			
Type of carrier (full covered/Open Roof)			
Mode of covering products(in case of Open Roof)			
Overall Hygiene in the interior			
Overall Hygiene on the exterior			
Any			
Any pests detected			
Any grease/oil detected			
Authorized Signature			

2.5 Product Release Record (Template)

Name of Product:	
Date of Manufacturing:	
Time of Manufacturing:	
Batch/Lot No.:	
Best Before/ Expiry Date:	
Quality Acceptance	
Analytical	
Microbiological	
Sensory	
Others, if any	
Quality Lab signature	

2.6 Non-conforming Material/Product (Template)

HOLD:	<input type="checkbox"/>	REJECT:	<input type="checkbox"/>
Material Type:			
Finished Product	Raw Material		
In-Process Product	Packaging Material		
Material Name:			
Date of Manufacturing/Receipt:			
Quantity of Manufacturing/Receipt:			
Lot/Batch No.			
Quantity used:			
Lot/Batch No.			
Quantity Hold:			
Lot/Batch No.			
Quantity Rejected:			
Lot/Batch No.			
Reason for Hold:			
Reason for Rejection:			
Rectification Measure:			
Preventive Action:			
Remarks:			
<i>Signature:</i> QC Executive		Quality Manager Mfg/Production Manager	

2.7 Outgoing Vehicle Inspection Record (Template)

Date of Outgoing Vehicle:		
Vehicle Type:		
Material in Vehicle to be dispatched:		
Date of : Time of		
Manufacturing:		
Batch/Lot No.:		
Number of Persons accompanying Driver:		
PARAMETER EVALUATED		REMARKS
Security lock		
Type of carrier (full covered/Open Roof)		
Mode of covering products(in case of Open Roof)		
Overall Hygiene in the interior		
Overall Hygiene on the exterior		
Any sharp edges /points in the interior of vehicle		
Any pests detected		
Any grease/oil detected		
Authorized Signature		

2.8 Product Recall record (Template)

S. No.	Date of Complaint	Nature of Complaint	Results of Investigation	Product/ Batches& Quantity recalled	Mode of Disposal

2.9 Product Identification & Traceability (Template)

Traceability Detail Format				
Product Description				
Plant Name:		Manufacturing Date:		
Product Name:		Manufacturing Time:		
Pack Size:		Batch/Lot no.:		
Traceability Details				
Investigation Date:		Investigation Time End:		
Investigation Time Start:		Total Time Taken:		
A. Cleaning Details				
EquipmentName	Date	Time	Person responsible	Remarks
B. Raw Material Details				
Material Description	Remarks			
Name		Batch/Lot No.		
C. Utility Details				
Chemical/Material Description	Remarks			
Name		Batch/Lot No.		
D. Primary Packaging				
Material Description	Remarks			
Name		Batch/Lot No.		
E. Manufacturing Details				
Date	Shift	Cases Manufactured	Compliance	Remarks
F. QC Details				
Date	Shift	QC compliance	Product blocked, if any	Remarks
G. Dispatch Details				
Invoice No.	Date of Dispatch	Quantity Dispatched= Total produced- (Rejected+ Control samples+ Warehouse retained)	Dispatch Destination	Remarks

2.10 List of Monitoring & Measuring Devices and Records of Calibration (Template)

2.11 Equipment Breakdown Maintenance report (Template)

Date:		Period of Report:					
S. No.	Name/Code No. of the Machine/ Equipment	Location	Nature of Breakdown	Details of repairs carried out	Breakdown Period	Work Done by	Remarks

2.12 Preventive Maintenance Schedule (Template)

2.13 Pest Management Plan (Template)

Type of Pest	Mode of Control	Station (locations) monitored	Number designated	Frequency of Monitoring	Remarks

2.14 Pest Monitoring record (Template)

Date	Type of Pest	Mode of Control	Station (locations) monitored	Number designated	Frequency of Monitoring	Clean (ok/Not ok)	Remarks	Sign

2.15 Waste Disposal Record (Template)

S. No.	Amount of waste						Daily disposal (Yes/No)
	Chemical/ Hazardous waste	Food material waste	Package material waste	Other waste (Dry)	Other waste (Wet)	%of total waste	

2.16 Pre-employment medical record (Template)

Name of Candidate: Father's name: Address: Date of Birth: Designation applied For: Age: Name of hospital/laboratory tested: Medical Examination	
Heart : Chest : Abdomen: Blood Pressure: Eye Sight : C.N.S. :	Blood Group : Blood Sugar : Haemoglobin : T.L.C. : D.L.C.: P L M E
X.Ray Chest: E.C.G.:	Urine Examination: Stool:
Final Medical Report:	
Signature of Candidate Reg. No .of the Medical Examiner:	Signature of Medical Examiner:

2.17 Regular Medical Checkup record (Template)

Name of employee:	
Date of medical test conducted:	
Next Medical test due on:	
Name of hospital/laboratory tested:	
Tests done for:	
Status of acceptance (Yes/No):	

2.18 Monitoring of Personnel hygiene (Template)

Date:															
S. No.	Employee Code	Employee name	Area of work	Hand wash, sanitize (and Gloves where necessary)	Clean & trimmed Nails	No open Wounds	No Jewellery	Covered Hair	Clean outer garments / protective clothing	Clean Shoes/ shoe covers	Infectious Disease /Skin infection / Allergy, if any	No Tobacco/ Smoking / Chewing	Overall Hygiene Status upon examination(Yes/No)	Action needed on non-compliance	Re-examination status (Yes/No)
1															
2															
3															
4															
12															
13															
14															
<i>Jewellery</i> wristwatches, cufflinks, earrings, glass bangles, stickbindis															

2.19 Visitor Record (Template)

Date of visit:	
Time of entry:	
Time of exit:	
Name of visitor:	
From(location):	
Whom to meet:	
Purpose of visit:	
Type of visitor:	<p><i>Please Tick:</i></p> <p>Type I(Critical areas: Internal processing areas)</p> <p>Type II(Outside processing areas)</p> <p>Type III(Office areas)</p>
Any Allergy/Infectious disease declaration:	
Belongings description:	
Signature of visitor:	
Signature of Security in-charge:	
Signature of person visited:	

NB: Pls adhere to all the food safety and quality; and company policies and rules during your visit

2.20 Product Information (Template)

S. No.	Description	Specifications
1	Product Category/Name	
2	Composition (Raw materials, Ingredients, etc.)	
3	General & Specific product specification	
4	Legislative requirements, Customer requirements	
5	Storage	
6	Labeling	
7	Transportation	
8	Product Shelf-life	
9	Packaging material	
10	Hazardous for any group of customers	
11	Food Category	
12	INTENDED USE	

2.21 Customer/Consumer Complaint Log (Template)

Complaint Number:			
Date:	Time recorded:	am	pm
Quality related:	<input type="checkbox"/>	Food safety related:	<input type="checkbox"/>
Customer Details			
Customer Name:			
Phone:			
Address:			
State/Province:			
Email:			
Product Consumed			
Product name:			
Batch Code/Lot no.:			
Package size:			
Location of purchased:			
Date of purchase:	Date consumed: _____		
How was the product stored?			
Nature of Complaint			
Foreign object	<input type="checkbox"/>	Off/Unsatisfactory Flavor	<input type="checkbox"/>
Packaging	<input type="checkbox"/>	Illness	<input type="checkbox"/>
How many people consumed?	Ages? _____		
Problem Information: _____			
Has the Customer Seen a Doctor?	Gone to Hospital?		
Spoken to a public health?	Contacted Regulatory Agency?		
Comments & follow-up action: _____			
Feedback from client- Status or date finalized			

2.22 Determination of Customer Satisfaction (Template)

We would like to know how well we are succeeding in meeting your needs. Following is the questionnaire about what you wanted from us. Answers will be treated with complete confidentiality. Please answer the questions using the scale (Please TICK that you choose).

('1' being the worst score; '5' being the best score)

S.No.	QUESTIONS	SCORE	1	2	3	4	5
1	How well do we communicate with you?		1	2	3	4	5
2	Do we give you the information you need?		1	2	3	4	5
3	Do we answer your queries promptly?		1	2	3	4	5
4	Do we respond positively to your problems &suggestions?		1	2	3	4	5
5	Do you feel we have a concern for quality & food safety?		1	2	3	4	5
6	Do we deliver quality & safe products consistently and on time?		1	2	3	4	5
7	Do we anticipate your needs?		1	2	3	4	5
8	Have we increased your understanding of quality & food safety?		1	2	3	4	5
9	Do we work with you as a team?		1	2	3	4	5

Any other comments?

Name and Address

2.23 Training Need Identification (Template)

Name of employee:	Date of Joining:
Qualification:	
Designation:	Department:
Key Responsibilities:	
Training(s) Required	
1 Managerial	
2 Technical	
3 On the Job	
4 General/Others	
Suggested Training institutions(applicable for external trainings):	
Any other suggestions:	
Signature of Dept. Head:	
Below topics of training to be determined, but not limited to:	
1 Food safety policy 2 Food safety objective and targets 3 Actual or potential significant environmental impacts and unacceptable risks of the work activities 4 Food Safety and hygiene related issues 5 Compliance to legal requirements 6 Roles and responsibilities of employees to ensure effective implementation of food safety 7 Operational Control procedures 8 Emergency Preparedness and response requirements 9 Potential effects of deviation from documented procedures	

2.24 Training Record (Template)

Date of Training: Conducted By: Subject of Training: Brief summary of the subject: Duration of Training:				
S.No.	Name of person trained	Functional area	Remarks	Signature
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

2.25 Training Effectiveness record (Template)

Date of Training: Subject of Training: Brief summary of the subject:							
S. No.	Name of person trained	Functional area	Pre-evaluation result	Post-evaluation result	Effectiveness status (Yes/No)	Comment on effectiveness	Signature of trainee
1							
2							
3							
4							
5							
6							

Effectiveness can be based on: Improvement in quality of work, Improvement in work output, Behavioural change, Overall usefulness of training, etc.

2.26 Training Calendar (Template)

S. No.	Topic of training	Month/Year:											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1													
2													
3													
4													
5													
6													

2.27 Internal Audit Schedule (Template)

Date of Audit:					
Standard of Audit:					
S. No.	Process Area	Auditee(s)& Functional Department	Auditor(s)& Functional Department	Date	Time
1	Store areas-Raw material, ingredients, chemicals, finished product				
2	Production/Manufacturing Area				
3	Housekeeping, Cleaning& Personal Hygiene				
4	Preventive Maintenance				
5	Internal Laboratory				
6	Management functions				
7	Packaging & Dispatch area				
8	Documentation				
9	Human Resource& Training				
10	Others				

2.28 Internal Audit Observation & Non- conformance report (Template)

2.29Internal Audit Plan (Template)

Annexure 2: Inspection Checklist

Date		FBO Name	
Food Safety Officer		FBO's representative	
FBO License No.		Address	

Indicate the following—Compliance(C), Non-Compliance (NC), Partial Compliance (PC) or Not Applicable (NA)

Sl. No.	Audit Questions	Scoring
1	Food establishment has an updated FSSAI license and is displayed at a prominent location.	2
	Design & facilities	
2	The design of food premises provides adequate working space; Permit maintenance & cleaning to prevent the entry of dirt, dust& pests.	2
3	The internal structure &fittings are made of non-toxic and Impermeable material.	2
4	Walls, ceilings &doors are free from flaking paint or plaster, condensation & shedding particles.	2
5	Floors are non-slippery & sloped appropriately.	2
6	Windows are kept closed & fitted with insect proof screen when opening to an external environment.	2
7	Doors are close fitted to avoid entry of pests.	2
8	Equipment and containers are made of non-toxic, impervious, non-corrosive material which is easy to clean &disinfect.	2
9	Premise has sufficient lighting.	2
10	Adequate ventilation is provided within the premises.	2
11	Adequate storage facility for food, packaging materials, chemicals, personnel items etc available.	2
12	Personnel hygiene facilities are available. (Adequate number of hand washing facilities, toilets, change rooms, rest & refreshment room etc).	2
13*	Potable water (meeting standards of IS:10500) is used as a product Ingredient or in contact with food or food contact surface &tested for quality semi-annually. Check for records.	4
14	Food material is tested either through internal laboratory or through an accredited lab. Check for records.	2
	II Control of operation	
15	Incoming material procured as per internally laid down specification &from an approved vendor. Check for records (like specifications, name and address of the supplier, batch no., quantity procured etc).	2
16	Raw materials are inspected at the time of receiving for food safety hazards.	2

17	Incoming material, semi or final products are stored according to their temperature and humidity requirement, in a hygienic environment. FIFO & FEFO is practiced.	2	
18*	Requisite time and temperature is being achieved, maintained, Monitored & recorded while manufacturing/processing. Check for records.	4	
19	Food manufactured/processed is packed in a hygienic manner.	2	
20	Packaging materials is food grade & in sound condition.	2	
21	Cleaning chemicals & other hazardous substance are clearly Identified & stored separately from food.	2	
22	Transporting vehicle for food use are kept clean and maintained in Good repair.	2	
23	Transporting vehicle are capable of meeting requisite temperature (where applicable).	2	
24	Recalled products are held under supervision & destroyed or Reprocessed / reworked in a manner to ensure their safety. Check for records.	2	
III	Maintenance & sanitation		
25	Cleaning of equipment, food premises is done as per cleaning Schedule & cleaning programme.	2	
26	Preventive maintenance of equipment and machinery are carried out Regularly as per the instructions of the manufacturer.	2	
27	Measuring & monitoring devices are calibrated periodically.	2	
28*	Pest control program is available & pest control activities are carried out by trained and experienced personnel. Check for records.	4	
29	No signs/evidence of pest activity or infestation in premises (eggs, larvae,	2	
30	Drains are designed to meet expected flow loads and equipped with traps to capture contaminants.	2	
31	Food waste and other refuse are removed periodically from food handling are as to avoid accumulation.	2	
32	Disposal of sewage and effluents is done in conformity with standards laid down under Environment Protection Act,1986.	2	
IV	Personal Hygiene		
33	Annual medical examination & inoculation of food handlers against the enteric group of diseases as per recommended schedule of the Vaccine is done. Check for records.	2	
34	No person suffering from a disease or illness or with open wounds or burns is involved in handling of food or materials which come in contact with food.	2	
35*	Food handlers maintain personal cleanliness (clean clothes, trimmed nails & water proof bandage etc) and personal behavior (hand washing, no loose jewellery, no smoking, no spitting etc).	4	
36	Food handlers equipped with suitable aprons, gloves, headgear, shoe cover, wear caps/masks/gloves during food handling	2	

V	Training & Complaint Handling		
37	Internal /External audit of the system is done periodically. Check for records.	2	
38	Food business has an effective consumer complaints redressal mechanism.	2	
39	Food handlers have the necessary knowledge and skills & trained to handle food safely. Check for training records.	2	
40*	Appropriate documentation & records are available and retained for a period of one year or the shelf-life of the product, whichever is more.	4	

Total points...../90

Asterisk mark (*) questions significantly impact food safety & therefore must be addressed as a priority. Failure in any of the asterisk mark (*) questions, will lead to Non-compliance

Grading –

A + 80-90 Compliance –Exemplar

A 72-79 Compliance/Satisfactory

B 45- 71 Needs Improvement

No grade <45 Non-Compliance

D. REFERENCES & SUGGESTED READINGS

E. REFERENCES & SUGGESTED READING

References

1. General requirements on hygiene and sanitation; Schedule 4;Food Safety and Standards Licensing and Registration of Food Business),Regulations 2011
2. Codex code of hygienic practice for canned fruit and vegetable products(CAC/RCP2-1969)
3. Codex Code of hygienic practice for dried fruits (CAC/RCP3-1969)
4. Codex Code of hygienic practice for dehydrated fruits and vegetables including edible fungi (CAC/RCP 5-1971)
5. Codex Code of practice for the processing and handling of quick frozen foods(CAC/RCP8-1976)
6. DRAFT KENYA STANDARD : Processed Fruits and Vegetables- Code of practice
7. National Horticultural Board (<http://nhb.gov.in/>)
8. Agricultural & Processed Food Products Export Development Authority (www.apeda.gov.in)
9. Horticultural Statistics at a glance, 2017 of the Department of Agriculture, Co-operation and Farmers Welfare.

Suggested Readings

1. Food Safety and Standards (Food Product Standards and Food Additives) Regulation, 2011& amendment there under (if any);
2. Food Safety and Standards (Prohibition and Restriction on Sales) Regulation, 2011& amendment there under (if any);
3. Food Safety and Standards (Packaging and Labelling) Regulation, 2011& amendment there under (if any);
4. Food Safety and Standards (Contaminants, Toxins and Residues) Regulation, 2011& amendment there under (if any);
5. Food Safety and Standards (Food Recall Procedure) Regulation, 2017& amendment there under (if any);

