TVET CERTIFICATE V in Culinary Arts

Food Safety Procedures Implementation

CUAFS501

Implement food safety procedures

Competence

Credits: 5

Learning hours: 50

Sector: Hospitality and Tourism

Sub-sector: Culinary arts

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Purpose statement

This general module describes the knowledge and attitude required to apply basic cooking. The learner will be able to evaluate organizational requirements for food safety, implement food safety procedures to control hazards and revise food safety procedures. This will allow the Chef de Partie to easily pursue further learning at higher level.

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Learning Unit 1: Evaluate Organizational Requirements for Food Safety

- **Topic 1: LO 1.0 Introduction**

Food borne disease causes considerable mobility and mortality through the world, even though the principles fo controlling most of these diseases are well established. The introduction of this module sets out the key terms in the food safety implementation as flow:

- ✓ **Hazardous food**: Food containing dangerous biological, chemical or physical agents, or food in a condition that has the potential to cause adverse health effects in humans. High-risk foods: Bacteria that has the potential to cause food-poisoning can grow and multiply on some foods more easily than others.

High-risk foods include meat, seafood, poultry, eggs, dairy products, small goods, cooked rice/pasta and prepared salads (such as coleslaw, pasta salads, rice salads and fruit salads). Food that is contained in packages, cans or jars can become high-risk once opened, and should be handled and stored appropriately

- ✓ **Cleaning** - the removal of soil, food residue, dirt, grease or other objectionable matter.
- ✓ **Contaminant** - any biological or chemical agent, foreign matter, or other substances not intentionally added to food which may compromise food safety or suitability.
- ✓ **Contamination** - the introduction or occurrence of a contaminant in food or food environment.
- ✓ **Disinfection** - the reduction, by means of chemical agents and/or physical methods, of the number of microorganisms in the environment, to a level that does not compromise food safety or suitability.
- ✓ **Establishment** - any building or area in which food is handled and the surroundings under the control of the same management
- ✓ **Food hygiene** - all conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.
- ✓ **Hazard** - A biological, chemical or physical agent, in, or condition of, food with the potential to cause an adverse health effect.
- ✓ **HACCP** - A system which identifies, evaluates, and controls hazards which are significant for food safety.
- ✓ **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.

- ✓ **Food safety** - assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use. Food suitability - assurance that food is acceptable for human consumption according to its intended use.
- ✓ **Control (verb**): To take all necessary actions to ensure and maintain compliance with criteria established in the HACCP plan.
- ✓ Control (noun): To state wherein correct procedures are being followed and criteria are being met.
- ✓ **Control measure**: Any action and activity that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level.
- ✓ **Corrective action**: Any action to be taken when the results of monitoring at the CCP indicate a loss of control.
- ✓ **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.
- ✓ **Critical limit**: A criterion which separates acceptability from unacceptability.
- ✓ **Deviation**: Failure to meet a critical limit.
- ✓ **Flow diagram**: A systematic representation of the sequence of steps or operations used in the production or manufacture of a particular food item. HACCP: A system which identifies, evaluates, and controls hazards which are significant for food safety.
- ✓ **HACCP plan**: A document prepared in accordance with the principles of HACCP to ensure control of hazards which are significant for food safety in the segment of the food chain under consideration.
- ✓ **Hazard analysis:** The process of collecting and evaluating information on hazards and conditions loading to their presence to decide which are significant for food safety and therefore should be addressed in the HACCP plan.
- ✓ **Monitor:** The act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control.
- ✓ **Step**: A point, procedure, operation or stage in the food chain including raw materials, from primary production to final consumption.
- ✓ **Validation**: Obtaining evidence that the elements of the HACCP plan are effective.
- ✓ **Verification**: The application of methods, procedures, tests and other evaluations, in addition to monitoring to determine compliance with the HACCP plan.

LO 1.1. Identify potential environmental of food safety

A food safety hazard is defined by the Codex Alimentations as "a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.

- **Topic 1: Types of food hazards**

1. Biological hazards

Examples of potential biological hazards include the following:

- ✓ . **Bacteria (non-spore forming):** Campylobacter spp. Pathogenic Escherichia coli (E. coli 0157:H7 and other enterohemorrhagic E. coli), Listeria monocytogenes Salmonella spp; (S. typhimurium, S. enteritidis); Shigella (S. dysenteriae), Staphylococcus aureus; Streptococcus pyogenes; Vibrio cholerae; Vibrio parahaemolyiticus, Vibrio vulnificus, Yersinia enterocolitica
- ✓ **Bacteria (spore forming)**: Clostridium botulinum, Clostridium perfringens, Bacillus cereus
- ✓ **Viruses**: Hepatitis A Virus, Noroviruses, Rotavirus,Cornavirus,etc
- ✓ **Protozoa and Parasites**: Cryptosporidium parvum, Diphyllobothrium latum, Entamoeba histolytica, Giardia lamblia, Ascaris lumbricoides, Taenia solium, Taenia saginata, Trichinella spirali.

2. Chemical hazards

Examples of potential chemical hazards include the following:

- ✓ **Naturally occurring chemicals:** Allergens Mycotoxins (e.g. aflatoxin), Scombrotoxin (histamine), Ciguatoxin, Pyrrolizidine alkaloids, Phytohemagglutinin, Mushroom toxins, Shellfish toxins (• Paralytic shellfish poisoning • Diarrhoeic shellfish poisoning • Neurotoxic shellfish poisoning • Amnesic shellfish poisoni)
- ✓ **Added Chemicals:** Polychlorinated biphenyls, Agricultural chemicals (• Pesticides • Fertilizers • Antibiotics • Growth hormones Prohibited substances • Direct • Indirect), Toxic element and compound (• Lead • Zinc • Cadmium • Mercury • Arsenic • Cyanide), Food additives, Vitamins and minerals, Contaminants (• Lubricants • Cleaners • Sanitizers • Coatings • Paints • Refrigerants • Water or steam treatment chemicals • Pest control chemical)
- ✓ **Chemicals from Packaging Materials**: Plasticizers, Vinyl chloride, Printing/coding inks, Adhesives, Lead and Tin.

3. Physical hazards

Examples of potential physical hazards include the following: **Metal, Glass, Wood, Stones, Bone (when not expected), Plastics**

4. **Allergens hazards**

Food allergies: Some foods and food ingredients, or their components, can cause severe allergic reactions including anaphylaxis (refer to Anaphylaxis Policy).

Example of 14 allergens food are:

- **Cereals containing gluten**, namely: wheat (such as spelt and Khorasan wheat), rye, barley, oats or their hybridized strains, Cereals and products thereof, except; wheat based glucose syrups including dextrose, wheat based maltodextrines glucose syrups based on barley, cereals used for making alcoholic distillates including ethyl alcohol of agricultural origin
- **Crustaceans** and products thereof
- **Eggs** and products thereof
- **Fish** and products thereof, except: fish gelatine used as carrier for vitamin or carotenoid preparations, fish gelatine or Isinglass used as fining agent in beer and wine
- **Peanuts** and products thereof

  Soybeans and products thereof, except: fully refined soybean oil and fat, natural mixed tocopherols (E306), natural D-alpha tocopherol, natural D-alpha tocopherol acetate, and natural D-alpha tocopherol succinate from soybean sources, vegetable oils derived phytosterols and phytosterol esters from soybean sources, plant stanol ester produced from vegetable oil sterols from soybean sources
- **Milk** and products thereof (including lactose), except: whey used for making alcoholic distillates including ethyl alcohol of agricultural origin

  and lactitol
- **Nuts**, namely: almonds (Amygdalus communis *L.), hazelnuts (*Corylus avellana*), walnuts (*Juglans regia*), cashews (*Anacardium occidentale*), pecan nuts (Carya illinoinensis* (Wangenh.) K. Koch), Brazil nuts (*Bertholletia excelsa*), pistachio nuts (*Pistacia vera*), macadamia or Queensland nuts (*Macadamia ternifolia*), and products thereof, except for nuts used for making alcoholic distillates including ethyl alcohol of agricultural origin
- **Celery** and products thereof
- **Mustard** and products thereof
- **Sesame seeds** and products thereof

- **Sulphur dioxide and sulphites** at concentrations of more than 10 mg/kg or 10 mg/litre in terms of the total SO_2 which are to be calculated for products as proposed ready for consumption or as reconstituted according to the instructions of the manufacturers
- **Lupin** and products thereof
- **Molluscs** and products thereof

- **Topic 2: Controlling food safety**

Clean, Hand washing, sanitizing and disinfect

Hand washing is one of the best ways to increase food safety. Hand washing reduces germs and decreases the chances of contaminating food or food-contact surfaces. Make sure that all food handlers know the importance of washing their hands thoroughly and frequently.

Follow these simple steps to wash hands properly:

- Remove rings and other jewellery (watches, bracelets, etc.);
- Wet hands thoroughly with warm water;
- Lather well using liquid soap or foam soap;
- Scrub hands with soap for a minimum of 20 seconds (long enough to sing the alphabet). Include wrists, forearms, nails, between fingers and around and under any jewellery that cannot be removed;
- Rinse thoroughly;
- Turn off tap with a paper towel; and
- Dry hands with a disposable paper towel.

Before:

- Preparing food
- Eating
- Starting or returning to work

Between:

- Handling raw foods (meat, fish, poultry and eggs) and touching any other food or kitchen utensils
- Changing work areas (e.g. moving from unfinished to finished product); and
- Handling different allergens. 7-3 Developing

After:

- Preparing food, especially raw foods;
- Being away from the work station;

- Taking medicines;
- Touching body parts (including hair, nose, arms and eyes);
- Using the toilet;
- Changing clothing or gloves;
- Emptying garbage/waste bins; and
- Coughing or sneezing

Any time: Hands may have been contaminated.

- Use foot baths and hand-dips to sanitize hands, gloves and footwear. Follow the directions that come with the sanitizing chemicals precisely. If necessary, get help and information about the sanitizing chemicals from the supplier.

  Food spoilage and food preservatives

  S**poilage** may occur at any stage along food chain. Spoilage may arise from insect damage, physical damage, indigenous enzyme activity in the animal or plant tissue or by microbial infections.
- Perishable foods such as fish, meat and bread have a short life span. but the main single cause of food spoilage is invasion by microorganisms such as molds, yeast and bacteria.
- Fresh fruits and vegetables are perishable and highly prone to microbial spoilage caused by fungi, bacteria, yeast and molds
- Fruits juices generally have relatively high levels of sugar and a low pH and this favors growth of yeasts, molds and some acid-tolerant bacteria.

  Preservatives: are substances which are added to food just to retard, inhibit or arrest the activity of microorganisms such as fermentation, putrefaction and decomposition of the food. Commonly used preservatives include, common salt, sugar, dextrose, spices, vinegar, ascorbic acid, benzoic acid and its salt, SO2 and the salts of sulphuric acid, nitrates, sorbic acid and its salts,

  Higher temperature

  High temperature and relative humidity favour the development of post-harvest decay organisms. More acidic tissue is generally attacked by fungi, while fruits and vegetables having pH above 4.5 are more commonly attacked by bacteria, eg of bacterial soft rot of potato caused by Ceratocystis, fimbriata, water soft rot of carrot by Sclerotinia sclerotiorum etc.

LO 1.2 Identify HACCP

HACCP (Hazard Analysis Critical Control Point) is described as a **preventative** management system that was developed by NASA in America in the 1960's. NASA developed HACCP as a means of guaranteeing that the food that was sent into space with the astronauts was safe and would not cause illness. In Australia, HACCP has been introduced as a model and means of increasing the standards of food hygiene and food quality

and to reduce the incidence of food poisoning and food borne illnesses. HACCP is an internationally recognized system.

The HACCP system, which is science based and systematic, identifies specific hazards and measures for their control to ensure the safety of food. HACCP is a tool to assess hazards and establish control systems that focus on prevention rather than relying mainly on end-product testing and inspection. Any HACCP system is capable of accommodating change, such as advances in equipment design, processing procedures or technological developments.

- **Topic 1: Identify HACCP Principles**

The HACCP system consists of the following **seven principles**:

Principle 1: **Conduct a hazard analysis**

Identify the potential hazard(s) associated with food production at all stages, from primary production, processing, manufacture and distribution until the point of consumption. Assess the likelihood of occurrence of the hazard(s) and identify the measures for their control.

Principle 2: Determine the Critical Control Points (CCPs)

Determine the points, procedures or operational steps that can be controlled to eliminate the hazard(s) or minimize its (their) likelihood of occurrence. A "step" means any stage in food production and/or manufacture including the receipt and/or production of raw materials, harvesting, transport, formulation, processing, storage, etc.

Principle 3: Establish critical limit(s).

Establish critical limit(s) which must be met to ensure the CCP is under control.

Principle: Establish a system to monitor control of the CCP

Establish a system to monitor control of the CCP by scheduled testing or observations.

Principle 5: Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.

Principle 6: Establish procedures for verification to confirm that the HACCP system is working effectively.

Principle 7: Establish documentation concerning all procedures and records appropriate to these principles and their application.

- **Topic 2: Key Points of Monitoring HACCP**

Identification of critical control point(ccp)

The Codex guidelines define a critical control point (CCP) as "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".

An identification of a CCP in the HACCP system can be facilitated by the application of a decision tree all situations. Other approaches based on risk analysis may be used

If a hazard has been identified at a step where control is necessary for safety/and if no control measure exists at that step or at any other, then the product or process should be modified at that step, or at an earlier or later stage, to include a control measures

Control measures

After the hazard analysis is completed, the team must then consider what control measures, if any, exist which can be applied for the control of each hazard. Control measures are any actions and activities that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level. More than one measure may be required to control a specific hazard and more than one hazard may be controlled by a specified measure. Risk analysis methods can help to determine the level of control that should be implemented to control a hazard

Corrective action to be taken if control measures are not met

Each HACCP plan should include verification procedures for individual CCPs and for the overall plan. HACCP plans are expected to evolve and to improve with experience and new information. Periodic verification helps improve the plan by exposing and strengthening weaknesses in the system and eliminating unnecessary or ineffective control measures. Verification activities include:

- HACCP plan validation
- HACCP system audits
- Equipment calibration
- Targeted sample collection and testing

Records that must be completed at each step

A record shows the process history, the monitoring, the deviations and the corrective actions (including disposition of product) that occurred at the identified CCP. The following records are completed at each step

- Identification of the deviant lot/product
- Amount of affected product in the deviant lot
- Nature of the deviation
- Information on the disposition of the lot
- Description of the corrective action

LO. 1.3 Examine and Asses Food Safety

Food service employees will examine and assess activities and any corrective action taken on the Food Contact Surfaces Cleaning and Sanitizing Log.

- **Topic 1: Importance of food safety**
  - ✓ **Temperature control**

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

- ✓ **Avoiding food contamination**

Pathogens can be transferred from one food to another, either by direct contact or by food handlers, contact surfaces or the air. Raw, unprocessed food should be effectively separated, either physically or by time, from ready-to-eat foods, with effective intermediate cleaning and, where appropriate, disinfection.

Access to processing areas may need to be restricted or controlled. Where risks are particularly high, access to processing areas should be only via a changing facility. Personnel may need to be required to put on clean protective clothing including footwear and wash their hands before entering.

Surfaces, utensils, equipment, fixtures and fittings should be thoroughly cleaned and where necessary disinfected after raw food, particularly meat and poultry, has been handled or processed.

Systems should be in place to prevent contamination of foods by foreign bodies such as glass or metal shards from machinery, dust, harmful fumes and unwanted chemicals. In manufacturing and processing, suitable detection or screening devices should be used where necessary

- **Topic 2: Food Safety Management System**

A food safety management system (FSMS) is not only a legal requirement, but a helpful tool to ensure safe practices are followed within your business.

A FSMS is a systematic approach to controlling food safety hazards within a food business in order to ensure that food is safe to eat. All businesses are required to put in place, implement and maintain a FSMS based on the principles of Hazard Analysis Critical Control Point (HACCP).

Food safety program

A written plan that details what an individual business does to ensure that the food it sells or handles is safe for human consumption. As the supervisor or manager, you are responsible for implementing the systems and programs that support the food safety program. Some of the systems and programs that you will be responsible for implementing and monitoring include:

1. PREMISES AND ROOMS

- Establishments should normally be located away from:

  - ✓ Environmentally polluted areas and industrial activities which pose a serious threat of contaminating food;
  - ✓ areas subject to flooding unless sufficient safeguards are provided;
  - ✓ areas prone to infestations of pests;
  - ✓ areas where wastes, either solid or liquid, cannot be removed effectively.

-Where appropriate, the internal design and layout of food establishments should permit good food hygiene practices, including protection against cross-contamination between and during operations by foodstuffs.

- Activities should be adequately separated by physical or other effective means where cross-contamination may result.
- Buildings and facilities should be designed to facilitate hygienic operations by means of a regulated flow in the process from the arrival of the raw material at the premises to the finished product. Where appropriate, blueprints and/or process flow diagrams should be available.
- Doors should have smooth, non-absorbent surfaces, and be easy to clean and, where necessary, disinfect
- Working surfaces that come into direct contact with food should be in sound condition, durable and easy to clean, maintain and disinfect. They should be made of smooth, non-absorbent materials, and inert to the food, to detergents and disinfectants under normal operating conditions.
- Drainage and sewage systems should be equipped with appropriate traps and vents.
- Establishments should be designed and constructed so that there is no cross-connection between the sewage system and any other waste effluent system in the establishment.
- Effluent or sewage lines should not pass directly over or through production areas unless they are controlled to prevent contamination.

- Coatings, paints, chemicals, lubricants and other materials used for surfaces or equipment that may have contact with food should be such that they will not contribute to unacceptable contamination of the food.
- Premises and structures covered here include market stalls, mobile sales and street vending vehicles, temporary premises in which food is handled such as tents and marquees.
- Such premises and structures should be sited, designed and constructed to avoid, as far as reasonably practicable, contaminating food and harboring pests.
- In applying these specific conditions and requirements, any food hygiene hazards associated with such facilities should be adequately controlled to ensure the safety and suitability of food.

- Ventilation systems should be designed and constructed so that air does not flow from contaminated areas to clean areas and, where necessary, they can be adequately maintained and cleaned**.**

- Adequate natural or artificial lighting should be provided to enable the undertaking to operate in a hygienic manner.

2. STORAGE AND STOCK CONTROL

Procedures should be in place to:

- Sort food and food ingredients to segregate material which is evidently unfit for human consumption;
- Dispose of any rejected material in a hygienic manner; and - protect food and food ingredients from contamination by pests, or by chemical, physical or microbiological contaminants or other objectionable substances during handling, storage and transport.

Care should be taken to prevent, so far as reasonably practicable, deterioration and spoilage through appropriate measures which may include controlling temperature, humidity, and/or other controls

3. STAFF HYGIENE

To ensure that those who come directly or indirectly into contact with food are not likely to contaminate food by:

-Maintaining an appropriate degree of personal cleanliness;

-Behaving and operating in an appropriate manner.

- People who do not maintain an appropriate degree of personal cleanliness, who have certain illnesses or conditions or who behave inappropriately, can contaminate food and transmit illness to consumers.

-People known, or suspected, to be suffering from, or to be a carrier of a disease or illness likely to be transmitted through food, should not be allowed to enter any food handling area if there is a likelihood of their contaminating food. Any person so affected should immediately report illness or symptoms of illness to the management.

-Medical examination of a food handler should be carried out if clinically or epidemiologically indicated.

-The manufacturer should have and enforce a policy to prevent personnel known to be suffering from or known to be carriers of a disease transmissible through food from working in food handling areas.

-The manufacturer should require that employees advise management when they are suffering from a communicable disease likely to be transmitted through food.

-Employees having open cuts or wounds should not handle food or food contact surfaces unless the injury is completely protected by a secure waterproof covering, e.g. rubber gloves.

-All persons should wash their hands upon entering food handling areas, before starting work, after handling contaminated materials, after break and after using toilet facilities. Where necessary to minimize microbiological contamination, employees should use disinfectant hand dips.

-Protective clothing, hair covering, footwear and/or gloves appropriate to the operation that the employee is engaged in, e.g. effective hair coverings for employees in production areas, should be worn and maintained in a sanitary manner.

-Any behavior that could result in contamination of food, such as eating, use of tobacco or chewing gum or unhygienic practices such as spitting, should be prohibited in food handling areas.

-Access of personnel and visitors should be controlled to prevent contamination. The traffic pattern of employees should not result in cross-contamination of the product.

4. CLEANING DISINFECTION/WASTE

You must ensure that the waste facilities are sufficient for the volume of waste generated, that waste is collected regularly and that waste areas are clean and well maintained - for example, lids should be used on all waste bins and they should never overflow. Recyclable materials should be separated from general waste.

Cleaning and disinfection programs should ensure that all parts of the establishment are appropriately clean, and should include the cleaning of cleaning equipment.

Cleaning and disinfection programs should be continually and effectively monitored for their suitability and effectiveness and where necessary, documented.

Where written cleaning programs are used, they should specify:

- Areas, items of equipment and utensils to be cleaned;
- Responsibility for particular tasks; - method and frequency of cleaning; and
- Monitoring arrangements.

Where appropriate, program should be drawn up in consultation with relevant specialist expert advisors.

- Suitable provision must be made for the removal and storage of waste. Waste must not be allowed to accumulate 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. Waste stores must be kept appropriately clean.

-Adequate facilities and equipment should be provided and maintained for the storage of waste and inedible material prior to removal from the establishment. These facilities should be designed to prevent contamination.

-Containers used for waste should be clearly identified, leak-proof and, where appropriate, kept covered.

-Waste should be removed and containers cleaned and sanitized at an appropriate frequency to minimize contamination potential.

5. PEST CONTROL

- A pest control maintenance contract should be undertaken with a licensed, reputable pest control company. Regular pest inspections of both inside and outside the premises should be carried out and any reported pest infestations attended to immediately.

- Good hygiene practices should be employed to avoid creating an environment conducive to pests. Good sanitation, inspection of incoming materials and good monitoring can minimize the likelihood of infestation and thereby limit the need for pesticides.

-The availability of food and water encourages pest harborages and infestation. Potential food sources should be stored in pest-proof containers and/or stacked above the ground and away from walls. Areas both inside and outside food premises should be kept clean. Where appropriate, refuse should be stored in covered, pest-proof containers.

-Treatment of equipment, premises or ingredients for pest control should be conducted in such a manner as to ensure that the permitted maximum residue limit is not exceeded, e.g. by limiting the number of fumigation treatments per lot

- Birds and animals, other than those intended for slaughter, should be excluded from establishments.

6. STAFF TRAINING

The law states that all persons undertaking or supervising food handling operations must have skills and knowledge in food safety and food hygiene matters commensurate with their work activities. All staff must be given basic food hygiene training, prior to handling food.

Food hygiene training is fundamentally important. All personnel should be aware of their role and responsibility in protecting food from contamination or deterioration. Food handlers should have the necessary knowledge and skills to enable them to handle food hygienically. Those who handle a strong cleaning chemicals or other potentially hazardous chemicals should be instructed in safe handling techniques.

- Training should be appropriate to the complexity of the manufacturing process and the tasks assigned.
- Personnel should be trained to understand the importance of the critical control points for which they are responsible, the critical limits, the procedures for monitoring, the action to be taken if the limits are not met and the records to be kept.
- Personnel responsible for maintenance of equipment having an impact on food safety should be appropriately trained to identify deficiencies that could affect product safety and to take appropriate corrective action, e.g. In-house repairs, contract repairs. Individuals performing maintenance on specific equipment, e.g. Closing machines, recorders, etc., should be appropriately trained.
- Personnel and supervisors responsible for the sanitation program should be appropriately trained to understand the principles and methods of effective cleaning and sanitizing.
- Additional training, e.g. Specific technical training, apprenticeship programs, etc., should be provided as necessary to ensure current knowledge of equipment and process technology.

The manufacturer should have a written training program for employees which should be delivered as follows:

-Appropriate training in personal hygiene and hygienic handling of food should be provided to all food handlers at the beginning of their employment.

- The original food hygiene training should be reinforced and updated at appropriate intervals.

LO 1.4-Evaluate policies and procedures for HACCP

- **Topic 1: Food safety control measures**

After the hazard analysis is completed, the team must then consider what control measures, if any, exist which can be applied for the control of each hazard. Control measures are any actions and activities that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level. More than one measure may be required to control a specific hazard and more than one hazard may be controlled by a specified measure.

Time limits-restricting time food spends in danger zone

control measure systems should also specify tolerable limits for time and temperature variations.

-Biological hazards can be controlled by limiting the time that organisms spend in danger zone and limiting removing or altering the growth kinetics microorganisms need to survive, grow and reproduce. They can be destroyed, eliminated or controlled by thermal processing (heating or cooking), freezing or drying

-Temperature/time control (proper control of refrigeration and storage time, for example, minimizes the proliferation of microorganisms)

-Heating and cooking (thermal processing) for an adequate time and at an adequate temperature to eliminate microorganisms or reduce them to acceptable levels

Combination of Time and Temperature control

Inadequate food temperature control is one of the most common causes of foodborne illness or food spoilage. Such controls include time and temperature of cooking, cooling, processing and storage. Systems should be in place to ensure that temperature is controlled effectively where it is critical to the safety and suitability of food.

Temperature control systems should take into account:

- the nature of the food, e.g. its water activity, pH, and likely initial level arid types of microorganisms;

- the intended shelf-life of the product;

- the method of packaging and processing; and! -how the product is intended to be used, e.g. further cooking/processing or ready-to-eat.

SUPPORT PROGRAMS

Some of the systems and programs that you will be responsible for implementing and monitoring include:

Supplier standards, Pest control, Cleaning procedures, personal hygiene, etc.

✓ **Cleaning Procedures**

- A cleaning plan will be followed for all items that are part of the premises and items used in the preparation of foods. The cleaning plan will detail WHAT is to be cleaned, WHO is responsible for cleaning it, WHEN it should be cleaned, and HOW it should be cleaned.
- All detergents, soaps, sanitizers and hand cleaners will be purchased from reputable cleaning suppliers who ensure that those cleaning materials are approved by regulatory bodies.
- All cleaning chemicals will be clearly labelled. All cleaning materials will be stored separately from food. The exception is detergent and spray sanitizer that will be readily available during food preparation. Staff will refer to
- Premises, appliances and vehicles will be kept clean to a standard that prevents accumulation of any garbage, food residues, dirt, grease or other visible matter.
- All food contact surfaces will be made of materials that can be cleaned and sanitized.
- Food contact surfaces will be cleaned and sanitized after use

Personal health and hygiene procedures

All food handlers must be informed of their health and hygiene obligations. Staff should be given written instructions for personal health and hygiene procedures.

Poor health and hygiene practices of staff could cause food to become contaminated. Clear health and hygiene procedures and regularly observing and giving feedback to staff on their hygiene practices are the best ways to ensure high standards are maintained.

Before allowing staff to return to food handling duties, you must see a copy of a medical certificate stating that the staff member is no longer suffering from the disease, nor is a carrier of it.

✓ **Supplier standards**

The quality of goods purchased is paramount to the production of safe food. All regular suppliers must be assessed according to the criteria listed on the Supplier Assessment Form and a register of Current Approved Suppliers should be established and maintained.

Files that relate to the performance of each supplier should be kept and should include any non-conformance reports and any records that relate to poor quality.

✓ **Pest control**

This procedure sets out the steps you must follow to control animals and vermin at the business. It applies to all sections of the establishment that require vermin control to ensure the safety of food. The term 'vermin' applies to all insect pests (including flies, cockroaches, weevils, including their eggs and their larvae) and animal pests (including mice, rats and birds).

Food Law and Regulations

The development of relevant and enforceable food laws and regulations is an essential component of a modern food control system.

Food law has traditionally consisted of legal definitions of unsafe food, and the prescription of enforcement tools for removing unsafe food from commerce and punishing responsible parties after the fact to reducing the risk of food borne illness.

In preparing food regulations and standards, countries should take full advantage of Codex standards and food safety lessons learned in other countries.

Food legislation should include the following aspects:

- It must provide a high level of health protection;
- It should include clear definitions to increase consistency and legal security;
- It should be based on high quality, transparent, and independent scientific advice following risk assessment, risk management and risk communication;
- It should include provision for the use of precaution and the adoption of provisional measures where an unacceptable level of risk to health has been identified and where full risk assessment could not be performed;
- It should include provisions for the right of consumers to have access to accurate and sufficient information;
- It should provide for tracing of food products and for their recall in case of problems; it should include clear provisions indicating that primary responsibility for food safety and quality rests with producers and processors;
- It should include obligation to ensure that only safe and fairly presented food is placed on the market; it should also recognize the country's international obligations particularly in relation to trade; and
- It should ensure transparency in the development of food law and access to information.

LO.1.5. Monitor and assess practices including records keeping

Records are essential for reviewing the adequacy of the HACCP plan and the adherence of the HACCP system to the HACCP plan.

- **Topic 1: Types of records of activities for food safety monitoring**

Four types of records should be kept as part of the HACCP program:

-Support documentation for developing the HACCP plan

-Records generated by the HACCP system

-Documentation of methods and procedures used

-Records of employee training programs

Staff training undertake (carry out)

This procedure outlines staff training requirements for all staff who are involved with food related products.

Procedures

- The business will ensure that persons undertaking or supervising food handling operations will have skills and knowledge in food safety and food hygiene matters commensurate with their work activities.
- The owner will assess **Staff Training Monitoring Forms** as a basis for further training. The owner will liaise with the HACCP team for recommendations for further training of staff.
- Posters will be displayed in areas and such amenities to reinforce training principles.
- It will be the responsibility of the manager to ensure that persons undertaking or supervising food handling operations will have skills and knowledge in food safety and food hygiene matters commensurate with their work activities.
- It will be the responsibility of the owner to assess monitoring forms and other evidence as a basis for further training.

- **Topic 2: food safety procedures for**:

Food growers or processors should have three objectives for their HACCP programs with regard to hazards:

- To eliminate or significantly reduce the hazard
- To prevent or minimize microbial growth and toxin production
- To control contamination

Learning Unit 2: Implement food safety procedures to control hazards

The benefits of implementing HACCP are;

- ✓ Creating a good reputation and boosting customer confidence
- ✓ Increasing business & Swells profits
- ✓ Enhance staff morale and loyalty
- ✓ Continuous improvement of food safety

LO 2.1. Improved food safety procedures

A HACCP requirement for improving a comprehensive program includes developing, documenting and implementing standard operating procedures(sop)

- **Topic 1: HACCP- Based standard operating procedures(SOPs)**

SOPs are step-by-step written instructions for routine food services tasks

HACCP-based SOPs include the following principles:

- ✓ **Scope** (what does the procedure cover)
- ✓ **Purpose** (why do you have the procedure)
- ✓ **Hazards** that you are trying to control (In some programs, all hazards are contained as part of the program and are not specific to each procedure)
- ✓ **Monitoring records** that are required as part of the procedure
- ✓ **Who** is responsible for the monitoring and the frequency of monitoring
- ✓ **The control measures** (what do you do to make sure the hazard will not occur)
- ✓ **Critical limits** (i.e. at what point is the hazard under control/ not under control). In your business most of these will be temperature based
- ✓ **Corrective action** (what do you do when you find a hazard that is not under control

1. **Cleaning and Sanitizing Food Contact Surfaces**

The Purpose of this sop is to prevent food borne illness by ensuring that all food contact surfaces are properly cleaned and sanitized. This procedure applies to food service employees involved in cleaning and sanitizing food contact surfaces.

Instruction:

- ✓ Train food service employees on using the procedures in this SOP.

- ✓ Follow State or local health department requirements.
- ✓ Follow manufacturer's instructions regarding the use and maintenance of equipment and use of chemicals for cleaning and sanitizing food contact surfaces. Refer to Storing and Using Poisonous or Toxic Chemicals SOP.
- ✓ Wash, rinse, and sanitize food contact surfaces of sinks, tables, equipment, utensils, thermometers, carts, and equipment using the following procedure:
  - Wash surface with detergent solution.
  - Rinse surface with clean water.
  - Sanitize surface using a sanitizing solution mixed at a concentration specified on the manufacturer's label.
  - Place wet items in a manner to allow air drying.

2. <u>Controlling Time and Temperature During Preparation</u>

The Purpose of this sop is to prevent food borne illness by limiting the amount of time that potentially hazardous foods are held in the temperature danger zone during preparation.

This procedure applies to foodservice employees who prepare food.

I**nstruction:**

- ✓ Train foodservice employees on using the procedures in this SOP. Refer to the Using and Calibrating Thermometers SOP.
- ✓ Follow State or local health department requirements.
- ✓ Wash hands prior to preparing foods. Refer to the Washing Hands SOP.
- ✓ Use clean and sanitized equipment and utensils while preparing food.
- ✓ Separate raw foods from ready-to-eat foods by keeping them in separate containers until ready to use and by using separate dispensing utensils. Refer to the Preventing Cross-Contamination During Storage and Preparation SOP.
- ✓ Pre-chill ingredients for cold foods, such as sandwiches, salads, and cut melons, to 41 ºF or below before combining with other ingredients.
- ✓ Prepare foods as close to serving times as the menu will allow.
- ✓ Prepare food in small batches.
- ✓ Limit the time for preparation of any batches of food so that ingredients are not at room temperature for more than 30 minutes before cooking, serving, or being returned to the refrigerator.
- ✓ If potentially hazardous foods are not cooked or served immediately after preparation, quickly chill.

3. <u>Cooking Potentially Hazardous Foods</u>

The Purpose is to prevent foodborne illness by ensuring that all foods are cooked to the appropriate internal temperature.

This procedure applies to foodservice employees who prepare Cooking or serve food.

Instructions:

- ✓ Train food service employees on using the procedures in this SOP. Refer to the Using and Calibrating Thermometers SOP.
- ✓ Follow State or local health department requirements.
- ✓ If a recipe contains a combination of meat products, cook the product to the highest required temperature.

4. <u>Cooling Potentially Hazardous Foods</u>

The Purpose is to prevent food borne illness by ensuring that all potentially hazardous foods are cooled properly.

This procedure applies to food service employees who prepare or serve food.

Instructions:

- ✓ Train food service employees on using the procedures in this SOP. Refer to the Using and Calibrating Thermometers SOP.
- ✓ Follow State or local health department requirements.
- ✓ Modify menus, production schedules, and staff work hours to allow for implementation of proper cooling procedures
- ✓ Prepare and cool food in small batches.
- ✓ Chill food rapidly using an appropriate cooling method:

5. <u>Date Marking and Ready-to-Eat, Potentially Hazardous Food</u>

The purpose **is** to ensure appropriate rotation of ready-to-eat food to prevent or reduce food borne illness from Listeria monocytogenes.

This procedure applies to food service employees who prepare, store, or serve food.

I**NSTRUCTIONS**:

1. Train food service employees on using the procedures in this SOP. The best practice for a date marking system would be to include a label with the product name, the day or date, and time it is prepared or opened. Examples of how to indicate when the food is prepared or opened include:

Labeling food with a calendar date, such as “cut cantaloupe, 5/26/05, 8:00 a.m.,”

Identifying the day of the week, such as “cut cantaloupe, Monday, 8:00 a.m.,” or

Using color-coded marks or tags, such as cut cantaloupe, blue dot, 8:00 a.m. means “cut on Monday at 8:00 a.m.”

2. Follow State or local health department requirements.
3. Label ready-to-eat, potentially hazardous foods that are prepared on-site and held for more than 24 hours. 4. Label any processed, ready-to-eat, potentially hazardous foods when opened, if they are to be held for more than 24 hours.
4. Refrigerate all ready-to-eat, potentially hazardous foods at 41 ºF or below.
5. Serve or discard refrigerated, ready-to-eat, potentially hazardous foods within 7 days.
6. Indicate with a separate label the date prepared, the date frozen, and the date thawed of any refrigerated, ready-to-eat, potentially hazardous foods.

6. <u>Handling a Food Recall</u>

The purpose is to prevent food borne illness in the event of a product recall.

This procedure applies to food service employees who prepare or serve food.

INSTRUCTIONS:

1. Train food service employees on using the procedures in this SOP.
2. Follow State or local health department requirements.
3. Review the food recall notice and specific instructions that have been identified in the notice.
4. Communicate the food recall notice to feeding sites.
5. Hold the recalled product using the following steps:
    - Physically segregate the product, including any open containers, leftover product, and food items in current production that items contain the recalled product.
    - If an item is suspected to contain the recalled product, but label information is not available, follow the district’s procedure for disposal.

6. Mark recalled product “Do Not Use” and “Do Not Discard.” Inform the entire staff not to use the product.

7. <u>Holding Hot and Cold Potentially Hazardous Foods</u>

The purpose is to prevent food borne illness by ensuring that all potentially hazardous foods are held under the proper temperature.

This procedure applies to food service employees who prepare or serve food.

INSTRUCTIONS:

1. Train food service employees on using the procedures in this SOP. Refer to the Using and Calibrating thermometers SOP.
2. Follow State or local health department requirements.
3. If State or local health department requirements are based on the 2001 FDA Food Code:
    - Hold hot foods at 135 ºF or above
    - Hold cold foods at 41 ºF or below
4. Preheat steam tables and hot boxes.

8. Personal Hygiene

The purpose is to prevent contamination of food by food service employees.

This procedure applies to food service employees who handle, prepare, or serve food.

INSTRUCTIONS:

1. Train food service employees on using the procedures in this SOP.
2. Follow State or local health department requirements.
3. Follow the Employee Health Policy. (Employee health policy is not included in this resource.)
4. Report to work in good health, clean, and dressed in clean attire.
5. Change apron when it becomes soiled.
6. Wash hands properly, frequently, and at the appropriate times.
7. Keep fingernails trimmed, filed, and maintained so that the edges are cleanable and not rough.

LO 2.2 Combine policies, methods and procedures for controlling food safety

- **Topic 1: Policies of food safety**

Under Standard3.2.2 Food Safety Practices and General Requirements, a food business must ensure that all staff have 'skills and knowledge in food safety and hygiene matters' [Clause 3]. This requirement specifies that staff have skills and knowledge that corresponds to their duties — so a chef would require different skills and knowledge from those required by a waiter. The skills and knowledge required by staff will vary from establishment to establishment according to the duties they perform.

Under Standard 3.2.2 Food Safety Practices and General Requirements [Clause 13], staff have a legal responsibility to 'take all reasonable measures not to handle food or surfaces likely to come into contact with food in a way that is likely to compromise the safety and suitability of the food'. They must be able to demonstrate and explain how to keep food safe while it is in their care.

Food Regulations

The Food Quality Management System must establish the procedures that will manage food safety within their operation.

The Food Standards Code states that a food business must have a Food Safety Program that:

- Systematically examines all of its food handling operations in order to identify the potential hazards that may reasonably be expected to occur;

- If one or more hazards are identified in accordance with the statement above, develop and implement a food safety program to control the hazard or hazards;

-Set out the food safety program in a written document and retain that document at the food premises; - Comply with the food safety program; and

-Conduct a review of the food safety program at least annually to ensure its adequacy.

The food standard Code states that the food safety program developed by a food business must contain

- Systematically identify the potential hazards that may be reasonably expected to occur in all food handling operations of the food business

-Identify where, in a food handling operation, each hazard identified above can be controlled and the means of control

- Provide for the systematic monitoring of those controls;

- Provide for appropriate corrective action when that hazard, or each of those hazards, is found not to be under control;

-Provide for the regular review of the program by the food business to ensure its adequacy; and

- Provide for appropriate records to be made and kept by the food business demonstrating action taken in relation to, or in compliance with, the food safety program.

Food Safety Enforcement Policy

The policy must ensure that food and drink intended for sale for human consumption which is produced, stored, distributed, handled or consumed within the Government is without risk to the health or safety of the consumer.

This will be achieved through the provision of education, advice and the use of statutory powers of enforcement

The aim of the Policy is:

• To inform the public and food businesses of the principles by which enforcement action is taken.

• To provide guidance for officers to enable them to make effective decisions that are transparent, accountable, proportionate and consistent and that do not impose unnecessary burdens on businesses.

• To ensure food safety enforcement action is focused on situations where the public are put at risk and on food businesses who negligently or intentionally contravene the law.

The Policy must have written having regard to the Food Standards Agency's Framework Agreement.

The Enforcement Profile relates the number of written warnings, suspensions and revocations issued in relation to CFIA registrations held by production or processing establishments. Enforcement actions are issued based on information concerning noncompliance to regulations gathered by inspection staff during verification activities

Compliance Verification (CV) refers to the audit based approach that the CFIA uses to verify the effectiveness of industry QMP controls. CV frequencies, as indicated in CFIA policy, are determined for fish processing establishments based on whether the HACCP plan has identified significant hazards or not. CFIA managers plan the number of CVs per month based on the industry profile and operating season. The CV delivery rate is the number of CVs completed divided by the number of CVs planned and represented as a percentage

Enforcement of the Food Act is essential for the effective management of food safety risks and the prevention of misleading conduct in connection with the sale of food. Accordingly, the Authority is committed to ensuring there is a high level of compliance with the Food Act and Regulations.

This policy sets out the Authority policies on compliance and enforcement that will facilitate the effective achievement of the regulatory goals of the Food Act in a manner that is:

- authorised by the law;
- procedurally fair;
- accountable and transparent;
- consistent; and
- proportionate.

- **Topic 2: Methods and procedures for controlling food safety**

1. **Deliveries and storage**

This work instruction outlines the steps you must follow for storing food items in order to minimize the risk of contamination and spoilage.

Procedure

1. Goods once received will be transferred to the appropriate storeroom or cool room without delay.

2. All food received will be stored in the appropriate store (dry; chilled; frozen) in their original inner packaging where practical.

3. All outer packaging is to be removed before placing items in the storeroom to prevent possible contamination or infestation by pests.

4. All food items will be controlled and FIFO (first-in-first-out) used, especially for food items with a limited shelf life and explicit 'use-by' dates. These food items will be stored in a manner that ensures older stock is used first.

5. The manager will ensure that all food items are received, stored and handled in a manner that will prevent temperature variations and contamination.

6. All food items must be clearly identified or labelled with the date of delivery/production, covered during storage if appropriate with either a lid or plastic film. Container lids must not be stored on the floor.

7. Raw and ready-to-eat food must be stored separately, ideally in separate cool rooms. If this is not possible, ready-to-eat food is to be stored on upper shelves above the raw foods.

8. Cool room doors are to be kept closed at all times (when not in use), and the temperature of food in cool rooms will be monitored and recorded twice a day. Any deviations in temperatures must be investigated to initiate correction. All refrigeration units will be properly cleaned and maintained at all times.

9. Checks of refrigerators will be made first thing in the morning and in the afternoon and recorded on the cold storage check sheet. Any food items with an expired use-by date will be discarded.

10. All cooked food items will have the date of cooking displayed.

2. Food Preparation

Food kept at room temperatures for longer than is necessary may allow any bacteria in the food to grow. Any food for preparation (especially high risk foods) should be brought out of the fridge in small batches that can be used quickly and then chilled September 2018 again until needed. This limits the length of time that bacteria have a chance to grow, keeping the food safe

- **Cooking**

Almost all food should be cooked thoroughly to a Centre temperature above 75°C. There are only a very few exceptions to this, such as rare steaks and some types of fish.

- **Cooling**

Food which has been cooked, and is to be stored in the refrigerator or freezer for use later, must be cooled down as quickly as possible so that germs do not have a chance to grow. This means that, no matter how much food you have cooked, it must be ready to go into the refrigerator or freezer in about one and a half hours (90 minutes)

Cooling food quickly can be difficult, especially in large quantities, but you must make sure you do this properly. Although you must not put hot food into a fridge, the food doesn't have to be completely cooled before you do so. You should ensure that your fridge temperature doesn't increase above your critical limit because you are cooling foods.

- **Re-heating**

When re-heating food which you have previously cooked, it must reach a temperature of at least 82°C. The only exemption is if you can show that this is not necessary for food safety reasons, and that re-heating to such a high temperature would damage the food.

Cooked food which you have bought in does not have to be reheated to 82°C, but must reach at least 75°C.

-**Transport**

If you deliver chilled or frozen food to your customers, ideally you should have a refrigerated or freezer compartment van. If not, you might need to use cool boxes or cool bags. You must ensure that you take the food as quickly as possible to your customer, and that it is still at a safe temperature when it is delivered.

You must be able to demonstrate that you are delivering food at the correct temperature.

- Purchasing

This procedure outlines the steps you must follow to ensure that food purchased complies with food safety requirements. It applies to all current or potential suppliers of products and/or services that supply food to the business.

Purchase orders will be raised in accordance with the business's purchasing requirements based on suppliers on the Approved Suppliers Listing.

LO 2.3 Establish and document HACCP records

A food safety program is a written document based on the principles of HACCP that contains written procedures and monitoring records to ensure the safety of your number asset.

- Topic 1: Seven stage of HACCP

There are twelve stage and seven principles to be implemented in the HACCP Food Quality Management system. They are as follows:

Stage 1. Assemble the HACCP Team with expertise in product and process. Determine what training is required and for whom.

Stage 2. Describe product.

Stage 3. Identify intended use

Stage 4. Construct a detailed flow diagram of the process.

Stage 5. Confirm flow diagram against process in operation (or planned process);

Stage 6. Principle 1. Identify hazards associated with each step, conduct a hazard analysis and consider control measures that will control hazards;

Stage 7. Principle 2. Establish Critical Control Points and tolerance levels for each CCP.

Stage 8. Principle 3. Establish critical limits for each C.C.P, and validate these limits;

Stage 9. Principle 4. Establish a monitoring system for each C.C.P.

Stage10. Principle 5. Establish corrective actions.

Stage11. Principle 6. Establish verification procedures.

Stage 12. Principle 7. Establish documentation and record keeping.

The application of HACCP should do be done in 12 stages. Now let's talk to seven stages

Assemble the HACCP team – stage1

The first task in the application of HACCP is to assemble a team having the knowledge and expertise to develop an HACCP plan.

Ideally the team should not be larger than six, although for some stages of the study it may be necessary to enlarge the team temporarily with personnel from other departments

When selecting the team, the coordinator should focus on:

- ✓ Those who will be involved in hazard identification
- ✓ Those who will be involved in determination of critical control points
- ✓ Those who will monitor critical control points
- ✓ Those who will verify operations at critical control points
- ✓ Those who will examine samples and perform verification procedures

Knowledge required

Selected personnel should have a basic understanding of:

- ✓ Technology and equipment used on the processing lines
- ✓ Practical aspects of the food operations
- ✓ The flow and technology of the process
- ✓ Applied aspects of food microbiology

The team must include a coordinator (chairperson) whose role is to:

• Ensure that the composition of the team meets the needs of the study

• Suggest changes to the team if necessary • Coordinate the team's work.

It is essential that the team members be trained on the Codex General Principles of Food Hygiene and the guidelines for the application of the HACCP system to ensure that the team will work together with a common focus and use the same approach and terminology.

Describe product and identify intended use - stage 2 and 3

The HACCP team must make a complete description of each food product

- including all ingredients/processing methods/packaging materials/etc. used in the formulation of the product

- to assist in the identification of all possible hazards associated with the product. In brief, the product description should include the name of the product, ingredients and composition, potential to support microbial growth (water activity [Aw], pH, etc.), brief details of the process and technology used in production, appropriate packaging and intended use, including target population.

The product to which the HACCP plan applies should be described on Forms 1 and2

Before arriving at the specific details of the product description to be included in the forms, the HACCP team should address the questions outlined below.

Formulation of product

- ✓ What raw materials or ingredients are used?
- ✓ Are microorganisms of concern likely to be present in or on these materials, and if so what are they?
- ✓ If food additives or preservatives are used, are they used at acceptable levels, and at those levels do they accomplish their technical objective?
- ✓ Will the pH of the product prevent microbial growth or inactivate particular pathogens?
- ✓ Will the Aw of the product prevent microbial growth?
- ✓ What is the oxidation/reduction potential (Eh) of the product?

Processing and preparation checklist

- ✓ Can a contaminant reach the product during preparation, processing or storage? • Will microorganisms or toxic substances of concern be inactivated during cooking, reheating or other processing?
- ✓ Could any microorganisms or toxins of concern contaminate food after it has been heated?
- ✓ Would more severe processing be acceptable or desirable?
- ✓ Is the processing based on scientific data?
- ✓ How does the package or container affect survival and/or growth of microorganisms? • How much time is taken for each step of processing, preparation, storage and display?
- ✓ What are the conditions of distribution?

Form 1 - Product description

See example.

1. Product name (common name) or group of product names (the grouping of like products is acceptable as long as all hazards are addressed)

2. Important end-product characteristics: properties or characteristics of the food under review that are required to ensure its safety (e.g. Aw, pH/preservatives)

3. How the product is to be used (i.e. ready-to-eat/further processing required, heated prior to consumption)

4. Type of package, including packaging material and packaging conditions (e.g. modified atmosphere)

5. Shelf-life, including storage temperature and humidity if applicable

6. Where the product will be sold (e.g. retail, institutions, further processing)

7. Labelling instructions (e.g. handling and usage instructions) 8. Special distribution control (e.g. shipping conditions)

Form 2 - Product ingredients and incoming material

See example.

List the product ingredients and incoming materials (including raw materials, product ingredients, processing aids, packaging materials) that are used during the manufacturing process. This exhaustive listing is required for proper identification of all potential hazards that could apply.

IDENTIFICATION OF INTENDED USE

The intended use of the product refers to its normal use by end-users or consumers. The HACCP team must specify where the product will be sold, as well as the target group, especially if it happens to be a sensitive portion of the population (i.e. elderly, immunosuppressed, pregnant women and infants). The intended use of the product should be described in Form 1.

Example FORM 1

PRODUCT DESCRIPTION

1. Product name(s)	Canned mushroom
2. Important product characteristics of end product (e.g. Aw, pH, etc.)	pH 4.8 to 6.5 (low acid) Aw > 0.85 (high moisture)
3. How the product is to be used	Normally heated before serving (casseroles, garnishes, etc.) or sometimes served unheated (salads, appetizers, etc.)

4. Packaging	Hermetically sealed metal container
5. Shelf-life	Two years plus, at normal retail shelf temperatures
6. Where the product will be sold	Retail, institutions and food service. Could be consumed by high-risk groups (infirm, immuno compromised, elderly)
7. Labelling instructions	None required to ensure product safety
8. Special distribution control	No physical damage, excess humidity or temperature extremes

DATE: _____ APPROVED BY: _____

Example FORM 2

PRODUCT INGREDIENTS AND INCOMING MATERIAL: Canned mushroom

RAW MATERIAL	PACKAGING MATERIAL	DRY INGREDIENTS
Mushrooms (domestic, white)	Cans Ends	Salt Ascorbic acid Citric acid
OTHER		
Water (municipal)		

DATE: _____ APPROVED BY: _____

Construct flow diagram and on-site confirmation of flow diagram - stage 4 and

FLOW DIAGRAM (stage 4)

It is easier to identify routes of potential contamination, to suggest methods of control and to discuss these among the HACCP team if there is a flow diagram. The review of the flow of raw materials from the point at which they enter the plant, through processing to departure is the feature that makes HACCP a specific and important tool for the identification and control of potential hazards.

A process flow diagram must be constructed, using Form 3, following interviews, observation of operations and other sources of information such as blueprints. The process flow diagram will identify the important process steps (from receiving to final shipping) used in the production of the specific product being assessed.

The example of Form 3 given at the end of the module shows a summary flow diagram. This example is an indication of the process only and should not be taken as an attempt to give the complete detail required. Remember to include all inputs such as water, steam and other process aids.

Each process step should be considered in detail and the information expanded to include all relevant process data. Data may include but is not restricted to:

- ✓ All ingredients and packaging used (biological, chemical, physical data)
- ✓ Sequence of all process operations (including raw material addition)
- ✓ Time/temperature history of all raw materials and intermediate and final products, including the potential for delay
- ✓ Flow conditions for liquids and solids
- ✓ Product recycle/rework loops
- ✓ Equipment design features

PLANT SCHEMATIC

A plant schematic must be developed, using Form 4, to show product flow and employee traffic patterns within the plant for the specific product. The diagram should include the flow of all ingredients and packaging materials from the moment they are received at the plant, through storage, preparation, processing, packaging, finished product holding and shipping This plan should aid in the identification of any areas of potential cross-contamination within the establishment.

The plant schematic/floor and equipment layout should be considered in detail and assessed

ON-SITE CONFIRMATION OF FLOW DIAGRAM AND PLANT SCHEMATIC (Task 5)

Once the process flow diagram and plant schematic have been drafted, they must be confirmed by an on-site inspection for accuracy and completeness. This will ensure that all the major process operations have been identified. It will also confirm the assumptions made with respect to the movement of product and employees on the premises.

Example FORM 3

FLOW DIAGRAM PRODUCT

NAME(S): Canned mushroom

MUSHROOM (Raw)	EMPTY CANS/ENDS	DRY INGREDIENTS	WATER (municipal)
1. Receiving	2. Receiving	3. Receiving	4. In taking

5. Storing	6. Storing	7. Storing	
8. Dumping/Washing	9. Inspecting/Depalletizing	10.Dumping	
11. Blanching	12. Conveying	13. Mixing	
14. Conveying/Inspecting	15. Washing		
16. Slicing/Dicing	17. Brine injecting		
18. Foreign object removing	19. Filling		
	20. Weighing		
	21. Water filling		
	22. Head-spacing		
	23. End feeding/Closing/ Inspecting		24. Chlorinating
	25. Thermal processing		
	26. Cooling		
	27. Conveying/Drying		
	28. Labelling/Storing		

DATE: _____ APPROVED BY: _____

Example FORM 4

PLANT SCHEMATIC/FLOOR PLAN PRODUCT

NAME(S): Canned mushroom

The diagram should show the product flow and employee traffic patterns in each individual plant to identify and eliminate cross-contamination potentials

DATE:_____ APPROVED BY:_____

List all potential hazards associated with each step, conduct a hazard analysis and consider any measures to control identified hazards - stage 6/Principle 1

The stage 7 is to determine the critical control points/principle 2

- **Topic 2: Conduct Hazard Analysis**

Hazard analysis is the first HACCP principle. As the name HACCP implies, hazard analysis is one of the most important tasks

HOW TO CONDUCT A HAZARD ANALYSIS?

After listing all the hazards (biological, chemical or physical) that may be reasonably expected at each step from primary production, processing, manufacturing and distribution until the point of consumption, the HACCP team should assess the potential significance or risk of each hazard by considering its likelihood of occurrence and severity

A hazard analysis must be conducted for each existing product or process type and for each new product. In addition, the hazard analysis done for a product or process type must be reviewed if any changes are made in raw material, product formulation, preparation, processing, packaging, distribution or intended use of the product. For simplicity, the hazard analysis procedure has been broken down into the five following activities. Applying them in a logical sequential manner will help to avoid any omissions. Once these five activities have been completed, the HACCP team will have an extensive list of realistic potential hazards on Forms 5 (biological hazards), 6 (chemical hazards) and 7 (physical hazards).

1. Review incoming material

In order to complete this activity, use the product description form (Form 1) and the list of product ingredients and incoming material (Form 2). Review the information on the product description form (Form 1) and determine how it could influence your interpretation during the analysis of the process. For example, a ready-to-eat product must not contain pathogens in amounts that may harm the consumer

To facilitate the identification of potential hazards, answer the following questions for each incoming material:

- ✓ Could pathogenic microorganisms, toxins, chemicals or physical objects possibly be present on/in this material?
- ✓ Are any returned or reworked products used as ingredients? If yes, is there a hazard linked to that practice?
- ✓ Are preservatives or additives used in the formulation to kill microorganisms or inhibit their growth or to extend shelf-life?
- ✓ Are any ingredients hazardous if used in excessive amounts? (for example, nitrites could be a chemical hazard if used excessively)

- ✓ Could any ingredients, if used in amounts lower than recommended or if omitted altogether, result in a hazard because of microbial vegetative or sporulated cell outgrowth?
- ✓ Does the amount and type of acid ingredients and the resulting pH of the final product affect growth or survival of microorganisms?
- ✓ Do the moisture content and the water activity (Aw) of the final product affect microbial growth? Do they affect the survival of pathogens (parasites, bacteria, fungi)?
- ✓ Should adequate refrigeration be maintained for products during transit or in holding?

2. Evaluate processing operations for hazards

The objective of this activity is to identify all realistic potential hazards related to each processing operation, the product flow and the employee traffic pattern.

This can be accomplished by reviewing the process flow diagram (Form 3) and the plant schematic (Form 4) and modifying them as follows.

- ✓ Assign a number to each processing step on the process flow diagram (Form 3) horizontally from receiving to shipping (see example)
- ✓ Examine each step on the process flow diagram and determine if a hazard (biological, chemical or physical) exists for that operation
- ✓ Write B for biological, C for chemical and P for physical beside each operation where such a hazard has been identified (see example)
- ✓ Review the plant schematic and employee traffic pattern on Form 4 in the same manner 124 The hazards identified on Forms 3 and 4 should be fully described on the hazard analysis forms (Forms 5,6 and 7).
- ✓ To help in determining if a hazard exists, the following questions should be answered for each processing step:
- ✓ Could contaminants reach the product during this processing operation? (consider personnel hygiene, contaminated equipment or material, cross-contamination from raw materials, leaking valves or plates, dead ends [niches], splashing, etc.)
- ✓ Could any microorganisms of concern multiply during this processing operation to the point where they constitute a hazard? (consider temperature, time)

3. Observe actual operating practices

The HACCP team must be very familiar with every detail of the operation under investigation. Any identified hazard must be recorded on the appropriate forms. The HACCP team shall:

- ✓ Observe the operation long enough to be confident that it comprises the usual process or practices
- ✓ Observe the employees (e.g. could raw or contaminated product cross-contaminate workers' hands, gloves or equipment used for finished or post-process product?)
- ✓ Observe hygienic practices and note the hazards
- ✓ Analyze if there is a kill step (process which destroys all microorganisms) during the process (if so, attention should be focused on potential cross-contamination after this processing operation)

4. Take measurements

It may be necessary to take measurements of important processing parameters to confirm actual operating conditions. Before measuring, make sure all devices are accurate and correctly calibrated.

The following are examples of some of the measurements that may be done, depending on the product or process type:

- ✓ Measure product temperatures, considering heat processing and cooling or chilling operations: take measurements at the coldest point of the product when heat processing is evaluated and at the warmest point of the product when cooling or chilling is evaluated (frequently at the Centre of the largest piece)
- ✓ Measure time/temperature for cooking, pasteurizing, canning cooling (rates), storing, thawing, reconstituting, etc.
- ✓ Measure the dimension of the containers used to hold foods being cooled and the depth of the food mass
- ✓ Measure pressure, headspace, venting procedure, adequacy of container closure, initial temperatures and any other factors critical to the successful delivery of a scheduled process
- ✓ Measure the pH of the product during processing and also of the finished product, measuring pH at room temperature whenever possible
- ✓ Measure Aw of the product, running duplicate samples whenever possible (because of variations) and remembering to make corrections for ambient temperatures, as necessary

Sample collections, inoculated-pack studies and microbial challenge studies could be necessary when information on hazards is not otherwise available, for new products or for assessing expected shelf-life.

5. Analyze the measurements

A qualified individual (with proper scientific background) must analyze the measurements to interpret correctly the data collected. During the review and interpretation of the data, identified hazards are fully described on Forms 5, 6 and 7.

For example:

- ✓ Plot time/temperature measurements using a computer or on graph paper
- ✓ Interpret controlled data versus optimal growth temperatures of microorganisms and temperature ranges at which they can multiply
- ✓ Estimate and evaluate probable cooling rates; interpret cooling rates and compare the measured temperatures with temperature ranges within which bacteria of concern multiply rapidly versus temperature at which growth begins, slows and ceases (see reference material); determine whether covers are used on containers to cool down foods (which may delay cooling but may also prevent contamination); if containers are stacked against each other in a manner affecting cooling or heating time/evaluate the impact
- ✓ Compare Aw and pH values to ranges at which pathogens multiply or are eliminated
- ✓ Evaluate the shelf stability of the product

CONTROL MEASURES

After the hazard analysis is completed, the team must then consider what control measures, if any, exist which can be applied for the control of each hazard. Control measures are any actions and activities that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level. More than one measure may be required to control a specific hazard and more than one hazard may be controlled by a specified measure. Risk analysis methods can help to determine the level of control that should be implemented to control a hazard

HAZARD ASSESSMENT

The information gathered from the hazard analysis can be used to determine:

- ✓ The severity of the hazard(s)
- ✓ Risks associated with hazards identified at various stages of the operation
- ✓ The points, steps or procedures at which control can be applied and a food safety hazard can be prevented, eliminated or reduced to an acceptable level, i.e. critical control points (CCPs)

Severity

Severity is the magnitude of a hazard or the degree of consequences that can result when a hazard exists. Disease-causing hazards can be categorized according to their severity. One system uses the categories of:

- ✓ High (life-threatening) - examples include illnesses caused by Clostridium botulinum, Salmonella typhi, Listeria monocytogenes, Escherichia coli 0157:H7, Vibrio cholerae, Vibrio vulnificus, paralytic shellfish poisoning, amnesic shellfish poisoning
- ✓ Moderate (severe or chronic) - examples include illnesses caused by Brucella spp., Campylobacter spp. Salmonella spp., Shigella spp. Streptococcus type A, Yersinia entercolitica, hepatitis A virus, mycotoxins, ciquatera toxin
- ✓ Low (moderate or mild) - examples include illnesses caused by Bacillus spp., Clostridium perfringens, Staphylococcus aureus, Norwalk virus, most parasites, histamine-like substances and most heavy metals that cause mild acute illnesses Risk of hazard Risk is a function of the probability of an adverse effect and the magnitude of that effect, consequential to a hazard(s) in food. Degrees of risk can be categorized as high (H), moderate (M), low (L) and negligible (N).

Identification of points, steps and procedures

The above data can then be used to ascertain the appropriate locations to establish critical control points, the degree of monitoring required and any changes in the process or ingredients that would reduce the magnitude of the hazards that exist.

Two-dimensional health risk assessment model

Example FORM 2

PRODUCT INGREDIENTS AND INCOMING MATERIAL

PRODUCT NAME(S): Canned mushroom

RAW MATERIAL	PACKAGING MATERIAL	DRY INGREDIENTS
Mushrooms (domestic, white) B, C, P	Cans B, C, P Ends B, C	Salt B, C Ascorbic acid B, C Citric acid B, C

OTHER		
Water (municipal) B, C		

DATE: _____ APPROVED BY: _____

Example FORM 3

FLOW DIAGRAM

PRODUCT NAME(S): Canned mushroom

MUSHROOM (Raw	**EMPTY CANS/ENDS**	**DRY INGREDIENTS**	**WATER (municipal)**
1. Receiving P	2. Receiving P	3. Receiving P	4. Intaking
5. Storing BP	6. Storing BCP	7. Storing BCP	
8. Dumping/Washing	9. Inspecting/Depalletizing BP	10. Dumping	
11. Blanching BC	12. Conveying BP	13. Mixing	
14. Conveying/Inspecting CP	15. Washing		
16. Slicing/Dicing CP	17. Brine injecting		
18. Foreign object removing	19. Filling CP		
	20. Weighing B		
	21. Water filling B		
	22. Head-spacing B		
	23. End feeding/Closing/ Inspecting BC		24. Chlorinating
	25. Thermal processing B		
	26. Cooling B		

	2 7. Conveying/Drying B		
	28. Labelling/Storing B		
	29. Shipping B		

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Example FORM 5

HAZARD IDENTIFICATION: BIOLOGICAL HAZARDS

PRODUCT NAME(S): Canned mushroom

Identified biological hazards	**Controlled at**
INGREDIENTS/MATERIALS	
Mushrooms - could contain C. botulinum or other pathogenic organisms, yeast or moulds	
Dry ingredients - could contain bacterial spores - could contain rodent excrement	
Water - could contain coliform or spore-forming bacteria or other microorganisms	
Empty cans/ends - could arrive with serious internal double seam or body plate defects which could result in leakage causing post-process contamination - could arrive with serious external double seam, body plate, lacquer/coating defects or damage which could result in leakage causing post-process contamination	
PROCESS STEPS	
5. Refrigerated mushroom storing - improper storage temperature and humidity could result in increase of bacterial load	
6. Can/end storing - physical damage could result in serious double seam defects which could result in postprocess contamination with pathogenic bacteria - could be contaminated with rodent excrement	

7. Dry ingredient storing - could be contaminated with rodent excrement	
9. Can depalletizing/inspection - incorrect cans, physical damage or serious visible defects could result in leakage and post-process contamination with pathogenic bacteria	
10. Mushroom blanching - improper cleaning of the blancher could result in the growth of thermophilic bacteria in mushrooms - inadequate blanching could result in insufficient removal of gases which could cause stress on double seams and perforations and lead to post-process contamination with pathogenic bacteria - excessive blanching could result in textural changes to the mushrooms which could result in inadequate thermal processing	
11. Can conveying - physical damage could result in the formation of defective double seams which could lead to post-process contamination with pathogenic bacteria	
12. Weighing - overfilled cans not properly rejected for overweight could be under processed	
13. Water filling - inadequate temperature could result in low initial temperature and subsequent underprocessing	
14. Headspacing - insufficient headspace could result in excessive internal pressure during processing causing distorted seams and leakage contamination	
15. End feeding/closing/inspecting - ends with damaged curls or other serious defects could result in leakage and contamination with pathogenic bacteria - improperly formed double seams could result in leakage and contamination with pathogenic bacteria	
16. Thermal processing - non-validated process or vent schedule could result in underprocessing and survival of pathogenic bacteria - improper flow patterns in processing area could result in heat-processed cans being contaminated with unclean water from unprocessed baskets of cans - improper flew design in processing area could result in retort baskets missing	

the retort, allowing growth of pathogenic bacteria - excessive time lapse between closing and retorting could result in excessive buildup of bacteria, some of which could survive the thermal process - lack of adherence to time, temperature and other critical factors of the scheduled process or vent schedule could result in inadequate heat treatment, allowing the survival of pathogenic bacteria	
17. Cooling - insufficient chlorinated cooling water could result in contamination of product during contraction of cans - excess chlorine in cooling water could result in corrosion and subsequent leakage and contamination of product - insufficient contact time between the chlorine and water could result in contamination of product during contraction of the cans - insufficient or excessive cooling could result in thermophilic spoilage or post-process contamination because of leakage of corroded cans	
18. Conveying/drying - contaminated water from wet and unclean post-process equipment could contaminate product	
19. Labelling/storing - physical damage to cans could result in leakage and contamination of product - high temperatures could result in growth of thermophilic bacteria	
20. Shipping - physical damage to cans could result in leakage and contamination of product	

List all biological hazards related to ingredients, incoming material, processing, product flow, etc.

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Example FORM 6

HAZARD IDENTIFICATION: CHEMICAL HAZARDS

PRODUCT NAME(S): Canned mushroom

List all chemical hazards related to ingredients, incoming material, processing, product flow, etc.

Identified chemical hazards	Controlled at
INGREDIENTS/MATERIALS	
Mushrooms - could contain pesticide residues - could contain heat -stable staphylococcal enterotoxin from improper handling	
Water - could be contaminated with dissolved heavy metals or toxic substances	
Empty cans/ends - cans/ends could be contaminated with greases/oils or cleaning chemicals	
PROCESS STEPS	
6. Can/end storing - cans/ends could become contaminated with non-food chemicals as a result of improper storage	
7. Dry ingredient storing - food ingredients could become contaminated with non-food chemicals if improperly stored	
11. Mushroom blanching - cleaning-chemical residues could contaminate the mushrooms - if live steam is used, boiler water additives could carry over and contaminate the product	
14, 16, 19, 23. Mushroom conveying, mushroom slicing/dicing, filling, end feeding/closing - cleaning-chemical residues or lubricants could contaminate the mushrooms	

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Example FORM 7

HAZARD IDENTIFICATION: PHYSICAL HAZARDS

PRODUCT NAME(S): Canned mushroom

List all physical hazards related to ingredients, incoming material, processing, product flow, etc.

Identified physical hazards	**Controlled at**
INGREDIENTS/MATERIALS	

Mushrooms - could be contaminated with harmful extraneous materials, e.g. glass, metal, plastic, wood	
Empty cans - could contain metal fragments, etc.	
Dry ingredients - could be contaminated with harmful extraneous materials	
INGREDIENTS/MATERIALS	
1. Mushroom receiving - inadequate protection against harmful extraneous material could result in contamination of mushrooms	
2. Can/end receiving - inadequate protection against harmful extraneous material could result in contamination of cans and ends	
3. Dry ingredient receiving - inadequate protection against harmful extraneous material could result in contamination of ingredients	
5. Mushroom storing - inadequate protection against harmful extraneous material could result in contamination of raw mushrooms	
6. Can/end storing - inadequate protection against harmful extraneous material could result in contamination	
7. Dry ingredient storing - inadequate protection against harmful extraneous material could result in contamination of food ingredients	
9. Can inspection/depalletizing - empty cans coming from storage could contain harmful extraneous material which could result in contamination of food product	
10. Can conveying - inappropriate design and protection against harmful extraneous material could result in contamination of food product	
11. Mushroom convening/inspection - inappropriate design and protection against harmful ex material could result in contamination of the mushrooms	
12. Mushrooms slicing/dicing - product could become contaminated with metal fragments from plant machinery	
13. Foreign object removal	

- inadequate monitoring of foreign object removal could allow foreign objects to contaminate the product	
14. Filling - filled cans of mushrooms could become contaminated with metal fragments from the filling equipment	

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- **Topic 3: Determine critical control points - Task 7/Principle 2**

The determination of critical control points (Task 7) is the second principle of HACCP. The Codex guidelines define a critical control point (CCP) as "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".

If a hazard has been identified at a step where control is necessary for safety/and if no control measure exists at that step or at any other, then the product or process should be modified at that step, or at an earlier or later stage, to include a control measure.

The determination of a CCP in the HACCP system can be facilitated by the application of a decision tree such as that included in the Codex Hazard Analysis and Critical Control Point (HACCP) system and guidelines for its application (see Figure) which indicates a logical reasoning approach. The application of the decision tree should be flexible according to the type of operation (production, slaughter, processing, storage, distribution or other). The decision tree proposed by Codex may not be applicable to all situations. Other approaches based on risk analysis may be used (see Annex 2).

REVIEW OF IDENTIFIED HAZARDS

Prior to determining CCPs, Forms 5, 6 and 7 should be reviewed to verify if any of the identified hazards are fully controlled by the application of the Codex General Principles of Food Hygiene, good manufacturing practices (GMPs) or good hygienic practices (GHPs). Furthermore, an on-site verification must be carried out by the HACCP team to verify if those hazards are in fact controlled by the application of GMP/GHP measures. If these hazards are controlled. Forms 5, 6 and 7 should be filled in accordingly.

Hazards that are not fully controlled by GMPs should be analyzed to determine whether they are CCPs or not.

The decision tree consists of a systematic series of four questions designed to assess objectively whether a CCP is required to control the identified hazard at a specific operation of the process. Form 8 was

developed from the decision tree and records all the appropriate information. This form will serve as a reference document as it is the only document in which all the ingredients and all the process operations are recorded together with the identified hazards. The form can be used for reference in re-evaluating why a certain process operation was or was not designated as a CCP

Question 1: Do control measure(s) exist?

Question 1 should be interpreted as asking whether or not the operator could use a control measure at this operation or anywhere else in the food establishment to control the identified hazard. Control measures could include, for example, temperature control, visual examination or use of a metal detector.

If the response to Question 1 is "yes", in the Question 1 column on Form 8 clearly describe the control measure(s) that the operator could use and proceed to Question 2 in the decision tree.

If the response is "no", i.e. a control measure does not exist, indicate how the identified hazard will be controlled before or after the manufacturing process (outside the control of the operator). For example, salmonella in raw poultry is controlled by the end-user. Alternatively, modify the operation, process or product so that a control measure exists, and then proceed to the next identified hazard in the process

Example of decision tree to identify critical control points

Question 2: Is the step specifically designed to eliminate or reduce the likely occurrence of the identified hazard to an acceptable level?

Examples of procedures or operations in a food process that are designed specifically to identified hazard include:

- ✓ The retorting operation in a canning plant
- ✓ Pasteurization
- ✓ Chlorination of cooling water
- ✓ The addition of a metal detector to a process line
- ✓ A particular sanitation procedure performed by the operator to clean contact surfaces without which the line would be stopped and the product would be contaminated

Acceptable and unacceptable levels need to be defined within the overall objectives in identifying the CCPs of the HACCP plan.

If the process or operation is specifically designed to eliminate or reduce the likely occurrence of the hazard to an acceptable level, answer "yes" under Question 2 on Form 8; such a step automatically becomes a CCP and it should be identified as such in the last column of Form 8.

If the step is not specifically designed, answer "no" and proceed to the next question. Note that Question 2 applies to processing operations only. For incoming materials as delivered, write "no" and proceed to Question3

Question 3: Could contamination with the identified hazard occur in excess of acceptable levels or increase to unacceptable levels?

In other words, is it likely that the hazard could have an impact on the safety of the product? Question 3 refers to both probability (likelihood) and seriousness. The response is a judgement call involving risk assessment which must be based on all of the information that has been gathered. When answering "yes" or "no", it may be useful to explain in the Question 3 column the basis of the response, for future reference. This would be especially useful in dealing with some hazards that may be controversial.

If searches in the company's complaint files or scientific literature suggest that contamination with the identified hazard may increase to an unacceptable level and result in an unacceptable health hazard, answer "yes" and proceed to the next question in the decision tree.

If the contamination is not known to represent a substantial threat to human health or is not likely to occur, answer "no" (not a CCP) and proceed to the next identified hazard in the process.

Question 4: Will a subsequent step eliminate the identified hazard or reduce likely occurrence to an acceptable level?

This question is designed to identify those hazards that are known to represent a human health threat or that could increase to an unacceptable level, and that will be controlled by a subsequent process operation.

If no subsequent operation is scheduled in the process to control this identified hazard, answer "no". This particular process step becomes a CCP and should be identified as such in the last column of Form 8.

If there is a subsequent operation or operations later in the process that will eliminate the identified hazard or reduce it to an acceptable level, answer "yes". This step is not a CCP. However, you will need to identify the subsequent step(s) that control(s) the hazard, thus proceeding to the next identified hazard.

IDENTIFICATION OF CCPs

The last column in Form 8 is where CCPs are identified. CCPs should be identified numerically with a category qualifier B, P or C for biological, physical or chemical. For example, if the first CCP identified will control a biological hazard, it is recorded as CCP-1 (B).

If the second CCP identified will control a chemical hazard, it is recorded as CCP-2 (C). If the fifth CCP will control both a biological and a chemical hazard at the same processing operation, it is record as CCP-5 (BC). This identification protocol was developed to identify CCPs sequentially, independent of process operation numbering, and to indicate readily to the user of the HACCP plan which type(s) of hazard need(s) to be controlled at a particular process operation.

Once all hazards related to incoming materials and process operations have been analysed in Form 8 to determine where and how they can be controlled, the right-hand column ("Controlled at") of Forms 5,6 and 7 is completed to identify where each hazard is controlled (see examples).

For hazards fully controlled by application of the Codex General Principles of Food Hygiene, write "GMP/GHP" on Forms 5,6 and 7 and specify the applicable programme. For hazards for which the answer to Question 3 is "no", write "not applicable" in the right-hand column on Forms 5,6 and 7.

Hazards identified on Forms 5, 6 and 7 are either controlled at some point in the food establishment or cannot be controlled by the food operator. Each hazard not controlled by the operator should be re-examined to determine whether or not a control measure could be established by the operator.

- ✓ If yes, then the appropriate control measure should be identified and Form 8 should be reviewed accordingly
- ✓ If no, then report these hazards on Form 9 and indicate how these hazards could be addressed outside the operator's manufacturing process

PARAMETERS ATTACHED TO CCPs

Once the CCPs have been established, the next step is to report the CCPs on Form 10 and to document on the same form the parameters that will be monitored and controlled.

HACCP Principles 3 to 7 will lead to the development of the establishment's HACCP plan which will be described on Form 10). The critical limits, monitoring procedures, deviation procedures, verification procedures and record keeping will be described in the HACCP plan. This HACCP plan will provide the written guidelines that will be followed in the establishment.

Example

FORM 5

HAZARD IDENTIFICATION: BIOLOGICAL HAZARDS

PRODUCT NAME(S): Canned mushroom

List all biological hazards related to ingredients, incoming material, processing, product flow, etc.

Identified biological hazards	Controlled at
INGREDIENTS/MATERIALS	
Mushrooms - could contain C. botulinum or other pathogenic organisms, yeast or moulds	- CCP5B
Dry ingredients - could contain bacterial spores - could contain rodent excrement	- CCP5B - GMP/GHP (Sanitation)
Water - could contain coliform or spore-forming bacteria or other microorganisms	- GMP/GHP (Premises)
Empty cans/ends - could arrive with serious internal double seam or body plate defects which could result in leakage causing post-process contamination - could arrive with serious external double seam, body plate, lacquer/coating defects or damage which could result in leakage causing post-process contamination	- CCP4B - CCP1B/CCP4B
PROCESS STEPS	
5. Refrigerated mushroom storing - improper storage temperature and humidity could result in increase of bacterial load	- GMP/GHP (Equipment)
6. Can/end storing - physical damage could result in serious double seam defects which could result in post-process contamination with pathogenic bacteria - could be contaminated with rodent excrement	- CCP1B - GMP/GHP (Sanitation)
7. Dry ingredient storms - could be contaminated with rodent excrement	GMP/GHP (Sanitation
9. Can depalletizing/inspection - incorrect cans, physical damage or serious visible defects could result in leakage and post-process contamination with pathogenic bacteria	- CCP1B
11. Mushroom blanching - improper cleaning of the blancher could result in the growth of thermophilic bacteria in mushrooms - inadequate blanching could result in insufficient removal of gases which could cause stress on double seams and perforations and lead to post-process contamination with pathogenic bacteria - excessive blanching could result in textural changes to the mushrooms which could result in inadequate thermal processing	- GMP/GHP (Sanitation) - GMP/GHP (Equipment)
12. Can conveying	- GMP/GHP

- physical damage could result in the formation of defective double seams which could lead to post-process contamination with pathogenic bacteria	(Equipment)
20. Weighing - overfilled cans not properly rejected for overweight could be underprocessed	- CCP2B
21. Water filling - inadequate temperature could result in low initial temperature and subsequent underprocessing	- CCP5B
22. Headspacing - insufficient headspace could result in excessive internal pressure during processing causing distorted seams and leakage contamination	- CCP3B
23. End feeding/closing/inspecting - ends with damaged curls or other serious defects could result in leakage and contamination with pathogenic bacteria - improperly formed double seams could result in leakage and contamination with pathogenic bacteria	- CCP4B - CCP4B
25. Thermal processing - non-validated process or vent schedule could result in underprocessing and survival of pathogenic bacteria - improper flow patterns in processing area could result in heat-processed cans being contaminated with unclean water from unprocessed baskets of cans - improper flow design in processing area could result in retort baskets missing the retort, allowing growth of pathogenic bacteria - excessive time lapse between closing and retorting could result in excessive buildup of bacteria, some of which could survive the thermal process - lack of adherence to time, temperature and other critical factors of the scheduled process or vent schedule could result in inadequate heat treatment, allowing the survival of pathogenic bacteria	- GMP/GHP (Records) - GMP/GHP (Personnel) - CCP5B - CCP5B - CCP5B
26. Cooling - insufficient chlorinated cooling water could result in contamination of product during contraction of cans - excess chlorine in cooling water could result in corrosion and subsequent leakage and contamination of product - insufficient contact time between the chlorine and water could result in contamination of product during contraction of the cans - insufficient or excessive cooling could result in thermophilic spoilage or postprocess	-ccp6B CCP6B - GMP/GHP (Sanitation, Personnel - GMP/GHP (Sanitation, Personnel

contamination because of leakage of corroded cans	
27. Conveying/drying - contaminated -water from wet and unclean post-process equipment could contaminate product	- GMP/GHP (Sanitation)
28. Labelling/storing - physical damage to cans could result in leakage and contamination of product - high temperatures could result in growth of thermophilic bacteria	- GMP/GHP (Equipment, Personnel) - GMP/GHP (Personnel)
29. Shipping - physical damage to cans could result in leakage and contamination of product	- GMP/GHP (Personnel Training

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Example FORM 6

HAZARD IDENTIFICATION: CHEMICAL HAZARDS

PRODUCT NAME(S): Canned mushroom

List all chemical hazards related to ingredients, incoming material, processing, product flow, etc.

Identified chemical hazards	Controlled at
INGREDIENTS/MATERIALS	
Mushrooms - could contain pesticide residues - could contain heat-stable staphylococcal enterotoxin from improper handling	See Form 9 See Form 9
Water - could be contaminated with dissolved heavy metals or toxic substances	See Form 9 See Form 9
Water - could be contaminated with dissolved heavy metals or toxic substances	- GMP/GHP (Premises)
Empty cans/ends - cans/ends could be contaminated with greases/oils or cleaning chemicals	GMP/GHP (Receiving, Storage & Transport)
PROCESS STEPS	
6. Can/end storing	GMP/GHP

- cans/ends could become contaminated with non-food chemicals as a result of improper storage	(Sanitation)
7. Dry ingredient storing - food ingredients could become contaminated with non-food chemicals if improperly stored	GMP/GHP (Sanitation)
11. Mushroom blanching - cleaning-chemical residues could contaminate the mushrooms - if live steam is used, boiler water additives could carry over and contaminate the product cleaning-chemical residues or lubrificants could contaminate the mushrooms	GMP/GHP (Sanitation) - GMP/GHP (Sanitation)

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Example FORM 7

HAZARD IDENTIFICATION: PHYSICAL HAZARDS

PRODUCT NAME(S): Canned mushroom List all physical hazards related to ingredients, incoming material, processing, product flow, etc.

Identified physical hazards	Controlled at
INGREDIENTS/MATERIALS	
Mushrooms -could be contaminated with harmful extraneous materials, e.g. glass, metal, plastic, wood	Not applicable (not likely to get through equipment and inspection belt)
Empty cans - could contain metal fragments, etc.	GMP/GHP (Receiving, Storing & Transport)
Dry ingredients - could be contaminated with harmful extraneous materials	- GMP/GHP (Receiving, Storing & Transport)
INGREDIENTS/MATERIALS	
1. Mushroom receiving - inadequate protection against harmful extraneous material could result in contamination of mushrooms	- GMP/GHP (Premises)

2. Can/end receiving - inadequate protection against harmful extraneous material could result in contamination of cans and ends	- GMP/GHP (Premises)
3.Dry ingredient receiving - inadequate protection against harmful extraneous material could result in contamination of ingredients	GMP/GHP (Premises)
5. Mushroom storing - inadequate protection against harmful extraneous material could result in contamination of raw mushrooms	GMP/GHP (Premises, Receiving, Storage & Transport)
6. Can/end storing - inadequate protection against harmful extraneous material could result in contamination	GMP/GHP (Premises, Receiving, Storage & Transport)
7. Dry ingredient storing - inadequate protection against harmful extraneous material could result in contamination of food ingredients	GMP/GHP (Premises, Receiving, Storage & Transport)
9. Can inspection/depalletizing - empty cans coming from storage could contain harmful extraneous material which could result in contamination of food product	- CC1P
12. Can conveying - inappropriate design and protection against harmful extraneous material could result in contamination of food product	GMP/GHP (Equipment)
14. Mushroom conveying/inspection - inappropriate design and protection against harmful extraneous material could result in contamination of the mushrooms	GMP/GHP (Premises, Equipment, Personnel)
16. Mushrooms slicing/dicing - product could become contaminated with metal fragments from plant machinery	GMP/GHP (Equipment)
18. Foreign object removal - inadequate monitoring of foreign object removal could allow foreign objects to contaminate the product	GMP/GHP (Equipment)
19. Filling - filled cans of mushrooms could become contaminated with metal fragments from the filling equipment	GMP/GHP (Equipment)

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Example FORM 8

CCP DETERMINATION

Process step/ incoming material	**Category and identified hazard**	**Question 1**	**Question 2**	**Question 3**	**Question 4**	**CCP number**
Mushrooms as delivered	**B** – pathogens	**Yes** heat treatment	N/A	**Yes**	**Yes** thermal processing (25)	
	C -pesticides **C** - heat-stable toxins	**No** control is at farms/growers **No** control is at farms/growers, storage				
	P - harmful extraneous material (HEM)	**Yes** visual inspection and foreign object removal	Yes	No		
Empty cans as delivered	**B** -post-process contamination from serious internal seam defects	**Yes** can tear-down and inspection	N/A	**Yes**	**Yes** closing and inspecting (23)	
	B - post-process contamination from serious	**Yes** visual can inspection	N/A	**Yes**	**Yes** inspecting/ depalletizi	

	external visible can defects				ng (9)	
	C - cleaning chemicals (GMPs) **P**-HEM		N/A	**Yes**	Yes inspecting/ depalletizing (9)	
Dry ingredients as delivered	**B** - bacterial spores	Yes heat treatment	N/A	**Yes**	Yes thermal processing (25)	
	B - rodent excrement (GMPs					
	P - HEM (GMPs)					
	B - faecal coliform (GMPs)					
1. Mushroom receiving	**P** - HEM (GMPs)					
2. Can/end receiving	**P** - HEM (GMPs)					
3. Dry ingredient receiving	**P -** HEM (GMPs)					
5. Mushrooms at receiving	**B** - growth of pathogens (GMPs					
	P - HEM (GMPs)					
6. Can/end storing	**B** - post-process contamination because of damaged cans/end	**Yes** visual Inspection	N/A	**Yes**	Yes inspecting/ depalletizing (9)	
	B - rodent excrement (GMPs)					
	C - cleaning					

	chemicals (GMPs)					
	P - HEM (GMPs)					
7. Dry ingredient storing	**B** - rodent excrement (GMPs)					
	C - cleaning chemicals (GMPs)					
	P - HEM (GMPs)					
9. Can inspecting/ depalletizing	**B** - post-process contamination because of incorrect cans or serious can defects	**Yes** visual inspection	**Yes**	**Yes**		**CCP 1 (BP)**
	P-HEM	**Yes** visual inspection	**Yes**	**Yes**		
11. Mushroom blanching	**B** - growth of thermophiles, textural changes affecting thermal process (GMPs)	**B** - inadequat e removal of gases (GMPs				
	C - cleaning chemicals (GMPs)					
12. Can conveying	**B** - post-process contamination because of damage (GMPs)					
	P - HEM (GMPs)					
14. Mushroom conveying/inspectin g	**C** - cleaning chemicals (GMPs)					
	P - HEM (GMPs)					

16. Mushroom slicing/dicing	C - cleaning chemicals, lubrificants (GMPs)					
	P - HEM (GMPs)					
18. Foreign object removal	**P** - metal fragments (GMPs)					
19. Filling	C - cleaning chemicals, lubrificants (GMPs)					
	P - HEM (GMPs)					
20. Weighing	**B** - product heavier than maximum fill weight in scheduled process	**Yes** weighing	**Yes**	**Yes**	**No**	**CCP 2 (B)**
21. Water filling	**B -** inadequate temperature resulting in low initial temperature (IT) for process	Yes take IT just prior to thermal process	**No**	**Yes**	**Yes** thermal processing (25)	
22. Head-spacing	**B** - insufficient headspace resulting in distorted, potentially leaking seams	**Yes**	**Yes**	**Yes**	**No**	**CCP 3 (B)**
23. End feeding/ closing/inspection	**B -** post-process contamination	**Yes** visual	**Yes**	**Yes**	**Yes**	**CCP 4 (B)**

	because of damaged ends	inspection				
	B - post-process contamination because of improperly formed seams	**Yes** visual and teardown can inspection	Yes	Yes	**No**	
	C - cleaning chemicals, lubrificants (GMPs)					
25. Thermal processing	**B -** non-validated process or vent schedule could result in underprocessing and survival of pathogenic bacteria (GMPs)					
	B - improper flow patterns for process could result in crosscontaminati on (GMPs)					
	B - improper flow patterns for process could allow bypass of thermal process	**Yes** use of heatsensit ive indicator	**Yes**	**Yes**	**No**	**CCP 5 (B)**
	B - excessive delays between closing and	**Yes** monitor time lapse	**Yes**	Yes	**No**	**CCP 5 (B)**

	retorting could result in excessive growth of pathogenic bacteria	between the two operations				
	B - excessive delays between closing and retorting could result in excessive growth of pathogenic bacteria	**Yes** monitor time lapse between the two operations	**Yes**	**Yes**	**No**	
	B - lack of adherence to time temperature and. other critical factors of scheduled process or vent schedule could result in inadequate heat treatment and growth of pathogens	**Yes** control critical factors of scheduled process and vent schedule	**Yes**	**Yes**	**No**	
26. Cooling	**B** - post-process contamination during cooling/contracting of cans because of	**Yes** control chlorine level in cooling water	**Yes**	**Yes**	**No**	**CCP 6 (B)**

	insufficiently chlorinated cooling water					
	B - post-process contamination because of leakage resulting from corrosion from excessive chlorine cleaning chemicals	**Yes** control chlorine level in cooling water	Yes	Yes	No	
	B - insufficient chlorine contact time could lead to contamination (GMPs)					
	B - insufficient or excessive cooling could result in thermophilic spoilage or contamination because of corrosion leakage (GMPs)					
27. Conveying/drying	**B** - unclean wet equipment could lead to contamination (GMPs)					
28. Labelling/storing	B - post-process contamination because of					

	damaged cans (GMPs)					
	B - growth of thermopiles (GMPs)					
29. Shipping	B - post-process contamination because of damaged cans (GMPs)					

Instructions:

- Category and identified hazard: Determine if hazard is fully controlled by adherence to Codex General Principles of Food Hygiene. If Yes, indicate "GMPs", describe and proceed to next identified hazard. If No, proceed to Question 1.
- Question 1: Do control preventive measure(s) exist? If No, this is not a CCP. Identify how the hazard can be controlled before or after the process and proceed to the next identified hazard. If Yes, describe and proceed to the next question.
- Question 2: Is the operation specifically designed to eliminate or reduce the likely occurrence of a hazard to an acceptable level? If No, proceed to Question 3. If Yes, this is a CCP; identify it as such in the last column.
- Question 3: Could contamination with identified hazard(s) occur in excess of acceptable level(s) or could these increase to unacceptable levels? If No, this is not a CCP; proceed to the next identified hazard. If Yes, proceed to Question 4.
- Question 4: Will a subsequent operation eliminate identified hazard(s) or reduce likely occurrence to an acceptable level? If No, this is a CCP; identify it as such in the last column. If Yes, this is not a CCP; identify the subsequent step and proceed to the next identified

Example FORM 9

UN-ADDRESSED HAZARDS

PRODUCT NAME(S): Canned mushrooms

List any biological, chemical and/or physical hazards that are not controlled at the establishment

Unaddressed hazard from previous list	Identified methods of addressing the hazard (e.g. cooking instructions, public education, use by date, etc.)
C - raw mushrooms could contain pesticide residues	Upstream (farm-level) programmes such as: A. Training persons who apply pesticides B. Purchasing registered pesticides for growers C. Auditing growers' application of pesticides and records thereof D. Requiring periodic pesticide residue analysis reports
C - raw mushrooms could contain heat-stable staphylococcal enterotoxin from improper grower handlin	Upstream (farm-level) programmes such as: A. Training growers on handling of raw product B. Ensuring growers' use of proper, effective refrigeration equipment C. Ensuring prompt delivery of raw product after picking

- **Topic 4: Establish critical limits for each critical control point - Task 8/Principle 3**

At each critical control point (CCP)/critical limits are established and specified.

Critical limits are defined as criteria that separate acceptability from unacceptability. A critical limit represents the boundaries that are used to judge whether an operation is producing safe products. Critical limits may be set for factors such as temperature, time (minimum time exposure), physical product dimensions, water activity, moisture level, etc. These parameters, if maintained within boundaries, will confirm the safety of the product.

The critical limits should meet requirements of government regulations and/or company standards and/or be supported by other scientific data. In some cases, food control regulatory authorities provide

information on which to establish the critical limits based on known food hazards and the results of risk analysis (e.g. the time/temperature requirements for thermal processes such as pasteurization, cooking, retorting; maximum number and size of physical contaminants, chemical residues).

It is essential that the person(s) responsible for establishing critical limits have a knowledge of the process and of the legal and commercial standards required for the product.

OPERATING LIMITS

If monitoring shows a trend towards lack of control at a CCP, operators can take action to prevent loss of control of the CCP before the critical limit is exceeded. The point at which operators take such action is called the "operating limit". Operating limits should not be confused with critical limits. Often, the operating limits are more restrictive and are established at a level that would be reached before the critical limit is violated; i.e. they should prevent a deviation from critical limits.

Table 1 EXAMPLES OF CRITICAL LIMITS

Hazard	**CCP**	**Critical limit**
Bacterial pathogens (non-sporulating)	Pasteurization	72°C for at least 15 seconds
Metal fragments	Metal detector	Metal fragments larger than 0.5 mm
Bacterial pathogens	Drying oven	Aw≤0.85for controlling growth in dried food products
Excessive nitrite	Curing room/brining	Maximum 200 ppm sodium nitrite in finished product
Bacteria pathogens	Acidification step	Maximum pH of 4.6 to control Clostridium botulinum in acidified food
Food allergens	Labelling	Label that is legible and contains a listing of correct ingredients
Histamine	Receiving	Maximum of 25 ppm histamine levels in evaluation of tuna for histamine

a Regulatory action level is 50 ppm, but histamine levels may increase during processing. Therefore, industry may want to set lower histamine critical limits at receiving.

An operator may observe a trend towards loss of control, such as the failure of a cooker to maintain the desired temperature consistently. Observing a trend towards loss of control early and acting on it can save product rework or, worse yet, product destruction. When the critical limit is exceeded, corrective action is required (see Task 10/Principle 5).

For this reason, a processor may choose to operate a CCP at a limit more conservative than the critical limit. Such operating limits may be selected for various reasons:

• For quality reasons, e.g. higher cooking temperatures for flavor development or product texture

• To avoid exceeding a critical limit, e.g. using a cooking temperature higher than the critical limit as an alarm point, to warn the operator that the temperature is approaching the critical limit and needs adjusting

• To account for normal variability, e.g. setting a cooker with 2°C variability at least 2°C above the critical limit to avoid violating it

The process may need to be adjusted when the operating limit is exceeded. Such actions are called "process adjustments" (see Figure). A processor should use these adjustments to prevent loss of control and the need for product disposition. Table 2 shows examples of critical limits versus operating limits

Critical and operating limits

Table 2 CRITICAL LIMITS VERSUS OPERATING LIMITS

Process	**Critical limit**	**Operating limit**
Acidification	pH 4.6	pH 4.3
Drying	0.84 Aw	0.80 Aw
Hot fill	80°C	85°C
Slicing	2 cm	2.5 cm

Example FORM 10

HACCP PLAN

PRODUCT NAME(S): Canned mushroom

Process step	**CCP No**	**Hazard description**	**Critical limits**	**Monitoring procedures**	**procedures Deviation procedures**	**HACCP records**

9. Can inspecting/ depalletizing	CCP 1B	1B Post-process contamination resulting from incorrect cans, damaged cans and serious defects	Can manufacturer's specifications No defects			
	CCP 1P	1P Harmful extraneous materials (HEM) ,e.g. wood, glass, metal fragments	No HEM			
20. Weighing	CCP 2B	Overfilling resulting in underprocessing	Maximum fill weight as specified in the scheduled process			
22. Head spacing	CCP 3B	Insufficient headspace resulting in excessive internal pressure and distorted seams	Minimum headspace as specified in the scheduled process			
23. End feeding/ closing/inspecting	CCP 4B	Post-process contamination resulting from damaged or defective ends or improper double seams	Can manufacturer's specifications No serious problems			
25. Thermal processing	CCP 5B	5B Inadequate heat treatment	Maximum time lapse			

			between closing and retort up, minimum IT, minimum time and temperature for vent and cook as specified in the scheduled process Heat-sensitive indicator changes colour			
26. Cooling	CCP 6B	Post-process contamination of product from cooling water	Detectable residual chlorine levels to 2 ppm in the cooling water			

Establish a monitoring system for each critical control point - Task 9/Principle 4

The Codex Hazard Analysis and Critical Control Point (HACCP) system and guidelines for its application defines monitoring as "the act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control".

Monitoring is the scheduled measurement or observation of a CCP relative to its critical limits. The monitoring procedures must be able to detect loss of control at the CCP. Therefore, it is important to specify fully how, when and by whom monitoring is to be performed. The purposes of monitoring include the following:

- To measure the performance level of the system's operation at the CCP (trend analysis)

• To determine when the performance level of the system results in a loss of control at the CCP, e.g. when there is deviation from a critical limit (see Task 10)

• To establish records that reflect the performance level of the system's operation at the CCP to comply with the HACCP plan

Monitoring procedures performed during the operation should result in written documentation which will serve as an accurate record of the operating conditions.

Monitoring may mean measuring a characteristic of the product or of the process to determine compliance with a critical limit. Examples include:

- Measurement of the time and temperature of a thermal process
- Measurement of cold-storage temperatures
- Measurement of pH
- Measurement of Aw

Monitoring may also mean observing whether a control measure at a CCP is being implemented. Examples include:

-Visual examination of sealed cans

-Verification of vendor's certificates of analysis

Microbiological testing is rarely effective for monitoring CCPs for this reason, and also because large sample sizes would be needed to find microorganisms at levels that may cause illness. Instead, physical and chemical measurements (e.g. pH, Aw, time, temperature) are preferred, as they can be done rapidly and can often be related to the microbiological control of the process.

The equipment used for monitoring CCPs will vary depending on the attribute being monitored. Examples of monitoring equipment include:

- Thermometers
- Clocks
- Scales
- pH-meters
- Water activity meters
- Chemical analytical equipment

Example FORM 10

HACCP PLAN

PRODUCT NAME(S): Canned mushroom

Process step	**CCP** No.	**Hazard description**	**Critical limits**	**Monitoring procedures**	**Deviation procedures**	**HACCP records**
1.Can inspecting/ depalletizing	CCP 1B	1B Post-process contamination resulting from incorrect cans, damaged cans and serious defects	Can manufacturer's specifications No defects	Can manufacturer's specifications No defects		
	CCP 1P	Harmful extraneous materials (HEM) ,e.g. wood, glass, metal fragments	No HEM	Continuous visual monitoring by the depalletizer operator		
2. Weighing	CCP 2B	Overfilling resulting in underprocessi ng	Maximum fill weight as specified in the scheduled process	On-line checkweigher to eject over- and underfilled cans after filling		
3. Head spacing	CCP 3B	3B Insufficient headspace resulting in excessive internal pressure and	Minimum headspace as specified in the scheduled process	Headspace check done after closing on consecutive samples, at least, one from		

		distorted seams		each head, by seam mechanic at start-up and every hour		
4. End feeding/ closing/inspecting	CCP 4B	Post-process contamination resulting from damaged or defective ends or improper double seams	Can manufacturer's specifications No serious problems	Continuous visual monitoring of ends by closing machine operator		
				Visual examination of sealed cans at start-up, after severe jam-ups and after adjustments as well as every half hour, and terndown examination every 4 hours on consecutive samples, one from each head, by closing machine operator		

5.Thermal processing	CCP 5B	Inadequate heat treatment	Maximum time lapse between closing and retort up, minimum IT, minimum time and temperature for vent and cook as specified in the scheduled process Heat sensitive indicator changes colour	QC to check on time lapse between closing and retort up (at least once per period) Retort operator to check on IT, time and temperature for vent and cook and thermograph Busse unloader to check heat sensitive indicator tape Busse unloader to segregate product if no indicator tape or no colour change of indicator tape		
6. Cooling	CCP 6B	Post-process contamination of product from cooling water	Detectable residual chlorine levels to 2 ppm in the cooling water	Chlorine checks every hour at exit of cooling water	Retort operator to adjust chlorine and to inform QC	

					Operator to hold and QC to investigate all product run since last satisfactory check	

DATE: _____ APPROVED BY: _____

- **Topic 5 Establish verification procedures - Task 11/Principle 6**

Verification is embodied in HACCP Principle 6: Establish verification procedures. The Codex guidelinesdefine verification as "the application of methods, procedures, tests and other evaluations, in addition to monitoring to determine compliance with the HACCP plan". Verification and auditing methods, procedures and tests, including random sampling and analysis, can be used to determine if the HACCP system is working correctly.

Routine monitoring activities for critical limits should not be confused with verification methods, procedures or activities.

Each HACCP plan should include verification procedures for individual CCPs and for the overall plan. HACCP plans are expected to evolve and to improve with experience and new information. Periodic verification helps improve the plan by exposing and strengthening weaknesses in the system and eliminating unnecessary or ineffective control measures. Verification activities include:

- HACCP plan validation
- HACCP system audits
- Equipment calibration
- Targeted sample collection and testing

Verification may also include targeted sampling and testing and other periodic activities. Targeted sampling and testing involves taking product samples periodically and testing them to ensure that critical limits are appropriate for product safety

Establish documentation and record keeping - Task 12/Principle 7

A record shows the process history, the monitoring, the deviations and the corrective actions (including disposition of product) that occurred at the identified CCP. It may be in any form, e.g. processing chart, written record, computerized record. The importance of records to the HACCP system cannot be overemphasized. It is imperative that the producer maintain complete, current, properly filed and accurate records.

Four types of records should be kept as part of the HACCP program:

- Support documentation for developing the HACCP plan
- Records generated by the HACCP system
- Documentation of methods and procedures used
- Records of employee training programs

The required HACCP records to be kept at each CCP should be written on Form 10 (see example). Failure to document the control of a CCP would be a critical departure from the HACCP plan.

The records generated by the HACCP system include all activities and documentation required by the plan, as follows.

Deviation and corrective action records

- Identification of the deviant lot/product
- Amount of affected product in the deviant lot
- Nature of the deviation
- Information on the disposition of the lot
- Description of the corrective action

Verification/validation records

- In-house on-site inspection
- Equipment testing and evaluation
- Accuracy and calibration of monitoring equipment
- Results of verification activities, including methods, date, individuals and/or organizations responsible, results or findings and action taken

- **Topic 6: Record keeping procedures**

The producer should maintain records of the methods and procedures used in the HACCP system. Examples include:

- Description of the monitoring system for the critical limit of each CCP, including: the methods and equipment used for monitoring, the frequency of monitoring and the person performing the monitoring
- Plans for corrective actions for critical limit violations or situations resulting in potential hazards
- Description of record keeping procedures, including copies of all record forms
- Description of verification and validation procedures

All HACCP monitoring records should be kept on forms that contain the following information:

- Form title
- Time and date
- Product identification (including product type, package size, processing line and product code)
- Critical limits
- Monitoring observation or measurement
- Operator's signature or initials
- Corrective action taken, where applicable
- Reviewer's signature or initials
- Date of review

Example FORM 10

HACCP PLAN

PRODUCT NAME(S): Canned mushroom

Process step	**CCP** No.	**Hazard description**	**Critical limits**	**Monitoring procedures**	**Deviation procedures**	**HACCP records**
1. Can inspecting/ depalletizing	CCP 1B	1B Post-process contamination resulting from incorrect cans, damaged cans and serious defects	Can manufacturer's specifications No defects	Can manufacturer's specifications No defects	Can depalletizer operator to remove any incorrect cans, cans with serious	Empty container cull report Low vacuum detector report

					defects and damaged cans and to inform QC Operator to hold remainder of pallets and QC to investigate	
	CCP 1P	Harmful extraneous materials (HEM) ,e.g. wood, glass, metal fragments	No HEM	Continuous visual monitoring by the depalletizer operator	Can depalletizer operator to remove any cans with HEM and to inform QC Operator to hold remainder of pallet and QC to investigate	Empty container cull report
2. Weighing	CCP 2B	Overfilling resulting in underprocessing	Maximum fill weight as specified in the scheduled process	On-line checkweigher to eject over- and underfilled cans after filling	Line operator to adjust weight of ejected can manually by adding or	Fill control report Daily grading repor

					taking away mushrooms	
3. Head spacing	CCP 3B	3B Insufficient headspace resulting in excessive internal pressure and distorted seams	Minimum headspace as specified in the scheduled process	Headspace check done after closing on consecutive samples, at least, one from each head, by seam mechanic at start-up and every hour	Closing machine mechanic to adjust headspaces and to inform QC Operator to hold and QC to investigate all product run since last satisfactory results	Double seam inspection report Daily grading report
4. End feeding/ closing/inspecting	CCP 4B	Post-process contamination resulting from damaged or defective ends or improper double seams	Can manufacturer's specifications No serious problems	Continuous visual monitoring of ends by closing machine operator	Closing machine operator to remove any damaged or defective ends and to inform QC Operator to hold and QC to investigate ends and sealed cans if necessary	Daily seamer report. Double seam inspection report Low vacuum detector report Container integrity inspection report

				Visual examination of sealed cans at start-up, after severe jam-ups and after adjustments as well as every half hour, and terndown examination every 4 hours on consecutive samples, one from each head, by closing machine operator	Seamer mechanic to adjust closing machine and to inform QC Operator to hold and QC to investigate all product run since last satisfactory inspection	

5.Thermal processing	CCP 5B	Inadequate heat treatment	Maximum time lapse between closing and retort up, minimum IT, minimum time and temperature for vent and cook as specified in the scheduled process Heat sensitive indicator changes colour	QC to check on time lapse between closing and retort up (at least once per period) Retort operator to check on IT, time and temperature for vent and cook and thermograph Busse unloader to check heat sensitive indicator tape Busse unloader to segregate product if no indicator tape or no colour change of indicator tape	Retort operator to adjust time and temperature of cook as per authorized contingency plan and to inform QC Operator to hold and QC to investigate all product suspected of deviation	Retort operator's log Thermograph charts Low vacuum detector report Heatsensitive indicator log
6. Cooling	CCP 6B	Post-process contamination of product from cooling water	Detectable residual chlorine levels to 2 ppm in the cooling water	Chlorine checks every hour at exit of cooling water	Retort operator to adjust chlorine and to inform QC Operator to hold and QC to	Retort operator's log Low vacuum detector report

					investigate all product run since last satisfactory check	

DATE: _____ APPROVED BY: _____

LO2.4 Apply control methods for each point of HACCP

There are 8 stages in the flow of the food through your establishment: (Purchasing and receiving, Storage, Preparation (including defrosting), Cooking, Cooling, Hot and cold holding, Reheating and Serving). At each stage the control should be applied for food safety implementation.

- **Topic 1: Control methods for each point of HACCP**

1. Food deliveries and receiving

- All food must come from approved sources
- Homemade or uninspected food is not allowed.
- Inspect all incoming food for torn, damaged or stained boxes.
- Inspect the condition of the delivery truck.
- Check the temperature of incoming food. Refrigerated foods must be at 4ºC (40ºF) or less. Frozen food must be at -18ºC (0ºF) or less.

2. **Storage**

- **General**

- Practice F.I.F.O. (First in, First Out)
- Store chemical products away from food products.
- When foods are repackaged, clearly label and date container.
- All food containers must be properly covered.

3. FoodPreparation

- Wash your hands before beginning preparation and in between tasks.
- Prepare food in small batches.

- Prevent cross contamination by cleaning and sanitizing utensils and work surfaces in between tasks, or by using color coded cutting boards for different foods.
- Prepare the food as close to serving time as possible.

4. Cooking cooked food

- Hot and cold spots - if no rotating base on the microwave physically stop the cooking process and turn the food occasionally.
- Check internal temperature at 3 different sites.
- Place thicker portions of food toward the exterior of the microwave dish.
- Ensure the containers are microwave safe.

4. **Cooling**

Food should be cooled from 60ºC (140ºF) to 4ºC (40ºF) within 4 to 6 hours. It can take hours, if not days, for large quantities of food to cool to appropriate temperatures.

- Suggestions of how to reduce cooling times:
  - Place pots of food in an ice water bath.
  - Divide large quantities of food into smaller containers 10cm (4in) in depth.
  - Stir frequently.
  - Slice or divide large cuts of meat into smaller pieces.
  - Place in the refrigerator and once it cools to 4ºC(40ºF) cover the container**.**

5. **Reheating**

- Reheat cold hazardous food to original cooking temperature.
- Reheat quickly on or in the stove.
- Never reheat slowly over several hours in hot holding units. Place food in/on stove or in microwave to reheat then place in hot holding units.

6. **Serving**

- Prevent cross-contamination by ensuring servers take appropriate personal hygiene measures (e.g. Hand washing, no direct contact with food).
- Ensure clean and sanitized utensils are used.
- Do not stack plates when serving meals to customers.
- Ensure service areas kept clean, and regularly wipe down menus. If transporting foods, ensure vehicles are clean and foods are held at proper hot or cold holding temperatures.

Learning Unit 3. Revised Food Safety Procedures Monitor Food Safety Program

One of your roles as a supervisor is to supervise the day-to-day implementation of the food safety program in your workplace. To do this it is essential that you have good communication skills. Being a supervisor also involves supporting others to implement the requirements of the food safety procedures.

LO.3.1. Communicate food safety procedures

- **Topic 1: Types of communication methods in food safety**
  - Induction training
  - On-the-job training
  - Other training sessions
  - Briefings and staff meetings
  - Notice boards
  - Staff intranet
  - Memos, e-mail and sms
  - Minutes of food safety team meetings

LO 3.2 Organize training and mentoring food safety policies and procedures

There is no standard that will outline all the requirements for technical training in the food industry. Each facility, product and position is unique and will require specific technical knowledge from staff.

Some positions require more formal training than others. Technical training is not always restricted to 'how to do the job.' In most situations, it is important to combine this training with food safety and other training.

- **Topic 2: Food Safety Training Methods**

There are various methods for technical training of employees including:

- Using job specific written SOPs (Standard Operating Procedures);
- Videos; and
- Job shadowing
- Lecture and
- Lecture/discussion

Types and methods of training in food safety

- **Cross-training Staff**

Most facilities ensure that some employees are cross-trained so they are available to fill in on short notice

- **Critical Control Point (CCP) Training**

Employees responsible for monitoring critical control points (CCPs) must be trained to understand the importance of the CCP and the critical limits. They must also understand procedures for monitoring the CCP, deviation procedures, and document control procedures.

Staff members responsible for key positions often need training not only for their job, but also in other duties. These include:

- Maintaining documentation;
- Understanding reasons for certain corrective actions; and plant's HACCP plan.

- **Calibration/Maintenance Training**

Maintenance staff members are often overlooked when it comes to food safety. Most companies hire maintenance personnel with the certification for their specific trade (e.g. plumber's certificate, electrician's certificate, etc.). However, they often overlook the importance of training these employees on how their work will affect food safety. Employees hired to calibrate or adjust equipment must also understand how their tasks affect food safety.

Maintenance staff must have the skills and knowledge to make sure that equipment is cleaned and sanitized. This must be done before equipment is allowed back into operations. Create procedures to notify Sanitation/Production/QA Staff when maintenance is complete. Also develop procedures to let maintenance staff and services know when there are changes in process safety or control.

- **Sanitation Training**

To reduce the chances of accidental food contamination, make sure staff have a basic knowledge of chemical use and sanitation.

The most important training for sanitation staff is how to correctly handle chemicals. Train sanitation crews in the correct dress and personal protective equipment required for both food safety and personal safety. Teach sanitation staff how to store and separate chemicals. Make sure they know to store all cleaning, sanitizing and pest control chemicals in areas separate from food processing.

- **Supervisor Training**

Supervisory employees are generally responsible for making sure all food employees on their shift follow company procedures and policies.

Most supervisory staff must be competent and trained to standards in the following areas:

- Relationship between the prevention of foodborne illness and the personal hygiene of an employee;
- The policies and responsibilities of a supervisor for preventing the transmission of foodborne disease from an employee to food or food products;
- The required food temperatures and safe cooking, cooling and storage of any potentially hazardous foods in the facility;
- The relationship between food safety and the management and control of:
- Cross-contamination
- Hand contact with ready-to-eat foods;
- Hand washing
- Maintaining a manufacturing environment in clean condition and good repair;
- The correct procedures for cleaning and sanitizing utensils;
- Poisonous or toxic material identification;
- Knowledge of all important processing points in the operation (from purchasing through to packaging)

LO. 3.3 Follow operational activities to ensure policies and procedures

- **Topic 1: Operational activities of food safety**

Controlling and reduce outbreak of food poisoning

✓ Carriers should be inspected by the manufacturer on receipt and prior to loading to ensure they are free from contamination and suitable for the transportation of food

✓ Carriers should be loaded, arranged and unloaded in a manner that prevents damage and contamination of the food.

✓ Transporters or storage facilities should be required to take proper hygienic measures to protect the food and should be required to keep and retain records that will document their adherence to food safety plans.

Registration of premise and vehicles

- ✓ Containers used to hold dangerous substances should be identified and, where appropriate, be lockable to prevent malicious or accidental contamination of food.
- ✓ Where the same conveyance or container is used for transporting different foods, or non-foods, effective cleaning and, where necessary, disinfection should take place between loads.
- ✓ Lot identification/registration is essential in product recall and also helps effective stock rotation. Each container of food should be permanently marked to identify the producer and the lot. Codex General Standard for the Labelling of Prepackaged Foods (CODEX STAN 1-1985) applies.
- ✓ Where appropriate, particularly in bulk transport, containers and conveyances should be designated and marked for food use only and be used only for that purpose.

Content and labelling of food

- ✓ Prepackaged foods should be labelled with clear instructions to enable the next person in the food chain to handle, display store and use the product safely: Codex General Standard for the Labelling 1 of Prepackaged Foods (CODEX STAN 1-1985) applies.

Prevention of manufacture and sale of injurious food

- ✓ The manufacturer should verify that carriers are suitable for the transportation of food. For example:
- ✓ The manufacturer should have a program in place to demonstrate the adequacy of cleaning and sanitizing. For example, for bulk carriers a written cleaning and sanitizing procedure should be available.
- ✓ Where the same carriers are used for food and non-food loads (e.g. dual use), procedures should be in place to restrict the type of non-food loads to those that do not pose a risk to subsequent food loads after an acceptable cleaning or to food loads in the same shipment. For example, the manufacturer may require a cleaning certificate and a record of the previous material transported prior to loading or unloading of dual-use tankers, or may have a program in place to verify the adequacy of cleaning, e.g. tanker inspection, sensory evaluation of ingredients and/or analysis, as appropriate.

Prevention of contamination and equipment contamination

- ✓ Chemical treatment should be monitored and controlled to deliver the desired concentration and to prevent contamination.
- ✓ Chemical sanitizers will be used in accordance with the manufacturer's instructions, ensuring that concentrations, surface contact times and rinsing requirements are maintained.

- ✓ Packaging design and materials should provide adequate protection for products to minimize contamination, prevent damage, and accommodate proper labelling.

Prevision of clean water, sanitary facilities, washing facilities

- ✓ The first step is to identify those circumstances that pose a significant health risk, such as improper handling of sensitive products or ineffective cleaning or sanitizing of transportation vehicles.
- ✓ Premises, appliances and vehicles will be kept clean to a standard that prevents accumulation of any garbage, food residues, dirt, grease or other visible matter
- ✓ Only potable water should be used
- ✓ -Water recirculated for reuse should be treated and maintained in such a condition that no risk to the safety and suitability of food results from its use. The treatment process should be effectively monitored.
- ✓ Recirculated water which has received no further treatment and water recovered from processing of food by evaporation or drying may be used, provided its use does not constitute a risk to the safety and suitability of food
- ✓ Recirculated water should be treated, monitored and maintained as appropriate to the intended purpose.
- ✓ Food spoilage is a metabolic process that causes foods to be undesirable or unacceptable for human consumption due to changes in sensory characteristics. Spoiled foods may be safe to eat, i.e. they may not cause illness because there are no pathogens or a toxin present, but changes in texture, smell, taste, or appearance cause them to be rejected.

LO3.4. Prevent food spoilage

Food spoilage is a metabolic process that causes foods to be undesirable or unacceptable for human consumption due to changes in sensory characteristics. Spoiled foods may be safe to eat, i.e. they may not cause illness because there are no pathogens or a toxin present, but changes in texture, smell, taste, or appearance cause them to be rejected.

- **Topic 1: Identification of food spoiled**

- ✓ Spoilage may occur at any stage along food chain. Spoilage may arise from insect damage, physical damage, indigenous enzyme activity in the animal or plant tissue or by microbial infections.

- ✓ Fresh fruits and vegetables are perishable and highly prone to microbial spoilage caused by fungi, bacteria, yeast and moulds
- ✓ Fruits juices generally have relatively high levels of sugar and a low pH and this favors growth of

Yeasts

- ✓ Yeasts are a subset of a large group of organisms called fungi that also includes molds and mushrooms.
- ✓ Yeasts can grow with or without oxygen (facultative) and are well known for their beneficial fermentations that produce bread and alcoholic drinks.

Molds

- ✓ Moulds are filamentous fungi that do not produce large fruiting bodies like mushrooms. Moulds are very important for recycling dead plant and animal remains in nature but also attack a wide variety of foods and other materials useful to humans.
- ✓ Most moulds grow at a pH range of 3 to 8 and some can grow at very low water activity levels (0.7–0.8) on dried foods. Spores can tolerate harsh environmental conditions but most are sensitive to heat treatment.

Bacteria

- ✓ Spore-forming bacteria are usually associated with spoilage of heat-treated foods because their spores can survive high processing temperatures
- ✓ **Spoilage of fruits and vegetables**; The main sources of microorganisms in vegetables are soil, water, air, and other environmental sources, and can include some plant pathogens. Fresh vegetables are fairly rich in carbohydrates (5% or more), low in proteins (about 1 to 2%), and, except for tomatoes, have high pH. Microorganisms grow more rapidly in damaged or cut vegetables.
- ✓ **Spoilage of dairy products**. Milk is an excellent medium for growth for a variety of bacteria. Spoilage bacteria may originate on the farm from the environment or milking equipment or in processing plants from equipment, employees, or the air

Prevention from food spoilage microorganism.

- ✓ **Pasteurization;** kills the psychrophiles and mesophilic bacteria (LAB), but heat-tolerant species (Alcaligenes, Microbacterium, and the sporeformers Bacillus and Clostridium) survive and may later cause spoilage in milk or other dairy products.

- Many food products are perishable by nature and require protection from spoilage during their preparation, storage and distribution to give them desired shelf-life.
- Food preservation is a continuous fight against microorganisms spoiling the food or making it unsafe. Several food preservation systems such as heating, refrigeration and addition of antimicrobial compounds can be used to reduce the risk of outbreaks of food poisoning.

- Proper handling, packaging, transportation and storage reduce the post-harvest losses of fruit and vegetables.
- **Fermentation** and/or pH control (for example, lactic acid-producing bacteria in yoghurt inhibit the growth of other microorganisms that do not tolerate the acidic conditions and competition
- **Use of food additives**; Food additives are substances or mixture of substances other than basic foodstuffs, which are present in the foods as reagent of any aspects of production, processing, storage, packaging etc.
- **Food additives** are (i) sugar, (ii) salt, (iii) acids, (iv) spices. They kill the microorganisms or do not allow them to multiplication.

(i) **Sugar:** The concentration of 68-70% is used for preparation of jam, jelly, marmalades etc. sugar act as a preservative by osmosis and not as a true poison for microorganisms. It absorbs most of the available water, so little water available for the growth of microorganisms.

(**ii) Salt**: 15-20% concentration is used for the preparation such as pickles. Salt inhibits enzymatic browning and discoloration and also acts as an anti-oxidant. It exerts its preservative action by:

a) Causing high osmotic pressure resulting in the plasmolysis of microbial cells;

b) Dehydrating food and microorganisms by tying up the moisture;

c) Ionizing to yield the chloride ion which is harmful to microorganisms, and

d) Reducing the solubility of oxygen in water, sensitizing the cells against CO2.

e) Packaging conditions (vacuum packaging, for example, can be used to inhibit microorganisms that require air to grow)

(**iii) Acids**: Many processed foods and beverages needs the addition of acids to impart their characteristic flavour and taste in the final product because acids provide desired flavour and taste.

- ✓ Acetic acid (Vinegar), Citric acid (Lime juice), Lactic acid (Lactose) etc. are used. Acetic acid is commonly used for pickles, chutney, sauce and ketchup, just to inhibit the growth of microorganisms.

- ✓ Citric acid is used for preparation of jam, jelly, squash, nectar etc. just to increase the acidity.
- ✓ Lactic acid: It is used for the formation of curd from milk, raw flavour, specific to pickles.
- ✓ Spices are plant products, are used in flavouring the foods and beverages to enhance the food flavour, colour and palatability, act as antibacterial and antifungal activity.
- ✓ Weak carboxylic acids, such as acetic, sorbic and benzoic acids, are generally regarded as safe anti-microbial additives, and have wide application as preservatives in foods and beverages.

- **Topic2: Temperature and condition for food storage**

My temperature checks at least once a day of a high-risk food in cold or hot storage that is:

-kept in each freezer, refrigerator and cool room and held in each hot storage unit (such as Bain maries).

- **Topic3: Storing food inside a freezer**

-Store law meat poultry and seafood by tightly wrapping it and then placing it on the bottom shell of a refrigerate. This basically prevent the raw juices from dripping on other food.

-Refrigerate or freeze perishable prepared food and leftover wthin2hours

-Keep foods wrapped or covered

-Use shallow pans for quick cooling

Store read to eat foods above row hazardous foods to prevent cross-contamination

- **Topic4: Storing conditions required by different foods**

-Hot food items should be cooked first

-freeze small quantity of food at time

-keep frequently used items as the front

-avoid washing fresh product

-Keep food covered this not only returns the heat but stop into the food

-For perishable food after a delivery immediately refrigerate them

-For meats and poultry keep it in its packing until just before using

- **Topic 5: Thawing/Defrosting**

  Food can be safely defrosted:

  - In the refrigerator;
  - Under cold running water;
  - In the microwave on the defrost cycle;
  - Raw food defrosted should not be refrozen;
  - Use item within 2 days

- **Topic 6: Food storage and temperature control**

Required storage temperatures are as follows:

- Raw meat/poultry/seafood: 0C – 5C
- Cooked meat/poultry/seafood: 0C – 5C
- Cooked vegetables: 0C – 5C
- Dairy produce: 0C – 5C
- Dry store: 12C – 18C
- Frozen products: Will remain frozen (usually below -18C)

Refrigeration Storage

- All refrigeration units must have an accurate indicating thermometer.

- Temperatures must be maintained at 4ºC (40ºF) or less.

- Store all raw foods below cooked or ready to eat foods to prevent cross contamination

- Avoid packing refrigerator full, air needs to circulate to maintain proper temperature.

• **Freezer Storage** - Must be maintained at -18ºC (0ºF) or less.

• **Dry Storage** - Keep food at least 15cm (6in) off the floor to facilitate cleaning and to easily identify rodent problem.

- Drying, which may use enough heat to kill microorganisms or may remove enough water from the food to prevent certain microorganisms from growing even when drying is conducted at lower temperatures

Cooking

a. 145 ºF for 15 seconds

- Seafood, beef, and pork

- Eggs cooked to order that are placed onto a plate and immediately served

b. 155 ºF for 15 seconds

- Ground products containing beef, pork, or fish
- Fish nuggets or sticks • Eggs held on a steam table
- Cubed or Salisbury steaks

c. 165 ºF for 15 seconds

- Poultry
- Stuffed fish, pork, or beef
- Pasta stuffed with eggs, fish, pork, or beef (such as lasagna or manicotti)

d. 135 ºF for 15 seconds

- Fresh, frozen, or canned fruits and vegetables that are going to be held on a steam table or in a hot box

Reheat cooked, hot food to 165 ºF for 15 seconds and start the cooling process again using a different cooling method when the food is:

- Above 70 ºF and 2 hours or less into the cooling process; and
- Above 41 ºF and 6 hours or less into the cooling process.

Hot and Cold Holding

Proper Hot Holding

-Maintain temperature of hazardous food above 60°C (140°F).

Check internal temperature of the food using a metal stem probe thermometer every 2 hours

-Reheat the food to 165 ºF for 15 seconds if the temperature is found to be below 135 ºF and the last temperature measurement was 135 ºF or higher and taken within the last 2 hours. Repair or reset holding equipment before returning the food to the unit, if applicable.

-Discard the food if it cannot be determined how long the food temperature was below 135 ºF.

Proper Cold Holding

Keep food cold in refrigerated display units or on ice. The internal temperature of the food must be maintained at 4ºC (40ºF)

-Rapidly chill the food using an appropriate cooling method if the temperature is found to be above 41 ºF and the last temperature measurement was 41 ºF or below and taken within the last 2 hours:

-Place food in shallow containers (no more than 4 inches deep) and uncovered on the top shelf in the back of the walk-in or reach-in cooler.

-Use a quick-chill unit like a blast chiller

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