UNIT-2

Preparatory Stage A:
Prerequisite Food Hygiene Requirements

Learning Outcomes
By the end of this unit the learner will be able to:
• Choose suitable personnel to involved in an HACCP team • Understanding the importance of educating and obtaining the commitment of management • Create an HACCP plan in appropriate format to ensure it is sufficiently detailed and as clear as possible

Unit 2

Preparatory Stage A: Prerequisite Food Hygiene Requirements

"Prerequisites" are basic hygiene measures that should be in place in your food business prior to you undertaking a HACCP study. They include matters such as supplier approval, incoming material specifications, finished product specifications and staff training. Once you have identified which prerequisites are relevant to your business, you should develop procedures, or review existing documentation, to ensure that adequate control measures are in place.

For each prerequisite you may wish to include the following points in your procedure:

- The title of the document. For example “Policy for glass and plastic management.”
- A brief statement on the purpose of the prerequisite measure. For example “To prevent contamination of products from glass or plastic from the factory environment.”
- What measures are necessary to achieve the desired outcome? For example, “No glass containers to be taken into production area.”
- Who will be responsible for ensuring that the requirements are met? For example, “Production supervisors must ensure that no glass containers are taken onto the production floor.”
- The nature and frequency of any checks that are to be made and by whom. For example, “Production supervisors must check the production area for any glass containers prior to commencing production each day.”
- What should happen if something goes wrong? For example, “Glass bottle found in production area. All staff provided with refresher training on glass policy to prevent recurrence.”
- How, where and by whom these checks are recorded. For example, “Production supervisors must record each pre-production glass check on form X1.”
- When and by whom the procedure must be reviewed for example, “This policy to be reviewed every 12 months by the Operations Manager.”

Preparatory Stage B: Obtain Management Commitment

The preparation and effective implementation of a HACCP system requires both time and effort not just on the part of the HACCP development team but also by everyone who is involved in the preparation and handling of your food. As such, there should be a clear statement by management which commits their support to the process.

It is best for the commitment to be made in the form of a clear written statement of management support for the HACCP process which gives authority to the HACCP team and can be referred to in staff briefings and training sessions. It would also be helpful to include details of the resources that will be made available for the process.

You might prefer to include the commitment to HACCP within a broader food safety policy that you make available to both staff and customers, for example on your website, to demonstrate your determination to develop and implement an effective food safety management. Smaller food

businesses in particular may choose to simply make such a declaration.

The key elements of a declaration of management commitment might include:

- Allocation of sufficient staff resources to complete the HACCP study and implement the HACCP system.
- Recruitment of any specialist staff needed to support the HACCP team.
- Raising awareness of the HACCP process with all staff and provide sufficient training to those directly involved in the study.
- Involvement of members of the management team as necessary.
- A commitment to provide timely management decisions as required by the HACCP team to facilitate the development and implementation of the HACCP.
- Purchase of additional equipment as required to ensure the effective operation of the HACCP system.

Preparatory Stage C: Define scope of the study

The purpose of this step is to ensure that you are absolutely clear about the nature and extent of your HACCP study. It involves:

- selecting an appropriate plan
- briefly describing the product
- identifying the start point and end of the study
- considering the likely hazards to be encountered

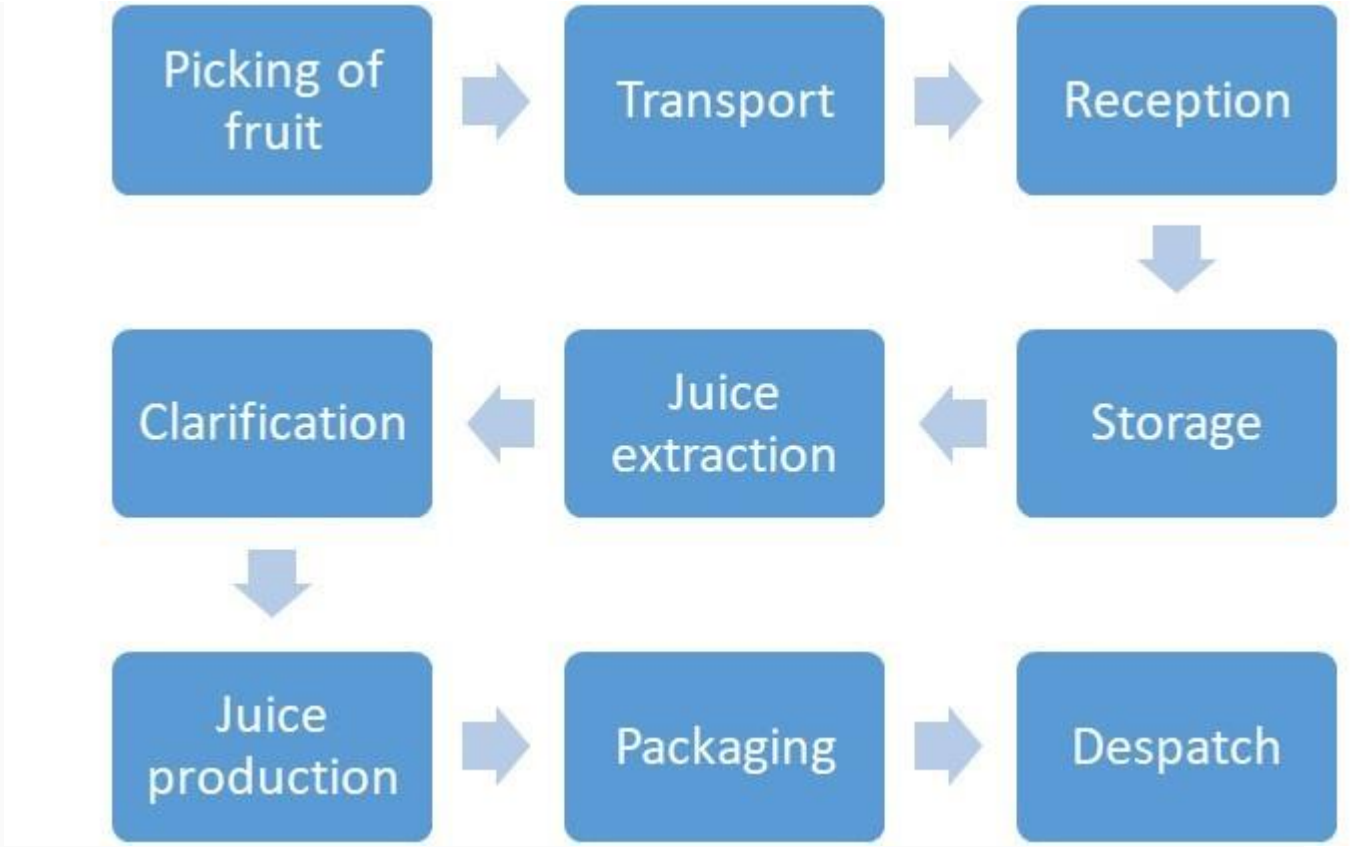
1. Type of HACCP Plan

You are asked to choose between a “Linear” or a “Modular” plan and you should select the appropriate one based on the complexity of your food operation.

A linear HACCP plan is one which considers each product as a whole, starting from the raw materials and ending with the finished product. A modular plan produces a plan made up of a series of building blocks or modules.

Linear plan

This would be suitable for a basic food production process where only a limited number of products are produced. For example, a manufacturer of orange juice may choose this approach because the manufacturing process involves a relatively small number of process steps. However, if the manufacturer decides to extend its product range to include apple, grapefruit and pineapple juices then a modular approach may be more suitable.



This is an example of a “linear HACCP” plan because the process flows in a simple line from one process step to another.

The diagram shows a linear plan with stages which follow each other in order.

1. Picking of fruit
2. Transport
3. Reception
4. Storage
5. Juice extraction
6. Clarification
7. Juice production
8. Packaging
9. Despatch

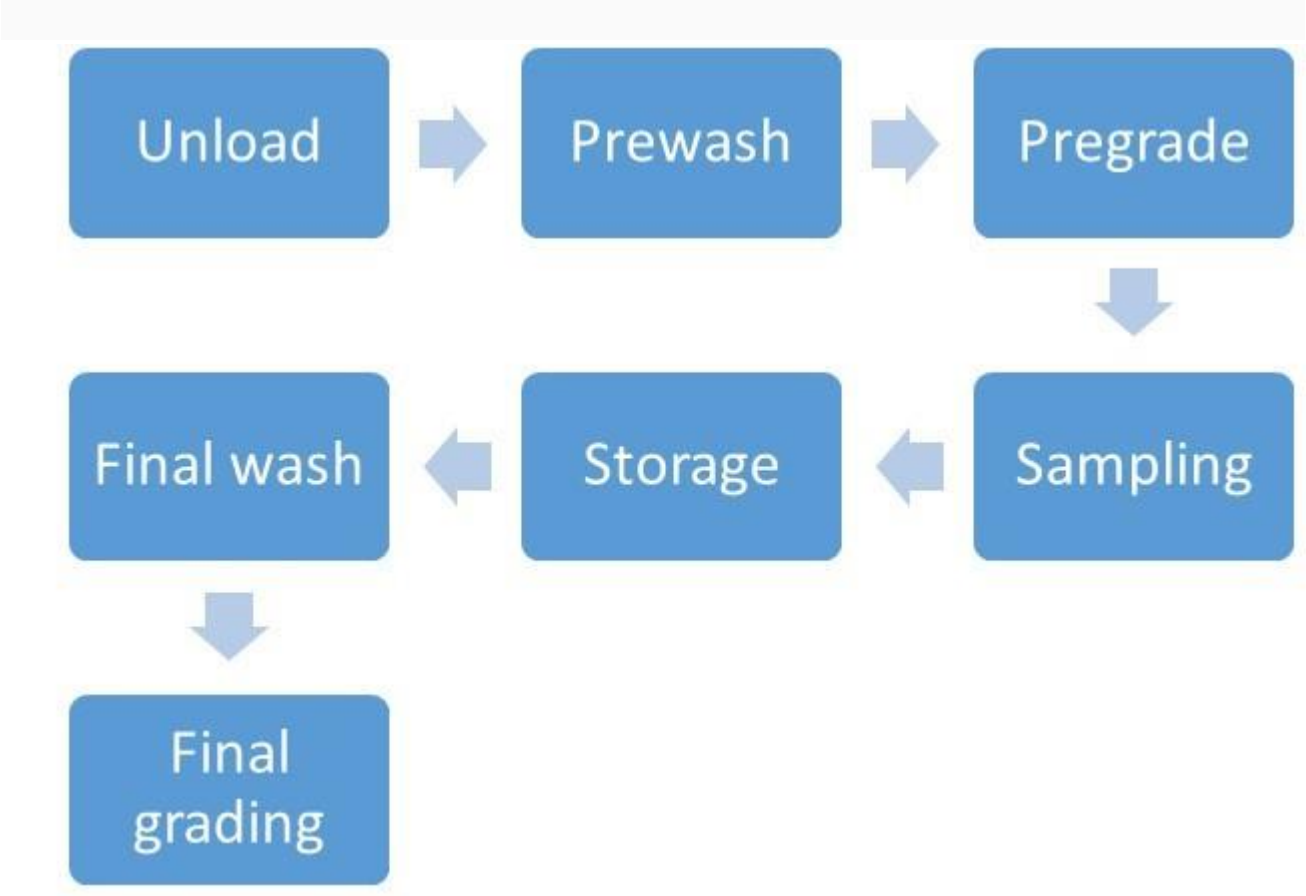
Modular Plan

This is the more common approach where the food production process is more complex and typically involves several steps which are shared with other products. The HACCP principles can be applied to specific activities or "modules" which are then added together to make a complete HACCP plan.

For example, a juice manufacturer may identify the following modules which are common to several products:

- Module 1: Fruit reception
- Module 5: Juice extraction

The hazards and controls will be the same for these operations, irrespective of the type of juice produced and so once the HACCP has been completed for each, they can be used wherever relevant for different products.



The diagram shows one module of a modular HACCP plan, relating to fruit reception in the production of fruit juices. The module contains steps which follow each other in order. The HACCP plan for each step could be used for any product type where the processes involved are the same, because the hazards and controls will also be the same.

Module: Fruit reception

1. Unload
2. Prewash
3. Pregrade
4. Sampling
5. Storage
6. Final wash
7. Final grading

2. Type of Product and How It Is Packed

You may choose to undertake a HACCP study of an individual product or prefer to group similar products together and include them in the same study. Whichever you prefer, you should clearly state your choice and include details of any relevant packaging. For example, “Manufacture of vacuum packed sliced ham” or “Preparation of individually boxed fresh cream cakes”.

3. Start and end points of study

The typical study will begin with the intake of ingredients and will end with the despatch of the final product.

However, in order to achieve food safety, you may need to consider activities not just within your own establishment but also those carried out by others such as distributors, retailers and customers. Of course you cannot be sure how your food is handled once it has left your control, but you should consider whether the study needs to include details of the likely way that others will handle your products and take these into account by, for example, providing instructions on the product label and/or packaging for storage and use.

4. What hazards will the HACCP plan cover?

The purpose of this step is to identify a “long list” of potential hazards which may be relevant to the production of your food. Hazards are anything which have the potential to cause harm and you will be required to identify hazards which fall into four categories: Physical, Chemical, Microbiological and Allergens.

- Physical hazards are specifically associated with a food, for example bones in fish or stones in fruit, or where a residual risk exists once appropriate pre-requisite controls have been put in place. For example, glass contamination in areas where products are packed in glass containers.
- Chemical hazards might include, for example, detergent residues from cleaning or chemical residues from farming practices such as antibiotic residues in milk.
- Microbiological hazards will include relevant bacteria, such as Salmonella, viruses such as norovirus and parasites such as nematodes. In most cases microbiological hazards should be specifically identified rather than merely classifying them by type such as “bacteria” or “viruses”. This is because different microorganisms will have different growth, death and survival characteristics which must be addressed separately in the HACCP plan.

- Food allergens: There are many foods which may cause allergies or intolerances to susceptible consumers but for the purposes of HACCP only the 14 allergens listed in Annex II of Regulation (EU) 1169/2011 need to be considered.

These are:

1. Named cereals containing gluten
2. Crustaceans
3. Sesame seeds
4. Sulphur dioxide & sulphites
5. Fish
6. Soybeans
7. Mustard
8. Peanuts
9. Celery
10. Eggs
11. Milk
12. Named nuts
13. Molluscs
14. Lupins

At this stage, you are simply choosing hazards from a suggested list which you consider might be relevant to your food. You will be required to evaluate these hazards, identifying those which are significant and placing them on a "short list" later in the study.

Feel free to add any other hazards that you can think of but which are not included in the list, but do not get carried away. You should take a realistic approach to this step and only include hazards that are likely to be of concern.

5. Details of any documents used in the HACCP plan

There are a number of documents that are relevant to your HACCP study but in this part of the tool you should record those documents which either set out your procedures for implementing an effective pre-requisite programme (explained in Preparatory Stage A) or those documents that you have relied upon to identify hazards.

Preparatory Stage D: Select the HACCP Team

The preparation of a HACCP plan involves a thorough review of the activities undertaken or proposed by the business and then the collection and evaluation of scientific and technical data relating to the production and handling of relevant products.

Not every member of the HACCP team needs to have a detailed knowledge of all these aspects, but they should collectively have sufficient knowledge of all the food activities being considered by the study as well as a thorough technical knowledge of relevant food safety matters.

It normally requires a team effort to produce a successful HACCP plan even in small businesses

which only employ a few staff. Irrespective of the size of business, the HACCP team should meet the following key criteria:

- Members of the team should be drawn from all relevant areas of the business and from all relevant staff levels. There should be, where possible, a healthy mix of management and operators from different parts of the business.
- The team should possess adequate technical knowledge to identify relevant hazards and appropriate controls. The team should also include members with sufficient practical knowledge of the process to advise on the practicalities of implementing such controls.

Example Team Matrix for process step 1, Goods In

Process step	Team member	Team role	Job title	Training provided	Reason for inclusion in HACCP team for this step	Authorised by
1. Goods In	**John Philips**	Technical	Technical Manager	Yes	Technical assistance	
1. Goods In	**Jane Foster**	Operational	Forklift Driver	Yes	Practicality of controls in goods in/despatch areas	
1. Goods In	**Trevor Grubb**	Other	Transport Supervisor	Yes	Description of goods in/out	

Example Team Matrix for process step 2, Storage

Process step	Team member	Team role	Job title	Training provided	Reason for inclusion in HACCP team for this step	Authorised by
2. Storage	**John Philips**	Technical	Technical Manager	Yes	Technical assistance	
2.	**Terry**	Operational	Warehouse	Yes	Practicality of	

Storage	**Connor**	Operative	controls on goods in storage

- Members of the team should be provided with sufficient training and management support to allow them to participate freely in the HACCP team.
- In small businesses, one or two people may take on the role of the HACCP team.

Choosing Members of the HACCP Team

The members of the HACCP team are normally selected by the "HACCP lead" (this role is described later in this section). The lead may find reference to the process flow diagram (described in Preparatory Stage G) useful to select members of the team who at each process step can provide:

- the necessary technical expertise
- knowledge of what actually happens in practice during the manufacture of the food
- knowledge of the practicalities of any controls suggested by the HACCP team

Some members of the team will be required throughout the study, for example those possessing technical knowledge and an understanding of the processes in overview. Others, who may have more specific knowledge at certain process steps, may be brought onto the team at relevant points during the study.

Each member of the HACCP team must be clear of their role, have been provided with adequate training and have been given express authority by management to participate effectively in the HACCP study.

To satisfy these requirements, you may find it helpful to create a HACCP team matrix, summarising the selection, roles, responsibilities and authorities of HACCP team members for each step.

Roles of HACCP Team Members

Whilst there are several different roles to be fulfilled within a HACCP team, it is a matter for each business to decide whether these roles are allocated to individual team members or whether some team members can undertake several roles. In small businesses, one person may assume several or all of these roles.

It can be helpful to separate roles into the following groups:

- Administrative – Members of the administrative group will be responsible for ensuring that the HACCP process is completed in a logical way and adequately documented. They will typically need a detailed understanding of the HACCP process.
- Technical – Members of this group will have a detailed understanding of food science, technology and hygiene as well as a good knowledge of HACCP.
- Operational – Members of this group should have a detailed knowledge of how the business operates in practice.
- Other – Additional expertise should be recruited into the HACCP team as necessary.

Table of typical roles in a HACCP team

Group	Role	Job title	Main functions	Skills required
Administrative	HACCP Lead	Technical Manager	Select HACCP team, chair HACCP meetings, manage HACCP process	Management and communication skills, detailed knowledge of HACCP process
Administrative	Administrator	Quality Assurance Technician	Produce HACCP plan, note taking at HACCP meetings	Administrative skills, good knowledge of HACCP process
Administrative	Challenger	Quality Assurance Manager	Challenge the work of the HACCP team to identify any weaknesses in the system	Thorough understanding of HACCP process
Technical	Product specialist	Technical Manager	Advise the team on the product description, its intended use and required shelf life	Detailed knowledge of the product recipes, processes and design
Technical	Food technologist	Technical Manager	Assist team with food science and technology matters	Good understanding of relevant food science and technology matters
Technical	Food microbiologist	Laboratory Manager	Assist team with microbiological matters	Thorough understanding of relevant microorganisms and their control in food
Technical	Hygiene specialist	Technical Manager	Advise team on hygienic design and	Detailed understanding of

Table of typical roles in a HACCP team

Group	Role	Job title	Main functions	Skills required
			layout	hygiene and prevention of contamination
Operational	Process specialists	Process operator, Fork lift truck operator etc (including shift workers)	To advise the team on existing working practices and on the practicality of any proposed revisions to these	Detailed knowledge of what actually happens in practice throughout the process
Operational	Equipment specialist	Engineer/fitter	Advise the team on the normal capabilities of equipment and on maintenance issues	Good working knowledge of all existing plant and equipment
Operational	Logistics specialist	Transport supervisor	Advise team on existing and proposed delivery and storage arrangements	Good working knowledge of current logistical chain including receipt and despatch of goods
Other	Additional specialists	External consultant	To advise team on matters outside of their competence	Detailed knowledge of areas identified by the HACCP team

Recording Details of the HACCP Team

The following information must be recorded as part of the HACCP study:

1. Name of HACCP lead for the business

The HACCP lead should have a sound understanding of HACCP and a good knowledge of both the food activities that form part of the study and the technical information that underpins it. The person named in the study will be responsible for managing the HACCP study and so should possess good management and communication skills. The full name of the HACCP lead should be given.

The competence of the person nominated as the HACCP lead can be demonstrated by recording any relevant training that they have completed, their qualifications gained and their relevant experience.

- Relevant training: The law requires that those responsible for the development and maintenance of HACCP procedures have received adequate training in the application of the HACCP principles.

Once the details for the HACCP lead have been recorded, the process should be repeated for each member of the HACCP team.

2. Name of HACCP Team Member

The full name of the team member should be given.

Is this person Internal or External to the company?

HACCP plans are best developed by those who know the business and will be required to implement controls identified by the HACCP team. As such, where possible, members of the HACCP team should be drawn from employees working within the business. Such employees are referred to as “internal” for the purposes of the study.

However, the HACCP lead may identify areas where there is insufficient knowledge or experience within the business to properly consider the control of all relevant food hazards. As such it may be appropriate to appoint external consultants, advisers or temporary employees to perform some roles within the HACCP team.

What is the Role of this Individual in the HACCP Team?

For a HACCP plan to be successful it must be appropriately designed to control specified food hazards. This will require certain members of the HACCP team to have adequate technical knowledge and as such their role will be focused on the identification of such hazards and suggestion of appropriate methods for their control. However, a control measure will only be effective if it is reliably implemented. If a control measure is not achievable in practice then it will be of little value in the production of safe food. It is therefore recommended that relevant staff with practical knowledge of the food production and handling processes are adopted onto the HACCP team.

Typical roles within the HACCP team might include:

- Technical Manager: Member of administrative and technical groups. Provide technical expertise in the identification and control of hazards.
- Consultant: Member of technical group. Advise on the application of HACCP principles.
- Production Supervisor: Member of operational group. Advise on process steps and practicality of implementation of control measures.
- Quality assurance technician: Member of administrative group. Writing of HACCP plan, note taking at HACCP meetings.

Relevant Training

The law requires that those responsible for the development and maintenance of HACCP procedures have received adequate training in the application of the HACCP principles. As such, there is no legal requirement for members of the HACCP team to have completed any formal accredited HACCP training, but it is recommended that each member undertakes at least a Level 2 HACCP in Manufacturing course or similar.

Qualifications

Any relevant qualifications should be recorded although it is not a requirement that all members of the HACCP team possess academic qualifications. Relevant vocational qualifications should be included for example “Basic fork lift truck training” or “Certificate in logistics”.

Relevant experience

Details should be recorded of any experience that the team member has gained which is relevant to their role on the HACCP team. For example:
“Six years’ experience operating polybottle filling machines as well as two years as an operator in the process control room.”

3. Do you consider the team to have sufficient skills (scientific/technical knowledge and HACCP expertise) to ensure the HACCP study will be effective?

The HACCP lead should undertake an honest appraisal of the competence of the HACCP team to produce an effective HACCP plan based collectively on their qualifications, experience and relevant training.

One way to achieve this in practice is to systematically work through the process flow diagram (described in Preparatory Stage G) and to consider at each process step whether the team includes someone who can advise on:

- the technical aspects of food safety at this step
- the practical elements of the food business and implications of suggested controls

Where gaps in knowledge are identified, these should be recorded and steps taken to bring additional members into the HACCP team to cover the gaps

Preparatory Stage E: Describe the Product

The first principle of HACCP involves the identification of significant hazards associated with a food and the implementation of effective control measures to ensure that these hazards do not harm the consumer.

The correct identification and control of such hazards requires a thorough understanding of aspects of the product such as:

- physical and chemical properties of the food
- the food packaging

- conditions of storage and distribution
- required shelf life
- Information to be provided to the consumer regarding appropriate storage, handling and use.

These factors are particularly important with respect to the control of microbiological hazards such as bacteria, which typically require moisture, favourable temperature conditions and time to grow to dangerous levels or produce harmful toxins.

The purpose of this preparatory stage therefore is to describe your products in terms of their suitability or otherwise to permit the growth of dangerous bacteria, so that adequate control measures can be identified and implemented at a later stage as part of your HACCP study.

Description of the product is normally achieved by considering two types of factors:

- Intrinsic factors: those found within the product itself such as its structure and composition.
- Extrinsic factors: those which are external to the food such as temperature control, packaging and method of processing.

It is helpful to think about your food in this way because any changes in recipes or ingredients are likely to affect the intrinsic factors, whereas changes in equipment or in the distribution chain are likely to affect the extrinsic factors. If full information about both factors is made available to the HACCP team they may choose to control an identified hazard by a change in the recipe, a change in the method of distribution or both.

All the information gathered in Preparatory Step E will be helpful to you when undertaking the hazard analysis of your products in Principle 1.2.

So that you can record all the relevant intrinsic and extrinsic factors and properly describe your food, MyHACCP asks you to provide the following information:

1. List all the ingredients and the name of the supplier for each one

This list will be of assistance later in the study to ensure that all ingredients are properly documented for each product and is of particular relevance to the control and provision of correct information to the consumer of the presence of food allergens.

Example list of ingredients, suppliers and allergens for a 'Chocolate celebration cake' product

Ingredient	Supplier	Specification	Allergens
Sugar	Chester Supplies	See Spec 123-456	None
Wheat flour	Grove Ingredients		Wheat

Vegetable oil	VegePure		Soya, celery
Vegetable margarine	VegePure		soya
Glucose syrup	Chester Supplies		None
Cocoa powder	Grove Ingredients		None
Skimmed milk powder	Dairy Badge		Milk
Milk chocolate	Grove Ingredients		Milk, soya
Whey powder	Dairy Badge		Milk
Cocoa butter	Chester Supplies		None
Powdered egg	Dairy Badge		Egg
Sodium bicarbonate	Grove Ingredients		None
Emulsifier E471	Grove Ingredients		None

2. State the physical properties of the product

The physical properties of the food will influence whether dangerous bacteria will be able to grow in the food and/or produce dangerous toxins. The main factors to consider here are:

- Physical state – Is the food a liquid, solid, foam, emulsion etc
  - Water activity (a_w) – this is the water that is available to microorganisms in the food. Whilst some foods may appear moist, the presence of sugar or salt in the liquid component of the food may prevent microorganisms from accessing the water thus restricting their growth. This is why the use of sugar, for example in jam making, or salt in the case of smoked salmon can be very effective at controlling the outgrowth of both spoilage and dangerous bacteria. Drying foods has an effect on both the moisture content and the a_w. Pure water has an aw of 1.0 and the addition of salt or sugar will reduce this value closer to 0. Most bacteria require an aw value > 0.92 to successfully grow in food but some moulds

may be able to grow below this. The aw value is most easily determined in liquid and homogenous foods where the sugar/salt content is likely to be evenly distributed throughout the food. Difficulties in determining a representative aw value may arise in composite foods which contain different varieties of ingredient distributed in an uneven way through the food, for example a meat stew. This will be a matter for your HACCP team to consider.

- pH – This is the measure of the acidity of a food and many bacteria are unable to grow in acidic conditions. For example, *Salmonella* species will typically grow well at neutral pH (7.0) but are unable to grow in acid conditions of 4.0 or below. As for aw, care should be taken to ensure that any pH measurements taken are representative of the food. For example, in a ready meal the pH of the curry sauce may be 5.5, which would inhibit the growth of some bacteria, but within clumps of vegetables it might be 7.0 which might permit the outgrowth of dangerous bacteria.
- Salt content – Whilst this affects the aw of the food, salt can also have an inhibitory effect on some bacteria in its own right.
- All the above factors influence the growth of microorganisms in food but so does a combination of these factors together.

3. Describe how the product is processed and/or other preservation methods used

Many traditional preservation techniques, if performed correctly, will produce safe food by the development of dry or acid conditions in the food. The most common types of process include:

- Heat treatment – Microorganisms can be affected by heat in different ways. Some, such as *Salmonella* and *Campylobacter*, will be easily killed by normal cooking temperatures (70°C for 2 minutes) whereas others, such as *Clostridium botulinum* and *Bacillus cereus*, will survive such temperatures by forming spores
- Hot smoking – Typically used for fish and meat products at temperatures of approximately 70°C – 80°C and often used in combination with brining
- Brining – Can involve the immersion of food into salt water or the direct application of salt crystals to the outside of the food
- Drying – used for a range of products including milk, egg, herbs, fish and meat products
- Fermentation – the production of alcohol and/or acids in foods, used in the production of meats such as salami as well as in bakery and brewing products

4. Describe how the product is packed and the packaging materials

Some methods of packaging will affect the nature and likelihood of food hazards associated with a food. For example, hot filling product into glass jars or the use of vacuum packing will create anaerobic conditions (reduced oxygen levels) which will favour the growth of certain bacteria such as *Clostridium botulinum*. If you are using such materials, then your HACCP team will need to identify suitable controls to prevent the outgrowth and toxin formation by these dangerous bacteria.

The packaging may also emit gasses or absorb them from the food, again changing the conditions for growth by microorganisms. Packaging could also protect microorganisms from damage by sunlight.

The use of glass containers may introduce an additional physical hazard, especially if they are reusable, whereas the use of aseptic filling lines may reduce the likelihood of contamination from the environment.

5. How is the product going to be stored and distributed?

The main options for storage and distribution are:

- ambient
- chilled
- frozen

Some common hazards will be controlled by freezing food, for example bacteria will not grow at frozen temperatures and most parasites, for example those found in fish, are destroyed by prolonged freezing of food. However, the storage and distribution of chilled foods may introduce additional hazards, such as *Listeria monocytogenes*. Prolonged ambient storage may render some foods susceptible to mould growth and toxin formation.

6. What is the shelf life of the product?

The shelf life that you assign to your products should be sufficiently long to allow your customers to make full use of them. However, in general, the longer the shelf life of a product, the more likely it is to spoil within date and the more food safety hazards it will present. As such it is advisable to think carefully about the need for an extended shelf life and it may be appropriate to undertake shelf life testing to verify that the products perform as expected throughout their shelf life.

Durability Date

If you are satisfied that no food safety issues will be presented by your products at the end of their shelf life, you should assign a “Best Before” date to the product. If, however, the food is likely to present a danger to health on expiry of the durability date, a “Use by” date should be applied.

7. State what your advice is to the purchaser for storing, handling and preparing the product

You should consider whether instructions for the storage, handling and preparation of the product are necessary to ensure the safety of the consumer. Such instructions should be in addition to other control measures introduced during manufacture and might include:

- Storage instructions prior to opening packaging
- “Store in a cool dry place”
- “Keep refrigerated”
- “Keep frozen”
- Storage instructions once packaging has been opened
- “once opened, keep refrigerated and use within 3 days”
- Cooking instructions
- “Cook at 200°C for 30 minutes. Check that food is piping hot before serving”

Preparatory Stage F: Identify intended use of the product

The HACCP team need to have a thorough understanding of the intended use of the product(s) included in the HACCP study so that they may undertake an accurate hazard evaluation as part of the Hazard Analysis.
How is this stage achieved?

There are two key factors which are relevant here:

1. The nature of the intended customer.
2. The extent of any further processing of the food prior to consumption.

1. The nature of the intended customer

You should consider whether the product is intended for supply to other food businesses or direct to the final consumer. You should also consider whether target consumers fall into one of the following vulnerable groups. Ask yourself "Do the consumers of my product have a particular food safety requirement?" It is your responsibility to understand your target group and increase your knowledge and awareness of hazards (physical, chemical, biological and allergens) that are of a particular concern to the vulnerable group/s.

Vulnerable group	Considerations
Allergy sufferers	Is the product intended to be consumed by sensitive groups who may be allergic to specific food ingredients? Are claims such as "free from" made on the product label and if so are such claims substantiated? Disclaimers such as "May Contain" should only be made where a thorough risk assessment identifies a residual risk of contamination by a food allergen after all reasonable control measures have been applied.
Young	Infants and young children are regarded as a vulnerable group when it comes to food safety. You need to think about what additional hazards may be specific to this target group (e.g. type of food, size of food, choking hazards, mineral levels).
Elderly	If elderly people are going to consume the product think about hazards that are specific to this group. Older adults are more susceptible to foodborne illness. The immune system often weakens as you get older and stomach acid also decreases, stomach acid plays an important role in reducing the number of bacteria in our intestinal tracts and the risk of illness.
Pregnant	There are some foods that pregnant women are advised to avoid consuming because they can make the woman ill or harm

Vulnerable group	Considerations
	the unborn child.
Immunocompromised/ immunosuppressed/ immune deficient	Is the product to be consumed by people that have an impaired immune response (for instance those undergoing chemotherapy or have AIDS, premature infants or transplant recipients that take drugs to prevent their body from rejecting the new organ). Consideration should be given to that fact that the immune system may be prevented from attacking harmful microorganisms in food.

Preparatory Stage G: Construct a flow diagram

A process flow diagram shows all the steps involved in the process outlined in the scope of the study. The scope is defined in Preparatory Stage C.

Making a Process Flow Diagram

The HACCP team or the person leading the development of the HACCP study should construct a flow diagram. Whatever format you choose, all steps in the process outlined in the scope of the study should be included.
You may wish to use a schematic layout of the factory to help you. Knowledge of what actually occurs in your processes is essential.

Listing the steps in the process

List each step in the process or module. You should consider what happens all the way from receiving the raw materials, through to at least the point of despatch or up to the point of final consumption of the product.

Think about:

- Preparation
- Packing
- Storage
- Distribution
- You could also consider the following:
- Raw material addition (including water)
- Services (air, water, steam)
- Any temporary product storage or hold periods (particularly during peak production times)
- Recycle or rework loops
- Process delays

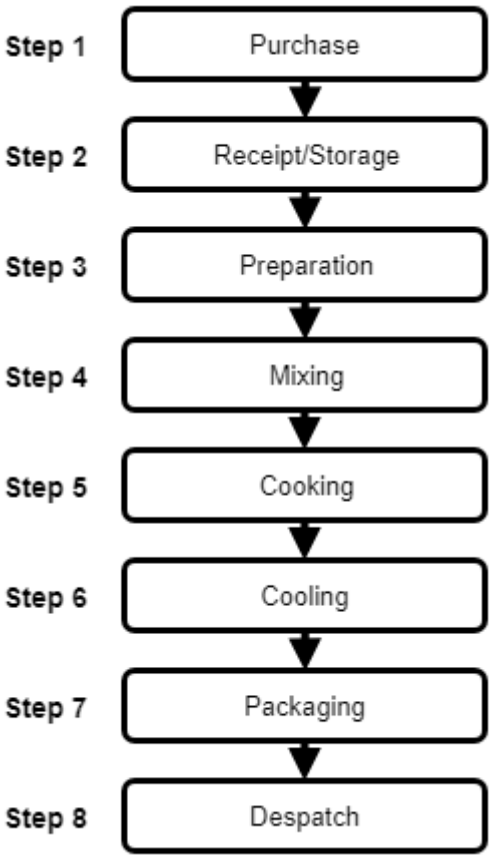
You can use a linear or modular format for your process flow diagrams. This might depend on how

complex your processes are, and whether parts of a process are the same for several products. View 'Process flow diagrams' for some examples of linear and modular diagrams and when you would use them.

Process Flow Diagrams

Linear process flow diagrams

The simplest form of process flow diagram is linear. The key steps in the process are identified, laid out step by step, and subsequently verified by the HACCP team.

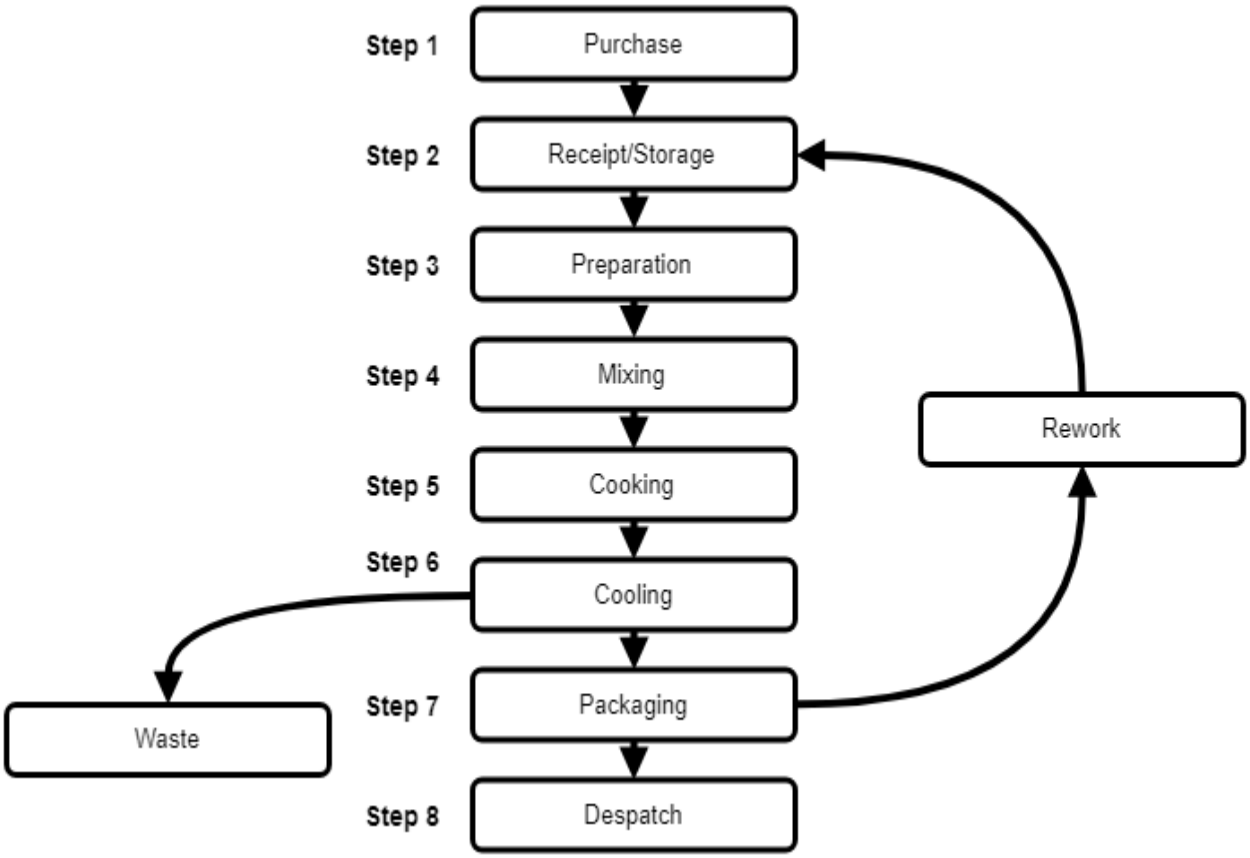


The diagram shows a simple 8-step process, where one step follows the next in order:

- Step 1: Purchase
- Step 2: Receipt/Storage
- Step 3: Preparation
- Step 4: Mixing
- Step 5: Cooking
- Step 6: Cooling
- Step 7: Packaging
- Step 8: Despatch

Additional Steps

Additional steps may be identified during the verification process and these should be added into the process flow diagram.

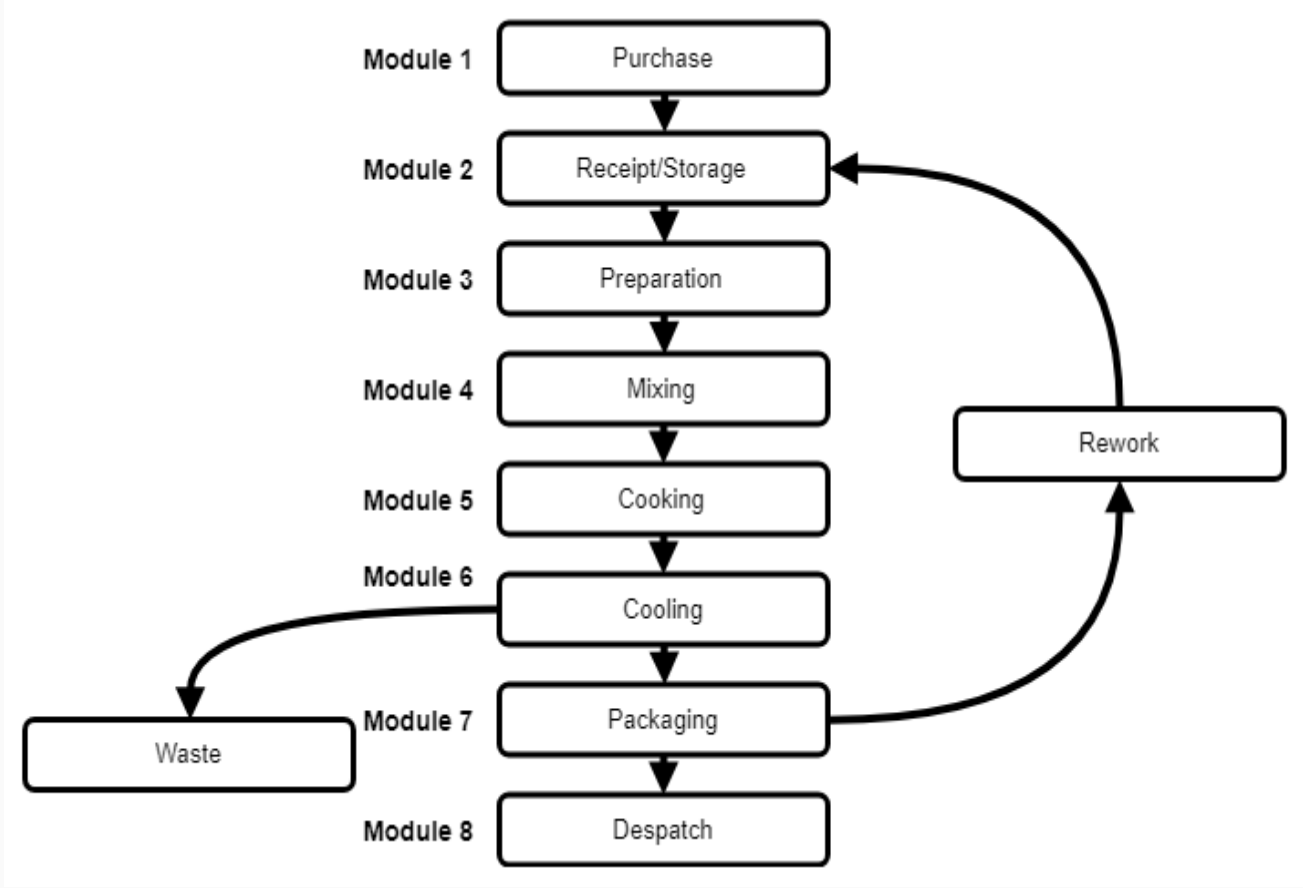


The diagram shows the same 8-step process as in the previous diagram, but with two new options added.

- From step 6, which is “Cooling”, the process could proceed to “Waste”, instead of to Step 7, Packaging.
- From Step 7, Packaging, the process could move to a new “Rework” step and then go back to Step 2, Receipt/Storage, instead of moving on to Step 8, Despatch.

Modular HACCP plans

These can be used for more complex food operations or in situations where several different foods are produced by the same business which share certain parts of the production process. You would create a diagram showing the modules in your overall process, and then additional diagrams showing the steps of the process within each module.

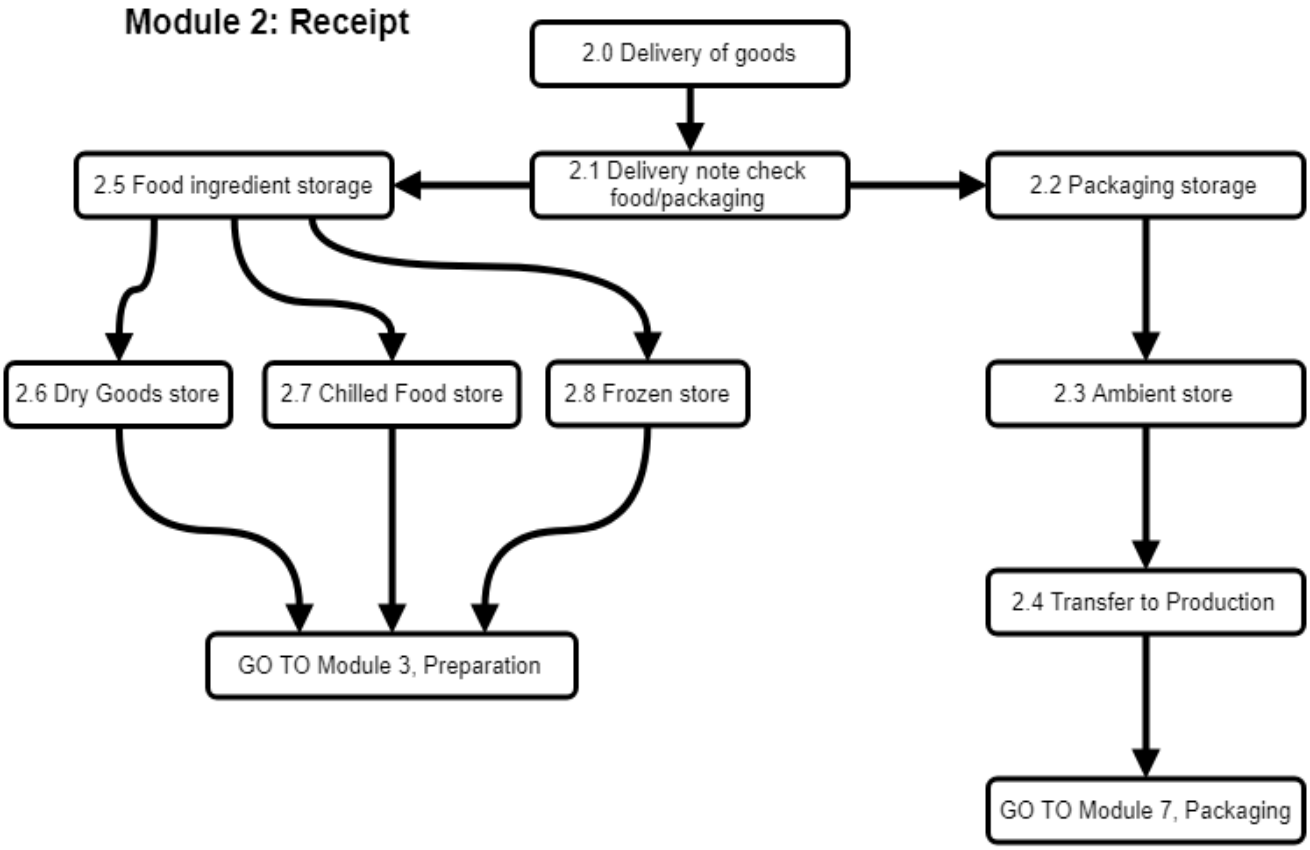


This diagram looks the same as the previous one, showing the linear process with “Rework” and “Waste” options added, except that the boxes are marked as Modules rather than Steps. This indicates that each module, such as Module 1: Purchase or Module 5: Cooking, would have a diagram showing the steps of that process.

If you have multiple products, and some of the processes you go through with different products work in the same way (for example, if you package or store several different products in the same way) you can refer to one shared diagram for the module, rather than making different ones. That way, you don’t have to update several different plans or diagrams if something in the shared process changes.

Diagrams for Single Modules

This diagram is an example of how you might show the process for Module 2 in the previous diagram, the “Receipt” process.



This diagram is headed “Module 2: Receipt” and it shows a process with steps numbered from 2.0 to 2.8.

The starting point is Step 2.0, Delivery of goods.

The process moves to Step 2.1, Delivery note check food/packaging.

From there, the process moves to either 2.2, packaging storage, or 2.5, Food ingredient storage.

The packaging part of the process has the following steps:

- 2.2, packaging storage
- 2.3, ambient storage
- 2.4, Transfer to production

After that, the diagram shows that you move to Module 7, Packaging, which would be presented in a different diagram.

The food ingredient part of the process goes from step 2.5, Food ingredient storage, to one of three options. These are:

- 2.6, Dry goods store
- 2.7, Chilled food store
- 2.8, Frozen store

From any of those three options, the diagram shows that you then move on to Module 3, Preparation, which would be presented in a different diagram.

Draw a rough paper sketch of the product flow. Consider how the process is managed and what could realistically happen while it's in progress. For example, consider optional and intermittent activities.

Including technical data

The inclusion of relevant technical data will depend on the complexity of the operation. This data is useful at the Critical Control Points that you will identify later.
Technical data could include:

- Time for process or process element (e.g. fry for 2 minutes at 190°C or cool to <5°C in 4 hours)
- Temperature at different parts of the process (e.g. fry at 190°C for 2 minutes or cool to <5°C in four hours)
- Line speed
- Floor plan, equipment and services layout
- Segregation of low/high risk operations
- Personnel routes
- Flow conditions for liquids and solids (psi=pounds per square inch or temperature in °C)
- Waste flows
- Movement routes for raw materials/ingredients

A piece of equipment may have several functions (e.g. a bottle filling machine including rinsing, volumetric/gravity/vacuum/hot fill and capping functions). All functions should either be included in the description at the process step OR each function entered as a different process step.

Preparatory Stage H: On-Site Confirmation of Flow Diagram

How Is This Stage Achieved?

The flow diagram should be confirmed as being correct. It is recommended that this is carried out by someone not familiar with the process in addition to members of the HACCP team. The advantage of having someone not familiar with the process to check the diagram is that "they are a fresh pair of eyes", and may identify a step that has been overlooked.
You may wish to consider the following:-

- Ensure it is a current and accurate representation of the process/module
- Ascertain if practices are the same for all shift patterns, differing staff levels, seasonal variations, all production patterns (e.g. high and low production volumes)

Documentation and Records

- Record that the flow diagram has been confirmed as being correct
- Record the date it was confirmed as correct
- Record who confirmed the flow diagram as being correct

Records of out-of-date flow diagrams must be kept.

Review

The flow diagram shall be subject to review and should be current and accurate at all times. Amend the flow diagram as the process changes.

Education and Training

The success of a HACCP system depends on educating and training management and employees in the importance of their role in producing safe foods. This should also include information the control of foodborne hazards related to all stages of the food chain. It is important to recognize that employees must first understand what HACCP is and then learn the skills necessary to make it function properly. Specific training activities should include working instructions and procedures that outline the tasks of employees monitoring each CCP.
Management must provide adequate time for thorough education and training. Personnel must be given the materials and equipment necessary to perform these tasks. Effective training is an important prerequisite to successful implementation of a HACCP plan.

Developing a HACCP Plan

The format of HACCP plans will vary. In many cases the plans will be product and process specific. However, some plans may use a unit operations approach. Generic HACCP plans can serve as useful guides in the development of process and product HACCP plans; however, it is essential that the unique conditions within each facility be considered during the development of all components of the HACCP plan.

Further Reading:

- ✓ ***Food Safety and Quality Systems in Developing Countries: Volume II: Case Studies of Effective Implementation 1st Edition, Kindle***
- ✓ ***What You Must Know About Food and Supplements for Optimal Vision Care: Ocular Nutrition Handbook Paperback – June 1, 2015 by Jeffrey Anshel OD***