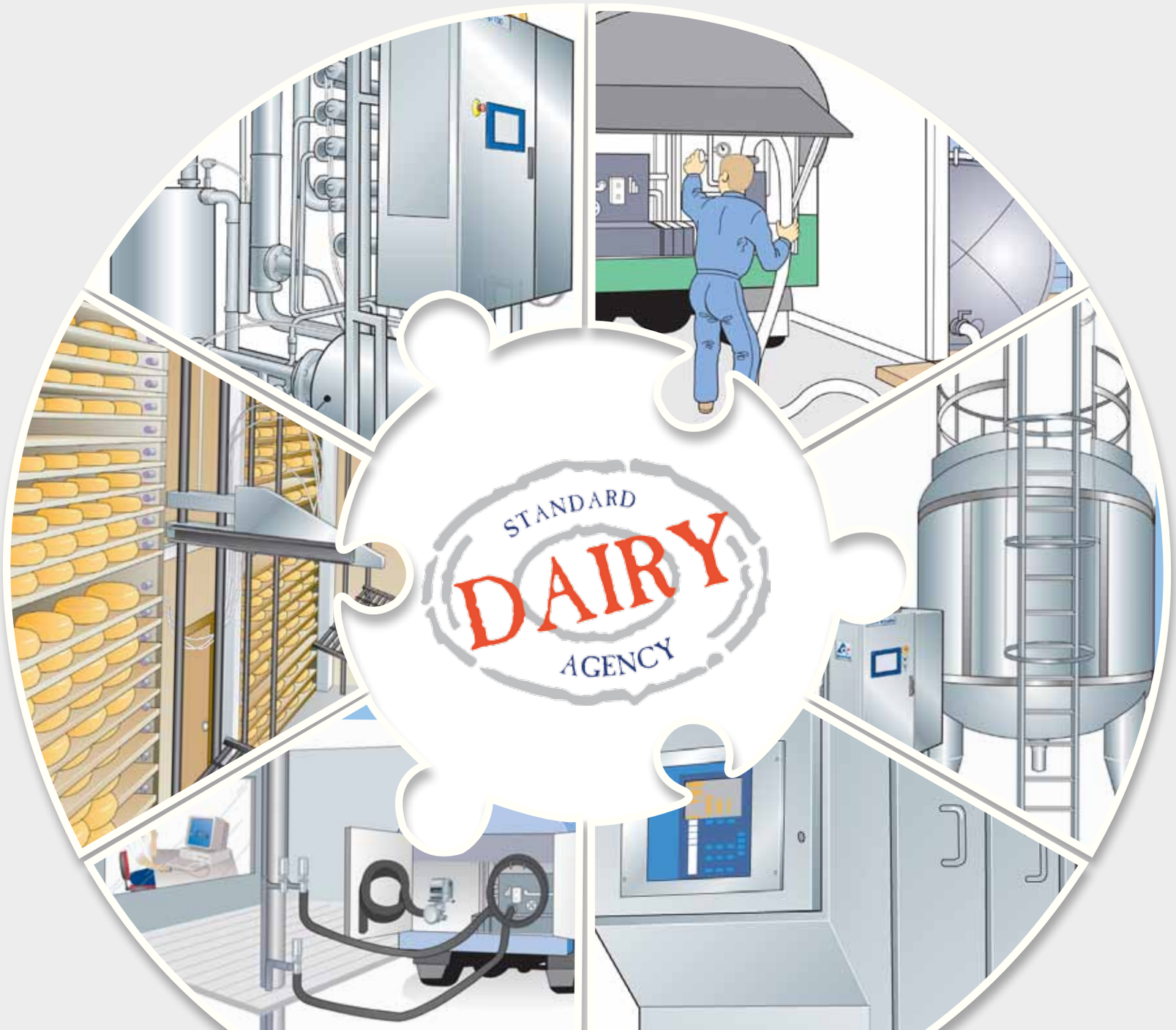
DSA CODE OF PRACTICE FOR THE SECONDARY DAIRY INDUSTRY



CHAPTER 1

APPLYING THE PRINCIPLES OF HACCP IN THE DAIRY INDUSTRY

Chapter 1: Applying the Principles of HACCP in the Dairy Industry

1. What is the definition of food safety?

R 908

According to Regulation R 908 of the Foodstuffs, Cosmetics and Disinfectant Act, Act 54 of 1972, "food safety" means the assurance that food will not cause harm chemically, biologically or physically to the consumer when prepared, used or eaten according to its intended use.

How can dairy products cause harm?
The consumer can be harmed when dairy products are contaminated or cross-contaminated with food safety hazards.

According to Codex Alimentarius, a **hazard** is a biological, chemical or physical agent in or condition of food with the potential to cause an adverse health effect.

2. Food safety hazards commonly associated with dairy products

Chemical	Biological	Physical
Antibiotics	Bacteria, specifically these pathogens: *Salmonella, Staphylococcus aureus, Listeria, Brucella abortus,* etc.	Insects
Mouldy feed resulting in aflatoxins	Yeasts and moulds, which are mainly spoilage organisms	Grass/feed
Cleaning residues		
Pesticides		Glass
Hydrogen peroxide	Tuberculosis	Rodents
Rodenticides		Nuts/bolts
Household chemicals		Jewellery
Non-food grade lubricants		Hard plastic
Heavy metals often associated with water contamination		Cloths
Coolant contamination often associated with ice		Wood
		Dust

While these hazards are generic, knowing about them is not enough. A dairy processor must put preventive measures in place to control these hazards.

3. Hazard Analysis Critical Control Point

The word HACCP (Hazard Analysis Critical Control Point) confuses many people, but simply put, it refers to a system that you must put in place to ensure that the food you produce is safe. This system is called a food safety management system and must be based on the internationally recognised principles of HACCP to ensure that it is a valid system.

The system originated in the 1960s with space travel to ensure the safety of astronauts' food. It has since been endorsed by many prominent scientific agencies worldwide and is a legal requirement in many countries.

SANS ISO 22000, 7.2
SANS 10049
SANS ISO 22002-1

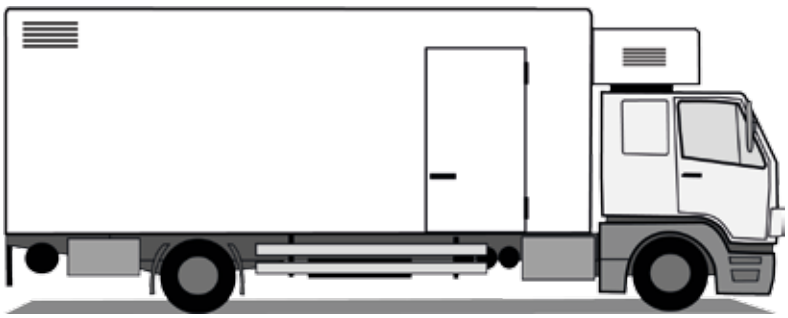
4. The importance of prerequisite programmes

Before embarking on a HACCP system, dairy processors should ensure that they have all the basic conditions in place to ensure safe processes and products. These are known as prerequisite programmes. HACCP can then be used to control steps in the business that are critical in ensuring the preparation of safe food.

SANS ISO 22000, 7.2
SANS 10049
SANS ISO 22002-1

These prerequisite programmes address the following:

- Construction and layout of buildings and associated utilities.
- Layout of premises, including workspace and employee facilities.
- Supplies of air, water, energy and other utilities.
- Supporting services, including waste and sewage disposal.
- The suitability of equipment and its accessibility for cleaning, maintenance and preventative maintenance.
- Management of purchased materials (e.g. raw materials, ingredients, chemicals and packaging), supplies (e.g. water, air, steam and ice), disposals (e.g. waste and sewage) and handling of products (e.g. storage and transportation).
- Measures for the prevention of cross contamination.
- Cleaning and sanitisation.
- Pest control.
- Personnel hygiene.
- Other aspects as appropriate.



Hazards and Controls Guide For Dairy Foods, FDA, 2006

Many hazards can be reduced by the implementation of effective prerequisite programmes that will ensure the following:

- Safety of the water that comes into contact with milk or milk products, or product contact surfaces, including steam and ice.
- Condition and cleanliness of food contact surfaces of equipment used.
- Prevention of cross-contamination from unsanitary objects and/ or practices to milk or milk products or product contact surfaces, packaging material and other food contact surfaces, including

utensils, gloves, outer garments, etc., and from raw product to processed product.
- Maintenance of hand washing, hand sanitising and toilet facilities.
- Protection of milk or milk products, packaging material and product contact surfaces from adulteration with lubricants, fuel, pesticides, cleaning compounds, sanitising agents, condensate and other chemical, physical and biological contaminants.
- Proper labelling, storage and use of toxic compounds.
- Control of employee health conditions, including employee exposure to high-risk situations, which could result in the microbiological contamination of milk or milk products, package materials and product contact surfaces.
- Exclusion of pests.

To be effective, these programmes should be documented and checked regularly.

This will form a solid foundation for the HACCP system.

5. The 12 steps of HACCP

The HACCP system uses a systematic approach to the identification of specific hazards and measures for its control or prevention to ensure the safety of food. The preventive measures must be described in detail and the people who have to execute them must be trained. HACCP involves careful recording of all details and actions in order to provide documentation that the system is in operation and in full control of all hazards in food processing.

Codex Alimentarius Commission, as guidance, defines seven principles and twelve steps that must be applied during the development of the HACCP plan and to implement the HACCP system. The seven principles of HACCP are:

1. Conduct a hazard analysis.
2. Determine the Critical Control Points (CCPs).
3. Establish critical limit(s).
4. Establish a system to monitor control of the CCPs.
5. Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.
6. Establish procedures for verification to confirm that the HACCP system is working effectively.
7. Establish documentation concerning all procedures and records appropriate to these principles and their application.

The seven basic principles are implemented through the twelve steps:

1. Assemble HACCP team.
2. Describe product.
3. Identify intended use.
4. Construct flow diagram.
5. On-site confirmation of flow diagram.
6. List all potential hazards associated with each step, conduct a hazard analysis, and consider any measures to control identified hazards (Principle 1).
7. Determine critical control points (Principle 2).
8. Establish critical limits for each CCP (Principle 3).
9. Establish a monitoring system for each CCP (Principle 4).
10. Establish corrective actions (Principle 5).
11. Establish verification procedures (Principle 6).
12. Establish documentation and record keeping (Principle 7).

SANS ISO 22000, 7.3

Step 1: Assemble the HACCP team

A company wishing to implement a HACCP system should ensure that the appropriate product-specific knowledge and expertise is available for the development of an effective HACCP plan.

The company should also understand that the implementation of an HACCP system requires a whole-company, team approach. It is not possible for one person alone to implement such a system. The HACCP team should be multidisciplinary and should include a motivated executive-level management member, capable of ensuring the necessary funding and overall company determination to ensure successful HACCP implementation.

The team should define the scope of the HACCP plan. The scope should describe which segment of the food chain is involved and which process of the business and the general classes of hazards are to be addressed (biological, chemical and physical).

The team should include experts covering all specific knowledge appropriate to the product under consideration, its production/manufacture, storage, distribution, consumption and associated potential hazards.

SANS ISO 22000, 7.3
CGCSA FSI GMCP I.C 1.1

Step 2: Describe the product

A full description of the product should be drawn up, including relevant safety information as shown in Chapter 3. It is also advisable to develop descriptions for all raw materials.

SANS ISO 22000, 7.3.4

Step 3: Describe the intended use of the product

The HACCP team should also define the normal or expected use of the product by the customer, and the consumer target groups for which the product is intended. The discussion should include any abuse of the product and how the product label addresses this.

SANS ISO 22000, 7.3.5
CGCSA FSI GMCP I.C 1.2

Step 4: Draw a process flow diagram

A product flow diagram should be constructed by the HACCP team. The flow diagram should cover all steps in the operation for a specific product. The same flow diagram may be used for a number of products that are manufactured using similar processing steps.

The flow diagram should start at receiving and end at the last point of control for your facility. This may be at the retail distribution centre or even

at the customer. If outsourced transport is used, the flow diagram will end at despatch at your facility when trucks are loaded. Consider rework processes.

Step 5: Confirm the flow diagram

SANS ISO 22000, 7.3.5
CGCSA FSI GMCP I.C.1.2

Take steps to confirm the processing operation against the flow diagram during all stages and hours of operation, and amend the flow diagram where appropriate. The confirmation of the flow diagram should be performed by a person or persons with sufficient knowledge of the processing operation and/or the multidisciplinary team, as appropriate.

Step 6: List ALL the hazards associated with that step

SANS ISO 22000, 7.4
CGCSA FSI GMCP B.C 1.1, I.C 1.3

The first principle of HACCP is to conduct a hazard analysis. Before beginning the process, the HACCP team should review the definitions of food safety hazards. Hazards are usually grouped into three categories: biological, chemical and physical.

a. Hazard identification

This first step in identifying hazards which might be associated with a production process might be considered a "brainstorming" session.

The HACCP team should use the flow diagram and product description, which was created in the preliminary steps, and systematically think about what could occur at each step in the process. Hazard identification should result in a list of potential hazards at each step (use the HACCP plan flow diagram) in the process, from the receipt of raw materials to the release of the finished product.

During hazard identification, the team does not have to be confined by the hazard's likelihood of occurrence or its potential for causing disease. All potentially significant hazards must be considered.

List the hazards that can be introduced at each step. Each step brings its own unique problems – using knives poses a metal problem, decanting bags of products may introduce string. Handling products brings up the problem of microorganisms on the hands. Food contact surfaces can be contaminated and hence contaminate the product.

Hazards can arise due to the process itself. There can be bottlenecks where temperature abuse can cause hazards to increase. There may be open conveyors where the product packaging is unprotected. In both cases, the design of the facility should change to establish control – no amount of paperwork will help here.

The hazard identification should also consider the following:

- Raw materials.
- Building and equipment.
- Pests.
- Processes.
- The impact of food handlers and visitors.

b. Hazard analysis

SANS ISO 22000, 7.4
CGCSA FSI GMCP B.C 1.1, I.C 1.3

The second part in performing a hazard analysis is to identify preventive measures that could be used to control each hazard. Preventive measures are the physical, chemical or other means that can be used to control a food safety hazard. Consider and describe what control measures exist, if any, which can be applied for each hazard. Control measures are those actions and activities that can be used to prevent hazards, eliminate them

or reduce their impact or occurrence to acceptable levels. More than one control measure may be required.

Some common hazards and their possible control measures

Source	Examples of hazards	Examples of possible controls
Raw ingredients	Biological (micro) – list species Stones, bones, dirt Glass, plastic Pests, pest debris Wood Cigarette ends Metal – nails, wire, bolts Chemicals	Approved suppliers Product specification, routine checking Cleaning, washing, inspection Good illumination for inspection Sieving, filtering Metal detection, magnets, sieving
Building	Flaking paint, rust, nails Condensation Glass – light fittings, windows Insulation Wood	Maintenance programme Replace worn and damaged surfaces Effective ventilation, cover food No glass, glass policy No wood surfaces or equipment Hygienic design
Equipment	Bolts, nuts Lubricant grease, oils Rust, paint	Maintenance programme, metal detection Staff training to use food grade lubricants No maintenance near open food Hygienic design
Pests	Bodies Droppings Larvae, eggs Pesticide spraying on food Pathogens	Prevent entry, good housekeeping Staff training on pest sightings and reporting Reject potentially contaminated food Correct storage and rotation Effective pest control (approved contractor) Correct placement of rodent bait stations Correct placement of electric fly killers
Cleaning and maintenance	Fibres, cloth, bristles Chemicals Screws, nuts, bolts Wire	Training of cleaning and maintenance staff Cleaning chemicals approved for food Correct cleaning equipment Avoid maintenance during production Check tools in and tools out with maintenance Cleaning inspections after maintenance
Food handlers and visitors	Jewellery Buttons Pen tops, cigarette ends Plasters	Personal hygiene Staff training Frequent hand washing and sanitising Correct protective wear for visitors Eating and smoking only in designated areas
Processing	Incorrect pasteurisation Cross-contamination	Parameters Divert valve Process control records

SANS ISO 22000, 7.4
CGCSA FSI GMCP B.C 1.4, I.C 1.4

According to ISO 22000 each hazard should be assessed in terms of the severity and probability of each occurrence. More significant hazards will require more control measures and it is important to be able to distinguish which hazards are more important. A variety of tools exist to apply a rating to the hazards.

Step 7: Identify critical control points

SANS ISO 22000, 7.5, 7.6
CGCSA FSI GMCP B.C 1.4, I.C 1.4, 1.13

The second HACCP principle is to identify the critical control points (CCPs) in the process. A CCP is a point, step or procedure in a food process at which control can be applied and, as a result, a food safety hazard can be prevented, eliminated or reduced to acceptable levels.

Not every step in a process is a CCP and a logical process must be undertaken to establish which steps are CCPs. Often a decision tree will be used to assist in identifying the steps in the process where hazards are in fact controlled.

In the example below there are two steps but only one of these is a CCP, where the control measure can be applied to **ALL** of the products. This is at the step of pasteurisation. Although the controls at cutting are important and must be done, these do not provide full control of the hazard in the same way that pasteurisation does.

Steps	Hazards		Control measure to prevent/ minimise/control this hazard	Reference number to facility procedure	Monitoring reference to form number
Cutting of cheese	Chemical	Residue from cleaning chemicals	Cleaning procedures	PR04	Cleaning checklist
	Biological	*Staphylococcus* from employee hands	Handwashing	PR05	Personal hygiene checklist Hand swabs
Pasteurisation	Biological	*Salmonella* (it can survive)	Pasteurisation procedure Divert valve Calibration	PR03	Thermograph Pasteuriser log sheet Calibration records

Step 8: Establish critical limits

SANS ISO 22000, 7.6
CGCSA FSI GMCP B.C 1.4, I.C 1.5

Each control measure associated with a CCP, should give rise to the specification of critical limits. Critical limits separate acceptability from unacceptability.

Examples of parameters include temperature, time, pH, moisture content, additive, preservative or salt level, sensory parameters such as visual appearance or texture, etc. In some cases, to reduce the risk of exceeding a critical limit due to process variations, it may be necessary to specify more stringent levels (i.e. target levels) to ensure that critical limits are observed. Critical limits may be derived from a variety of sources. When not taken from regulatory standards or from guides of good hygiene practices, the team should ascertain their validity relative to the control of identified hazards at the CCPs. In the case of dairy processing in South Africa, the critical limits for pasteurisation are defined by law.

Step 9: Establish monitoring procedures

SANS ISO 22000, 7.5, 7.6
CGCSA FSI GMCP B.C 1.5, I.C 1.6

An essential part of an HACCP system is a programme of observations or measurements performed at each critical point to ensure compliance with specified critical limits. Observations or measurements must be able to detect loss of control at critical points and provide information in time for corrective action to be taken. Where possible, process adjustments should be made when the monitoring results indicate a trend towards loss of control at a CCP. The adjustments should be made before a deviation occurs. Data derived from monitoring must be evaluated by a designated person with knowledge and authority to carry out corrective actions when indicated. Observations or

measurements can be made continuously or intermittently. When observations or measurements are not continuous, it is necessary to establish a frequency of observations or measurements which provides reliable information.

In summary, the monitoring programme should describe the following for each CCP:

- The methods of monitoring.
- The frequency of observations or measurements.
- The recording procedure.
- Who is to perform monitoring and checking.
- When monitoring and checking is performed.
- How monitoring and checking is performed.
- Parameters for hazards.
- Corrective actions if trends indicate a loss of control.

The records associated with the monitoring of the CCPs must be signed by the person(s) doing the monitoring, when the records are verified.

Step 10: Establish corrective actions

SANS ISO 22000, 7.10
CGCSA FSI GMCP B.C 1.5, I.C 1.8

The HACCP team has to plan corrective actions for each CCP in advance, so that they can be taken without hesitation when monitoring indicates a deviation from the critical limit. Such corrective actions should include the following:

- Proper identification of the person(s) responsible for the implementation of the corrective action.
- Description of means and action required to correct the observed deviation.
- Action to be taken with regard to products that have been manufactured during the period when the process was out of control.
- Written record of measures taken, indicating all relevant information (for example date, time, type of action, actor and subsequent verification check).

Step 11: Establish verification procedures

SANS ISO 22000, 7.8, 8
CGCSA FSI GMCP I.C 1.7, 1.9, 1.10

Before implementing the HACCP system, the HACCP team has to validate the control measures and the critical limits to ensure that these control measures produce safe food.

Even if legal critical limits and control measures are used, the processor must still ensure that the control measures are capable of achieving the critical limits and confirming this with records. The choices made while working through the preliminary steps and HACCP principles must be tested repeatedly, and it must be clear that they prevent or control identified hazards in the “real world”. In this phase, microbial or residue testing can be used effectively to verify that the process is under control and is producing acceptable products. Such testing provides clear evidence that the techniques and methods adopted by the plant to control hazards are not just effective in theory but will work in this specific plant.

The HACCP team should specify the methods and procedures to be used for determining if the HACCP is working correctly. Methods for verification may include random sampling and analysis, reinforced by analysis or tests at selected critical points, intensified analysis of intermediate or final products, surveys on actual condition during storage, distribution and sale, and on actual use of the product. The

frequency of verification should be sufficient to confirm that HACCP is working effectively. The frequency of verification will depend on the characteristics of the business (output, number of employees, nature of the food handled), the monitoring frequency, the accuracies of the employees, the number of deviations detected over time and the hazards involved.

Verification procedures include the following:
- Audits of HACCP and its records.
- Inspection of operations.
- Confirmation that CCPs are kept under control.
- Validation of critical limits.
- Review of deviations and product dispositions; corrective actions taken with regard to the product.

Verification will comprise all the following elements, but not necessarily all at the same time:
- Check on the correctness of the records and analysis of deviations.
- Check on the person monitoring processing, storage and/or transport activities.
- Physical check on the process being monitored.
- Calibration of instruments used for monitoring.

Verification should be carried out by someone other than the person who is responsible for performing the monitoring and corrective actions. Where certain verification activities cannot be performed in-house, external experts or qualified third parties should perform the verification on behalf of the business.

Ongoing verification ensures that the HACCP plan is working effectively on a day-to-day basis. Reassessment is an overall review of the plan that must be performed at least annually, or whenever any changes occur that could affect the hazard analysis or alter the HACCP plan. Reassessment is similar to validation in that it considers whether the plan is adequate in general, rather than focusing on the plan's daily operations. It is also similar to validation in that it must be done by an HACCP-trained person or team.

Step 12: Establish documentation and record keeping

SANS ISO 22000, 4.2
CGCSA FSI GMCP, I.C 1.11, 1.12

Efficient and accurate record keeping is essential to the application of an HACCP system. HACCP procedures should be documented. Documentation and record keeping should be appropriate to the nature and size of the operation and sufficient to assist the business to verify that the HACCP controls are in place and are being maintained.

Keep documents and records for a sufficient time to allow the competent authority to audit the HACCP system.

Documents should be signed by the person responsible for reviewing them. Expertly developed HACCP guidance materials (e.g. sector-specific HACCP guides) may be utilised as part of the documentation, provided that those materials reflect the specific food operations of the business.

Documentation examples include:
- Hazard analysis.
- CCP determination.
- Critical limit determination.

Record examples are:

- CCP monitoring activities.
- Deviations and associated corrective actions.
- Verification activities.
- Modifications to the HACCP system.

Although this is an introduction to the concept of HACCP, it is not an exhaustive discussion/explanation on the subject. Additional requirements are necessary to comply fully to the standards in this regard and specialised intensive training is recommended.