

HACCP

Hazard Analysis and Critical Control Point

What is HACCP?

What are the 7 Principles of HACCP?



- A system of food safety management that is science-based and systematic, preventive, and applicable throughout the food chain (from farm to fork).

HACCP Principles are 7

1. Conduct a hazard analysis

2. Identify critical control points (CCPs)

3. Establish critical limits for each CCP

4. Establish CCP monitoring requirements

5. Establish corrective actions

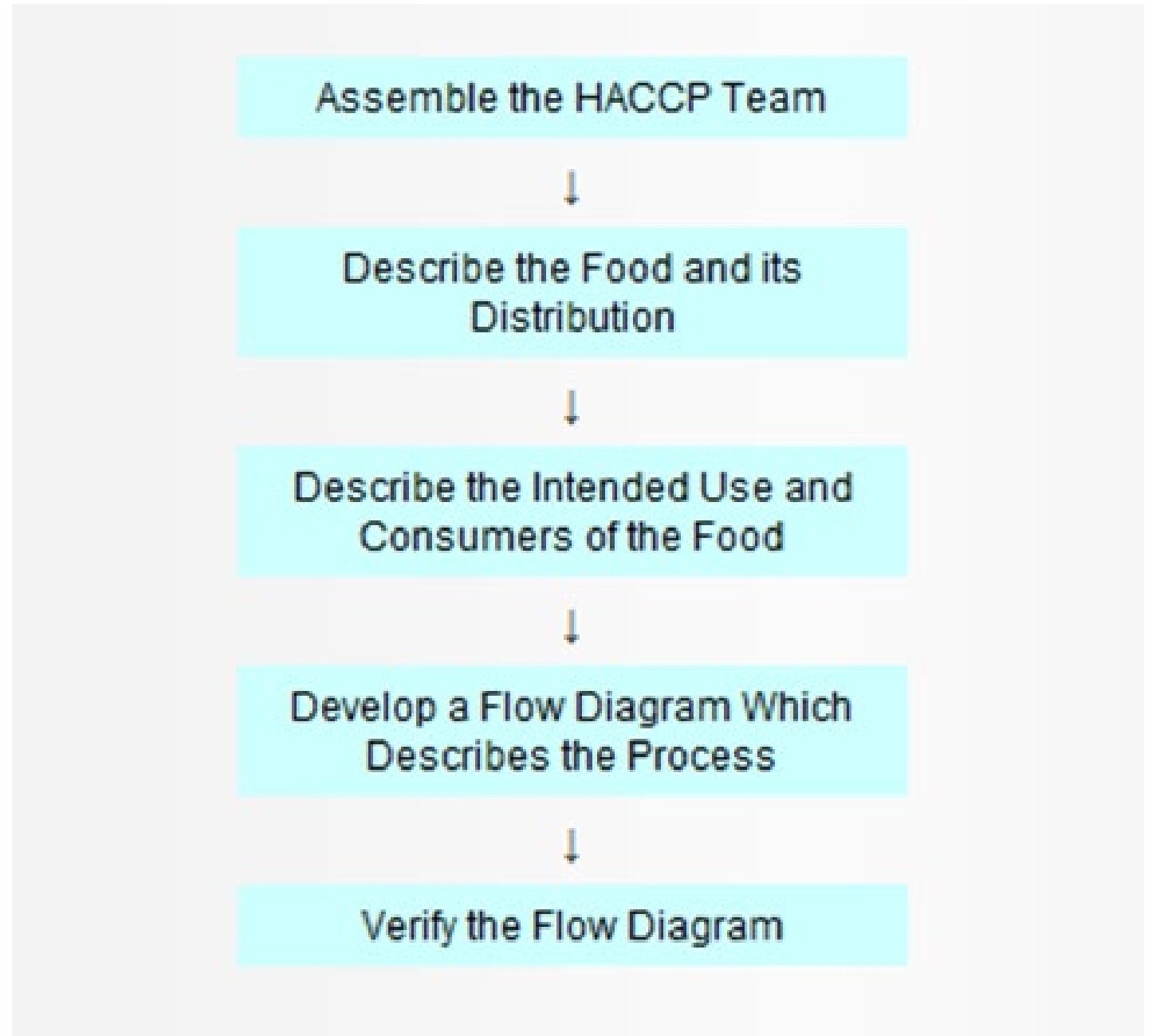
6. Establish Verification Procedures

7. Establish record keeping procedures

Developing a HACCP Plan

- the plans will be product and process specific.
- Customized to each organization
- In the development of a HACCP plan, five preliminary tasks need to be accomplished before the application of the HACCP principles to a specific product and process.

HACCP Plan



HACCP Plan

- *1) Assemble the HACCP Team*
- The team is a technical team that should be multi-disciplinary and include individuals from areas such as: engineering, production, sanitation, quality assurance, and food microbiology.
- The team should not be composed of only outside experts, the team should also include internal personnel who are involved in the operation as they are more familiar with the variability and limitations of the operation. (those who must implement the plan).

HACCP Plan

- *2) Describe the food and its distribution*
- The HACCP team first describes the food.
- This consists of a general description of the food, ingredients, and processing methods.
- The method of distribution should be described, such as information on whether the food is to be distributed as frozen, or refrigerated, or at ambient temperature.

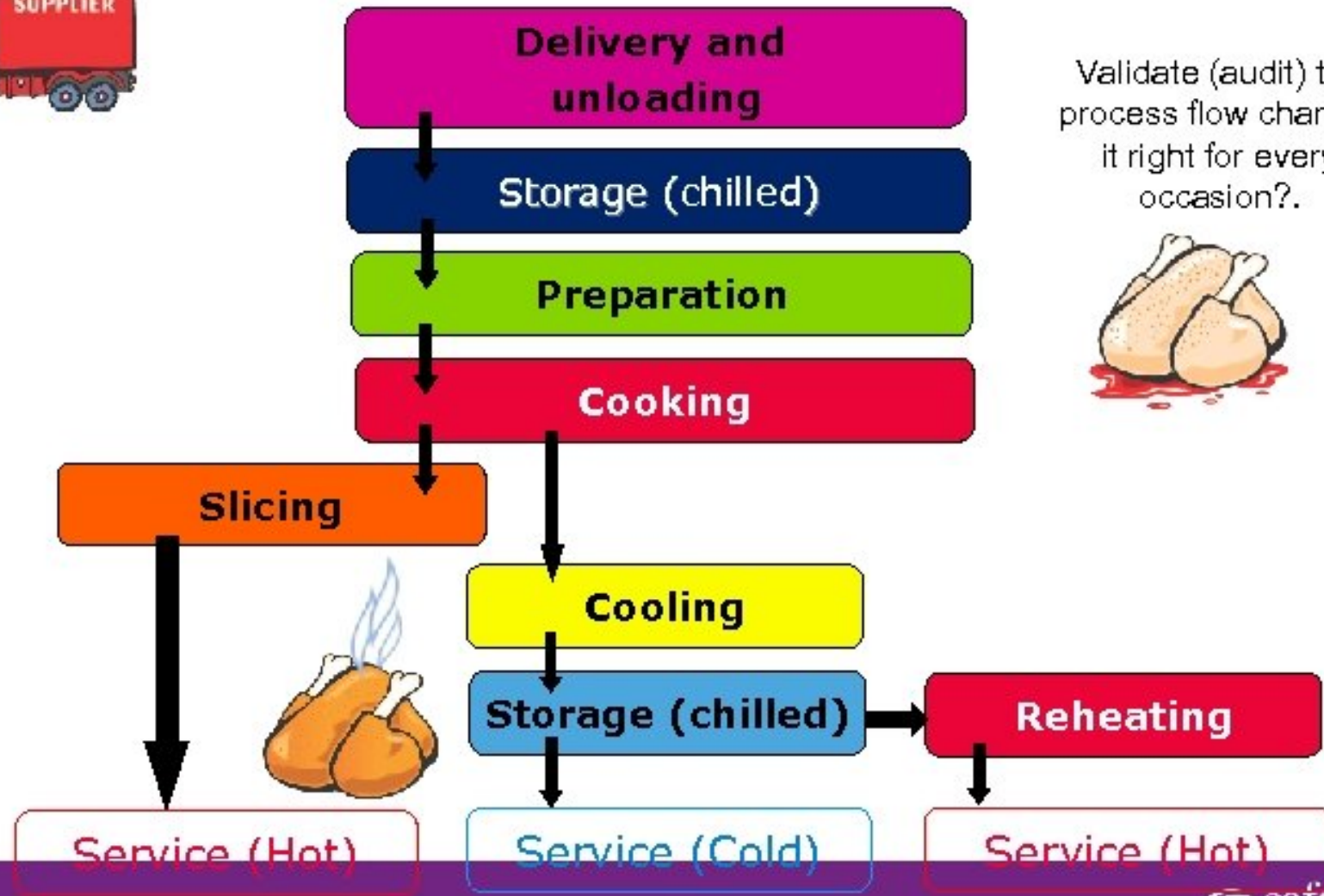
HACCP Plan

- ***3) Describe the intended use and consumers of the food***
- Describe the normal expected use of the food.
- The intended consumers may be the general public, or a particular segment of the population such as infants, immunocompromised individuals, the elderly, etc.

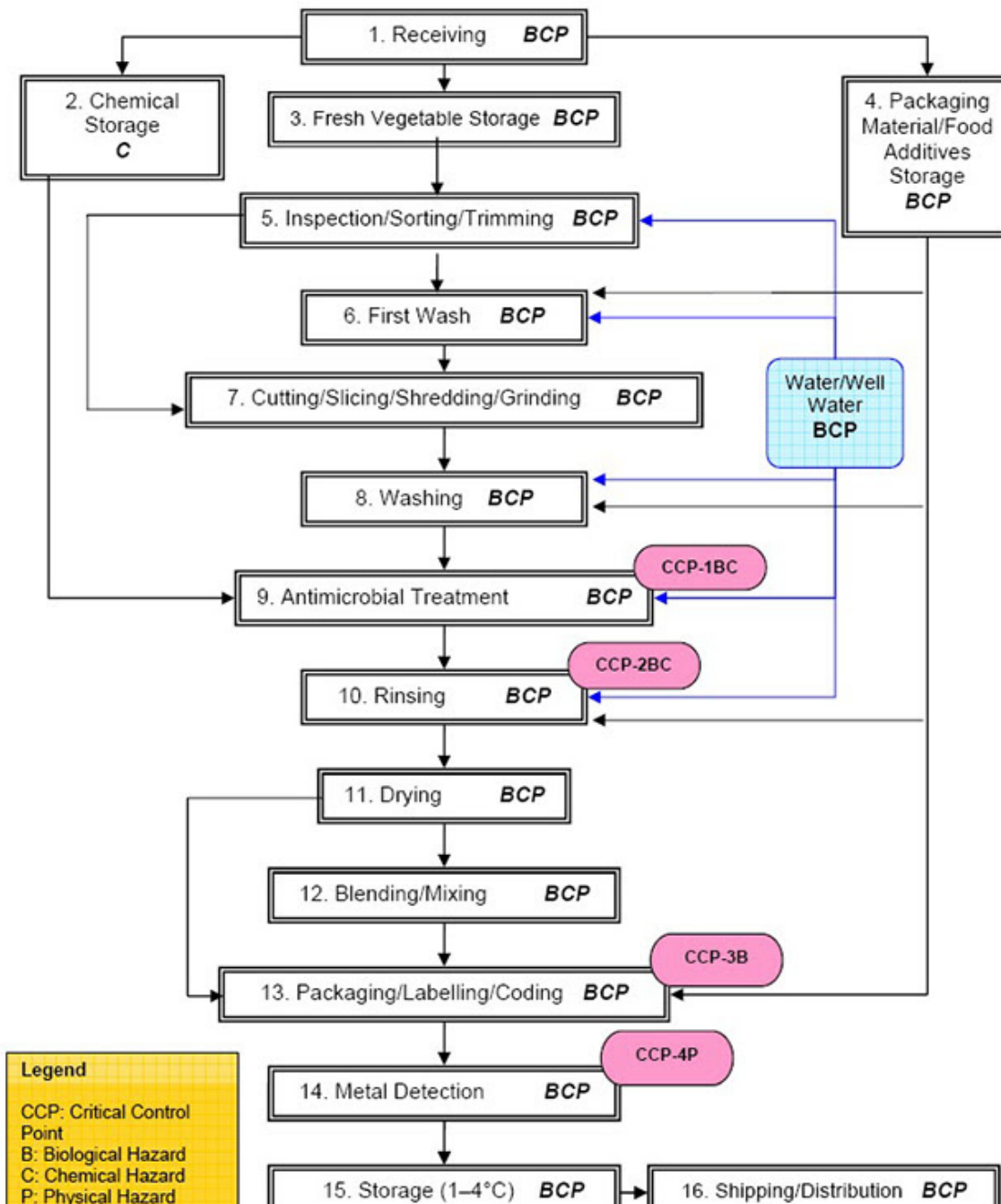
HACCP Plan

- *4) Develop a flow diagram which describes the process*
- The purpose of a flow diagram is to provide a clear, simple outline of the steps involved in the process.
- The scope of the flow diagram must cover all the steps in the process which are directly under the control of the establishment.
- In addition, the flow diagram can include steps in the food chain which are before and after the processing that occurs in the establishment.

HACCP flow diagram for cooking a fresh chicken and serving hot, cold or reheating



Form 3: Process Flow Diagram



HACCP Plan

- *5) Verify the flow diagram*
- The HACCP team should perform an on-site review of the operation to verify the accuracy and completeness of the flow diagram.
- Modifications should be made to the flow diagram as necessary and documented.
- **After these five preliminary tasks have been completed, the 7 principles of HACCP are applied**

HACCP PRINCIPLES

HACCP is a systematic approach to the identification, evaluation, and control of food safety hazards based on the following seven principles:

Principle 1: Conduct a hazard analysis.

Principle 2: Determine the critical control points (CCPs).

Principle 3: Establish critical limits.

Principle 4: Establish monitoring procedures.

Principle 5: Establish corrective actions.

Principle 6: Establish verification procedures.

Principle 7: Establish record-keeping and documentation procedures.

Conduct a hazard analysis (Principle 1)

- The purpose of the hazard analysis is to **develop a list of hazards** which are significant and are reasonably likely to cause illness if not effectively controlled.
- When conducting a hazard analysis, safety concerns must be differentiated from quality concerns.
- The analysis may identify needed modifications to a process or product so that product safety is further assured or improved.
- The analysis provides a **basis for determining CCPs in Principle 2.**

The process of conducting a hazard analysis involves two stages.

- **Stage one**

- Hazard identification can be regarded as a brain storming session.
- Then the team develops a list of potential biological, chemical or physical hazards.
- Knowledge of illnesses historically associated with the product will be of value in the brain storming session in stage 1.

Stage two,

- Hazard evaluation, is conducted.
- The HACCP team decides **which potential hazards must be addressed in the HACCP plan**. Each hazard is evaluated based on the **severity** of the potential hazard and its likely occurrence
- (**severity** is the seriousness of the consequences of exposure to the hazard).

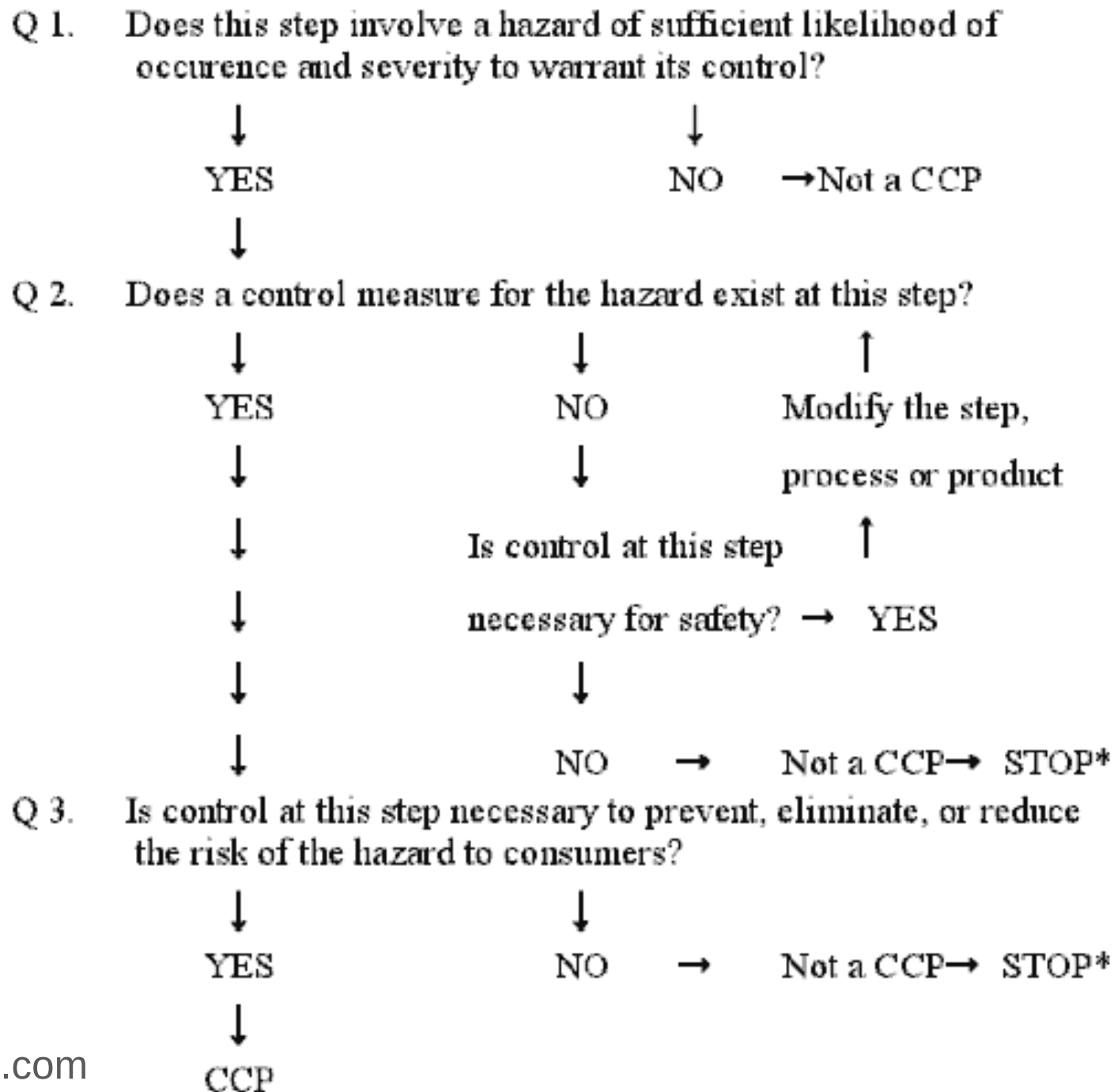
Hazard analysis

- Hazards identified in one operation or facility may not be significant in another operation producing the same or a similar product
 - because of for example a) differences in equipment and/or b) an effective maintenance program

[Examples of How the Stages of Hazard Analysis are used to Identify and Evaluate Hazards.docx](#)

Determine critical control points (CCPs) (Principle 2)

- CCP is defined as a step or procedure at which control can be applied, and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level.
- CCPs are derived from the hazard analysis.
- One way to facilitate the identification of each CCP is the use of a CCP decision tree. **CCP decision tree** is not mandatory but it is helpful, a CCP decision tree is not a substitute for expert knowledge.



Important considerations when using the decision tree

- The decision tree is used **after the hazard analysis**. It is used at the steps where a hazard that must be addressed in the HACCP plan has been identified.
- More than one step in a process may be involved in controlling a hazard.
- More than one hazard may be controlled by a specific control measure.

Examples of (CCPs)

- 1) thermal processing to destroy specific pathogens;
 - 2) chilling to prevent multiplication of microorganisms;
 - 3) testing ingredients for chemical residues;
 - 4) product formulation control such as adjusting the pH to prevent toxin formation, and testing product for metal contaminants.
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- Different facilities preparing similar food items can differ in the hazards identified and the steps which are CCPs. This can be due to differences in each facility's layout, equipment, selection of ingredients, processes employed, etc.

Establish critical limits (Principle 3)

- A critical limit is a maximum and/or minimum value to which a biological, chemical or physical hazard must be controlled at a CCP
- Each control measure has one or more associated critical limits.
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- Critical limits may be based upon factors such as temperature, time; humidity, moisture level in the product; water activity (a_w); pH; salt concentration; preservatives,
- Critical limits must be scientifically based.
- The critical limits may be derived from sources such as regulatory standards and guidelines, literature surveys, experimental results, and experts.

Process Step	CCP	Critical Limits
5. Cooking	YES	Oven temperature: ____°C Time: _____ seconds Patty thickness: ____in. Patty composition: e.g. all beef Oven humidity: % RH

Objectives of Monitoring Procedures (Principle 4)

- is a planned sequence of observations or measurements to assess whether a CCP is under control and to produce an accurate record for future use in verification.
- Monitoring serves many purposes, it facilitates:
 - tracking the operation and any **deviation** from critical limits;
 - taking **corrective action** when a deviation occurs;
 - providing **written documentation** for verification.

Objectives of Monitoring Procedures (Principle 4)

- Monitoring should be:
 - 1) done by the assigned personnel,
 - 2) documented,
 - 3) dated and
 - 4) signed or initialed,
 - 5) continuous whenever possible is preferable, or a monitoring frequency should be planned
- Examples of monitoring activities include
 - 1) visual observations
 - 2) measurement of temperature, time, pH, and moisture level.

Establish corrective actions (Principle 5)

- Corrective actions are what to do when there is a deviation from critical limits.
- They determine & correct the cause of non-compliance, determine the disposition of non-compliant product (what to do with a non-compliant product).
- corrective actions should be **specific for each CCP**

Establish verification procedures (Principle 6)

- Verification is defined as those activities that determine the validity of the HACCP plan and that the system is operating according to the plan.

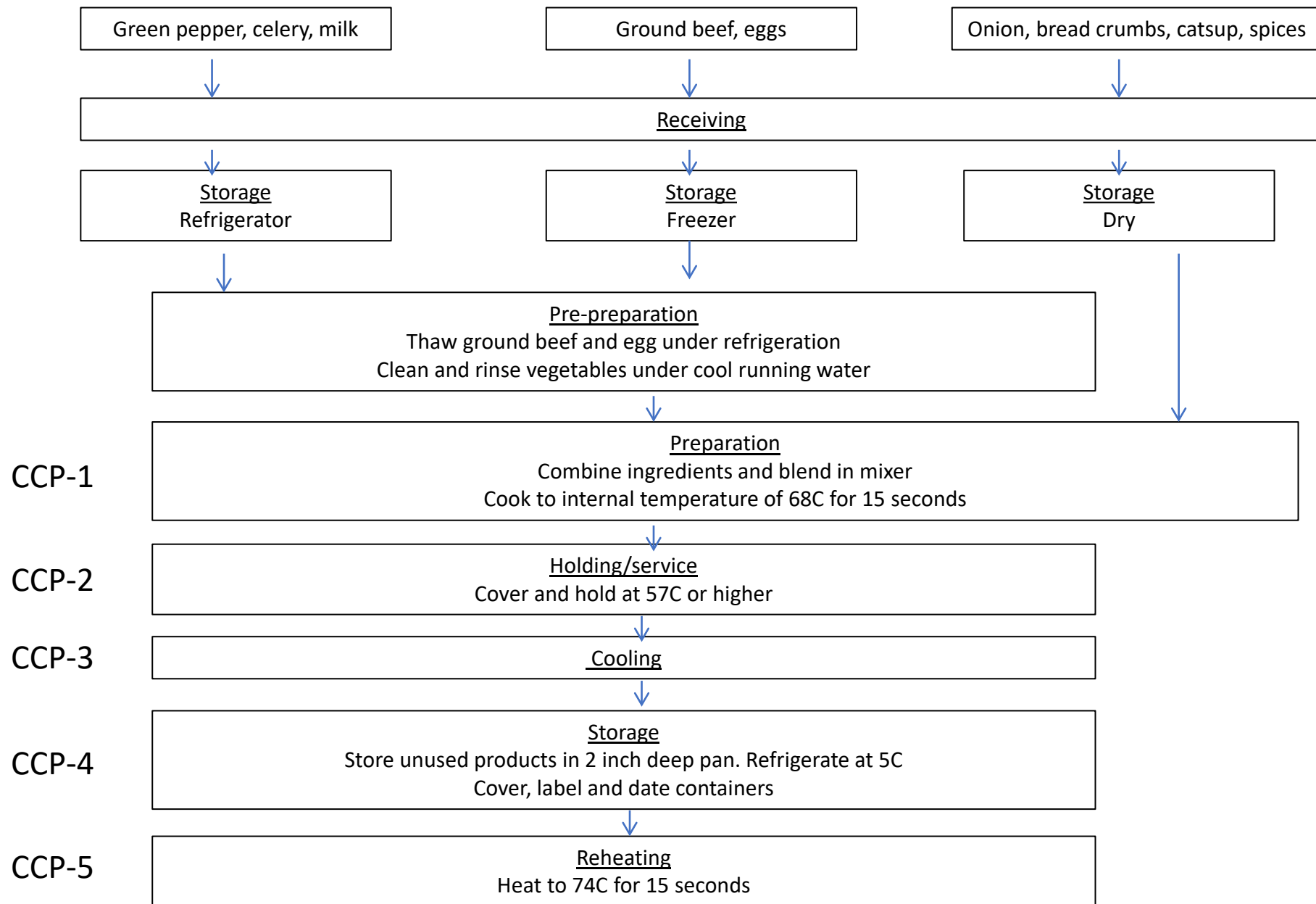
Establish record-keeping and documentation procedures (Principle 7)

- should include a summary of the:
 - Hazard analysis, including the rationale for determining hazards and control measures;
 - Position responsible for performing the activity;
 - the Procedures and Frequency.

CCP	Hazards	Critical limit(s)	Monitoring Procedure (s)	Corrective Actions	Verification	Records

HACCP chart for meat loaf

Ingredients	Amount	Serving		
		25	50	100
Ground beef	Lbs.	6	12	24
Onion, diced	Cups	2	4	8
Green pepper, diced	Cups	1	2	4
Celery, diced	Cups	1	2	4
Bread crumbs	Cups	3	6	12
Pasteurized egg, frozen	Cups	1	2	4
Catsup	Cups	1	2	4
Homogenized milk	Cups	½	1	2
Pepper	Cups	½	1	2
Salt	Cups	½	1	2



Examples of How the Stages of Hazard Analysis are used to Identify and Evaluate Hazards*				
Hazard Analysis Stage		Food Product	Food Product	Food Product
		Frozen cooked beef patties produced in a manufacturing plant	Product containing eggs prepared for foodservice	Commercial frozen pre-cooked, boned chicken for further processing
Stage 1 Identify potential hazards associated with the product		Enteric pathogens (i.e., E. coli O157:H7 and Salmonella)	Salmonella in finished product.	Staphylococcus aureus in finished product.
Stage 2 Hazard Evaluation	a) Assess the severity of health consequences if the potential hazard is not properly controlled.	Epidemiological evidence indicates that these pathogens cause severe health effects including death among children and the elderly. Undercooked beef patties have been linked to disease from these pathogens.	Salmonellosis is a food borne infection causing a moderate to severe illness that can be caused by ingestion of only a few cells of Salmonella.	Certain strains of Staphylococcus aureus produce an enterotoxin which can cause a moderate foodborne illness.
	b) Determine the likelihood of occurrence of a potential hazard if not properly controlled.	E. coli O157:H7 is of very low probability, and salmonellae is of moderate probability in raw meat.	Product is made with liquid eggs which have been associated with past outbreaks of salmonellosis. Recent problems with	Product may be contaminated with Staphylococcus aureus due to human handling during boning of cooked chicken. Enterotoxin capable of causing illness will only occur

			Salmonella serotype Enteritidis in eggs cause increased concern. Probability of Salmonella in raw eggs cannot be ruled out. If not effectively controlled, some consumers are likely to be exposed to Salmonella from this food.	as <i>S. aureus</i> multiplies to about 1,000,000/g. Operating procedures during boning and subsequent freezing prevent growth of <i>S. aureus</i>, thus the potential for enterotoxin formation is very low.
	Using the above information, c) Determine if this potential hazard is to be addressed in the HACCP plan.	The HACCP team decides that enteric pathogens are hazards for this product. Hazards must be addressed in the plan.	HACCP team determines that if the potential hazard is not properly controlled, consumption of product is likely to result in an unacceptable health risk. Hazard must be addressed in the plan.	The HACCP team determines that the potential for enterotoxin formation is very low. However, it is still desirable to keep the initial number of <i>Staphylococcus aureus</i> organisms low. Employee practices that minimize contamination, rapid carbon

				dioxide freezing and handling instructions have been adequate to control this potential hazard. Potential hazard does not need to be addressed in plan.
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Process Step	Potential Hazard(s)	Justification	Hazard to be addressed in plan? Yes/No	Control Measure(s)
5. Cooking	Enteric pathogens such as: Salmonella, toxigenic-E. Coli.	Enteric pathogens have been associated with outbreaks of foodborne illness from undercooked ground beef.	Yes	Cooking to a safe temperature.

Activity	Frequency	Responsibility	Reviewer
Initial Validation of HACCP Plan	Prior to and During Initial Implementation of Plan	Independent Expert(s) ^(a)	HACCP Team
Verification Activities Scheduling	Yearly or Upon HACCP System Change	HACCP Coordinator	Plant Manager
Subsequent validation of HACCP Plan	When Critical Limits Change, Significant Changes in Process, Equipment occur, After System Failure, etc.	Independent Expert(s) ^(a)	HACCP Team
Verification of CCP Monitoring as Described in the Plan (e.g., monitoring of patty cooking temperature)	According to HACCP Plan (such as once per shift)	According to HACCP Plan (such as Line Supervisor)	According to HACCP Plan (such as Quality Control)
Review of Monitoring, Corrective Action Records to Show Compliance with the Plan	Monthly	Quality Assurance	HACCP Team
Comprehensive HACCP System Verification	Yearly	Independent Expert(s) ^(a)	Plant Manager
^(a) Done by others (than the team writing and implementing the plan). May require additional technical expertise as well as laboratory and plant test studies.			