Food and Agriculture Organization
of the United Nations

GHP – SECTION 3

ESTABLISHMENT – DESIGN OF FACILITIES AND EQUIPMENT

FAO Good Hygiene Practices (GHP) and
Hazard Analysis and Critical Control Point
(HACCP) Toolbox for Food Safety

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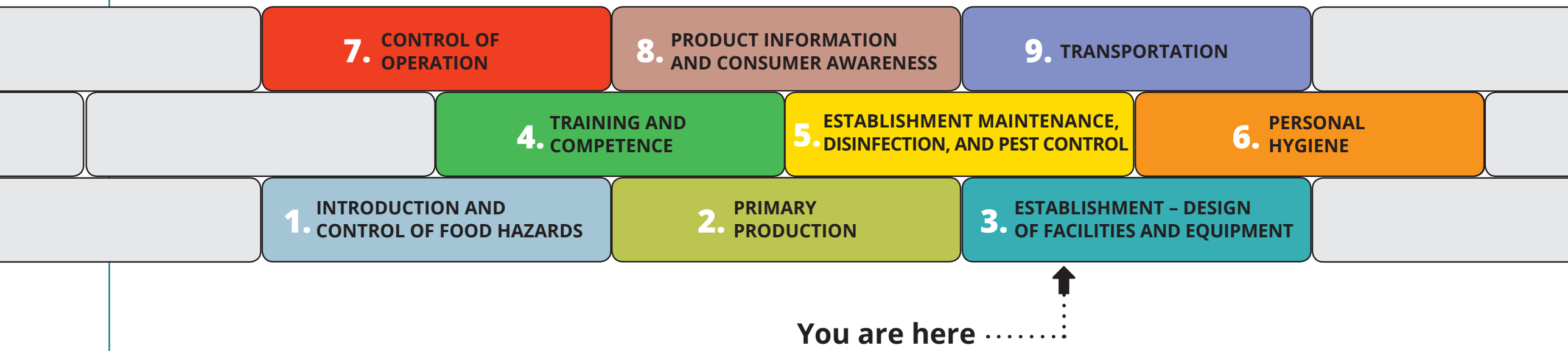
ESTABLISHMENT – DESIGN OF FACILITIES AND EQUIPMENT

SCOPE AND INSTRUCTIONS FOR USE

This guidance document is part of a toolbox of materials and has been developed to provide users with a good understanding of Section 3, Establishment – design of facilities and equipment of the Codex General Principle of Food Hygiene (CXC 1-1969).

Effective and well-established Good Hygiene Practices provide the foundation for food safety management systems. This tool divides the practices into nine sections, as illustrated by the brick schematic below. The section addressed by the current guidance document is indicated by the arrow.



ESTABLISHMENT – DESIGN OF FACILITIES AND EQUIPMENT

CONTEXT

Food handling premises provide the first point of protection against hazards as the place where food is separated from the external environment where it was grown or raised. The **premises, equipment and other facilities** should be located, designed and constructed to permit maintenance, cleaning and disinfection. The environment should be controlled for temperature and humidity, and there should be a system to prevent pests from entering the premises. Surfaces and materials, particularly those in contact with food, should be intended for use for the processing/handling of foods. Facilities, including washrooms, should be adequately designed for waste management and cleaning and support the hygienic production of food.

Food safety can be built into a facility by taking into account the location, design, layout and materials used for construction well before the establishment becomes operational. Such forethought makes it possible to prevent, contain and minimize hazards during processing. Failure to consider these elements before operations begin can increase the risk of contamination. It can be complicated and costly to implement changes once processing has already begun.

CONTEXT

Rationale

Attention to good hygienic design and construction, appropriate location, and the provision of adequate facilities is necessary to enable contaminants to be effectively controlled.

Learning Objectives

This document on the design of facilities and equipment provides guidance on how to:

- identify potential hazards associated with the establishment's location, design, facilities and equipment; and
- learn how to prevent food contamination with the right design and construction and by choosing appropriate equipment.

Codex definitions:

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

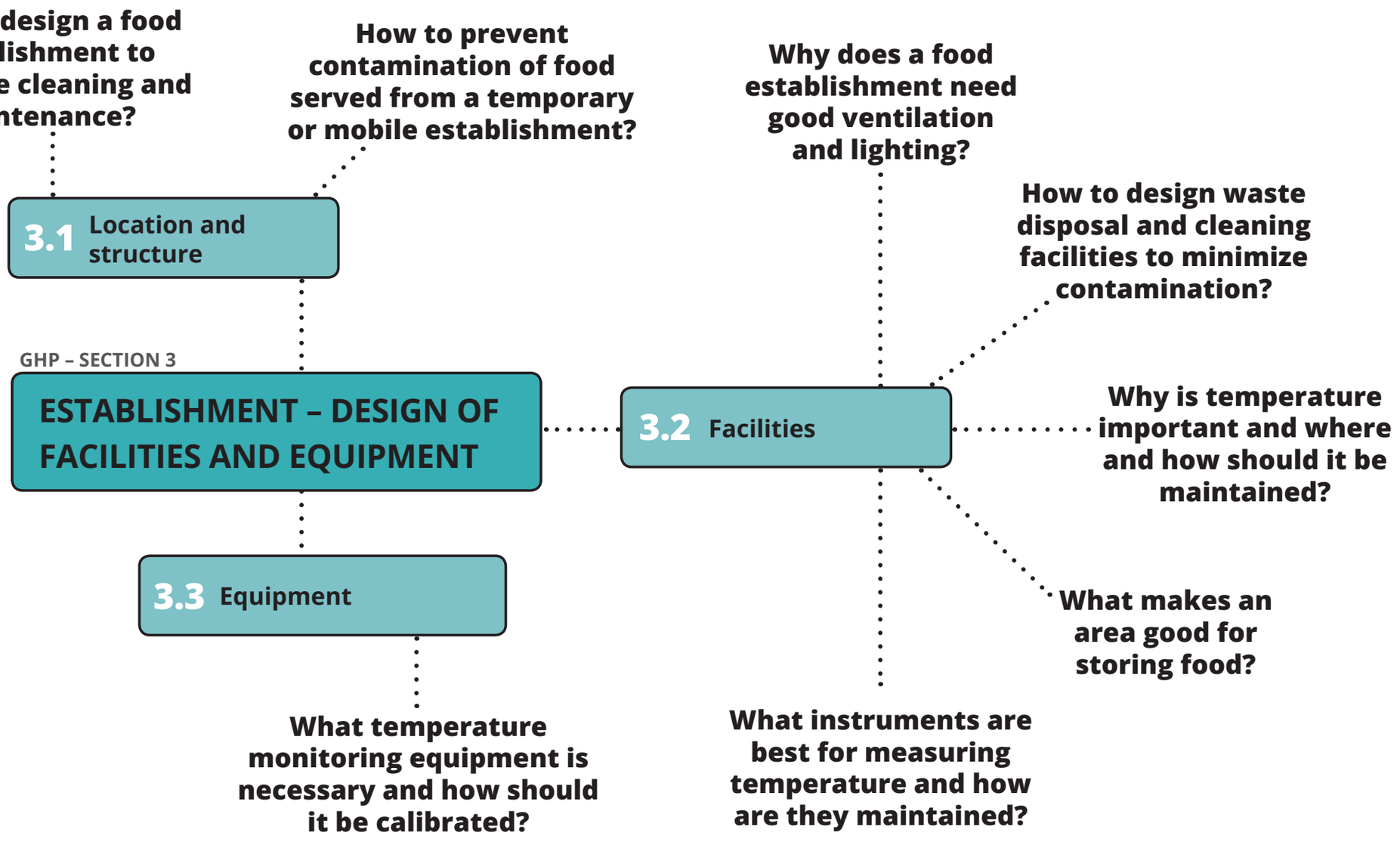
Disinfection: Reduction by means of biological or chemical agents and/or physical methods in the number of viable microorganisms on surfaces, in water or air to a level that does not compromise food safety and/or suitability.

Flow diagram: A systematic representation of the sequence of steps used in the production or manufacture of food.

ESTABLISHMENT – DESIGN OF FACILITIES AND EQUIPMENT

MINDMAP

This section of the guidance is divided into sub-sections. You can jump to a particular sub-section by clicking on it, or return to this page at anytime by clicking on ESTABLISHMENT- DESIGN OF FACILITIES AND EQUIPMENT



3.1 LOCATION AND STRUCTURE

The food establishment should be designed and located in a way that minimizes the risk of introducing and spreading hazards. It is essential that the location, construction, and design, from the exterior fence and the area up to the internal layout, be carefully planned.

Location of establishment

It is important to choose the location for the food premise carefully and to understand the neighbourhood. Consider any nearby businesses and know what kind of activities take place there since many food contaminants are linked to hazards found in the surrounding area. For example, locating the facility near a landfill site, waste treatment centre or chemical factory could increase the risk of hazards entering the processing area.

3.1 LOCATION AND STRUCTURE

Proximity to other businesses

The area surrounding a food establishment may present a potential risk to food safety. Typically, the risks are related to the vicinity of a processing plant to an environmentally and industrially polluted area.

Things to consider

- Industrial sites, urban centres and animal production can contaminate food products. For example, foul odours, smoke, chemical discharges, effluent wastewater and changing air quality from industries will contaminate the air, soil and water in the vicinity and could expose the final food products to chemical and biological hazards.

- Construction sites produce dust that could enter a nearby food establishment.

- Water used for washing or watering animals can be a source of pathogenic microorganisms and waste chemicals.

- Toxic fumes and waste disposal sites, even at a distance, can contaminate foods.

3.1 LOCATION AND STRUCTURE

Climate and geological factors

The prevailing environmental condition, particularly wind direction, wetlands and flooding, can pose potential risks for a food establishment.

Things to consider

- Floodwater can contaminate the ground and soil if the wastewater from treatment plants, sewer lift stations, sewer collection systems, etc. overflows. These floodwaters can spread bacteria, viruses, protozoa and other microbial contaminants.

- If a food establishment is constructed on wet soils, appropriate draining structures should be constructed. If there is humidity below the building, it will need to have the correct type of flooring to prevent the moisture from destroying the foundation and sufficient ventilation inside the building to inhibit the growth of mould.

- Wind can blow microbes, aerosol dust and toxic gases from the surrounding area or sites (if there are waste disposal units, effluent treatment plants or any cleaning operations) directly into the food manufacturing area.

3.1 LOCATION AND STRUCTURE

Avoiding pest infestation

Pests, such as rodents, can carry infectious diseases that can be introduced into food storage and processing areas. Pests are attracted to locations when there is food available (e.g. waste bins) and when there are nesting areas such as bushes. If pests find entry points into the establishment, they can become established in storage areas then spread to food handling areas.

Things to consider

- Trees and shrubs that surround food production facilities can harbour pests. The perimeter of the factory should therefore be kept free of vegetation.

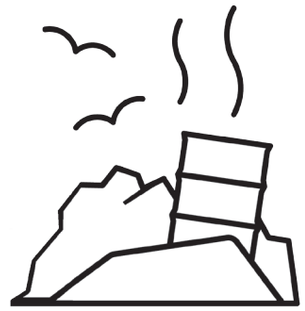
- Moist and humid locations, such as puddles from leaks and rainfall, condensation, drains, or runoff, are attractive to pests. Open waterways can attract birds, insects, rodents, etc. and should be enclosed in culverts if possible.

- Waste disposal sites, if not properly designed or maintained, can attract pests (e.g. rodents and insects).

- Security lighting can attract flying insects. They should be installed in areas further from factory doors and windows in order to attract insects away from the building.

3.1 LOCATION AND STRUCTURE

Proximity to waste disposal sites



The presence of waste disposal sites near a food establishment poses a serious risk to food safety. The hazards from waste disposal sites can enter food establishments through contaminated ground surfaces and water supplies, the wind or by creating other unsanitary conditions that may attract pests, insects and other vermin.

Things to consider

- Food establishments should be located away from areas where wastes, either solid or liquid, cannot be removed effectively.

- Ensure that bins and waste storage are secured and well maintained so that they are inaccessible to pests and do not pose a risk of contamination.

3.1 LOCATION AND STRUCTURE

Establishment design and layout

The establishment should be designed to minimize cross-contamination of the finished product and the incoming raw materials by separating high risk areas (e.g. cooked products) from low risk areas (e.g. incoming raw materials). This requires physical separation by walls and doors and well designed flow patterns for people and materials.

3.1 LOCATION AND STRUCTURE

Facilitate cleaning and maintenance

Food establishments should be designed and laid out in a way that facilitates timely and effective cleaning and maintenance of the entire premises. There should be sufficient working space for all operations to be carried out hygienically.

Things to consider

- Product contact surfaces should be made of easily cleanable materials so they can be sanitized to eliminate any microbial contaminants, and they should be durable enough to tolerate the chemicals used for cleaning.

- Any pits, cracks, gaps, open seams, hollow spaces, lap joints or other niches in the physical structure (e.g. floors, walls and ceilings) are hard to clean and can harbour pests / bacteria /moulds.

- The design should ensure that product residue or liquid do not accumulate.

- The design should contain enough space for inspection, maintenance, cleaning and sanitation.

3.1 LOCATION AND STRUCTURE

Minimize cross contamination

The establishment should be organized so that the flow of materials/products, personnel, air, water and waste can move in the right direction and minimize the chance of contaminating the final product. Moving hazards from low-risk areas of the factory to medium or high-risk areas (i.e. over or near any exposed products) should be restricted. Different hygiene levels (basic, medium and high) for areas in the food establishment should also be clearly identified and will depend on the process and the type of food.

Product handling and hygienic behaviour of personnel according to level of hygiene required

Hygiene level	Product handling	Hygienic behaviour
High	all handling of the unpacked, final product (e.g. area where yogurt containers are filled)	In addition to the rules below, personnel should observe the strictest hygiene practices (e.g. no constant exiting and entering the area).
Medium	handling raw materials before processing steps (e.g. weighing, mixing)	Access only for authorized personnel wearing hygienic clothing. Hands should be washed upon entering the area.
Basic	no production in these areas (e.g. storage for wrapped packaging materials)	Access allowed to anyone on the premises, no special clothing requirements.

3.1 LOCATION AND STRUCTURE

Things to consider

Movements of personnel inside the buildings should flow in a way to minimize or prevent cross-contamination.

- In basic hygiene areas, standard hygiene levels should be applied. Anyone on the premises is allowed access to these areas, and there are no special clothing requirements.

- In medium hygiene areas, elevated standards should be applied. Access is allowed only for authorized personnel or visitors accompanied by such personnel, wearing special protective hygienic clothing, observing hand hygiene rules, and no jewelry.

- In the high hygiene areas, the strictest access rules should be applied. These rules include those that apply in the medium hygiene areas as well as special standard operating procedures, which could include wearing additional protective clothing and/or restricting access to authorized personnel only.

cont.

3.1 LOCATION AND STRUCTURE

Things to consider

- Different hygiene levels in production site areas should be defined and there should be signs identifying them.

- Each area with different hygiene controls should be separated from the others by a physical barrier (walls, partitions) and/or separated by location (distance), traffic flow (one-directional production flow), airflow, or separated by timing (e.g. cleaning activities are carried out at different times from processing activities). Each area should be cleaned and disinfected between uses.

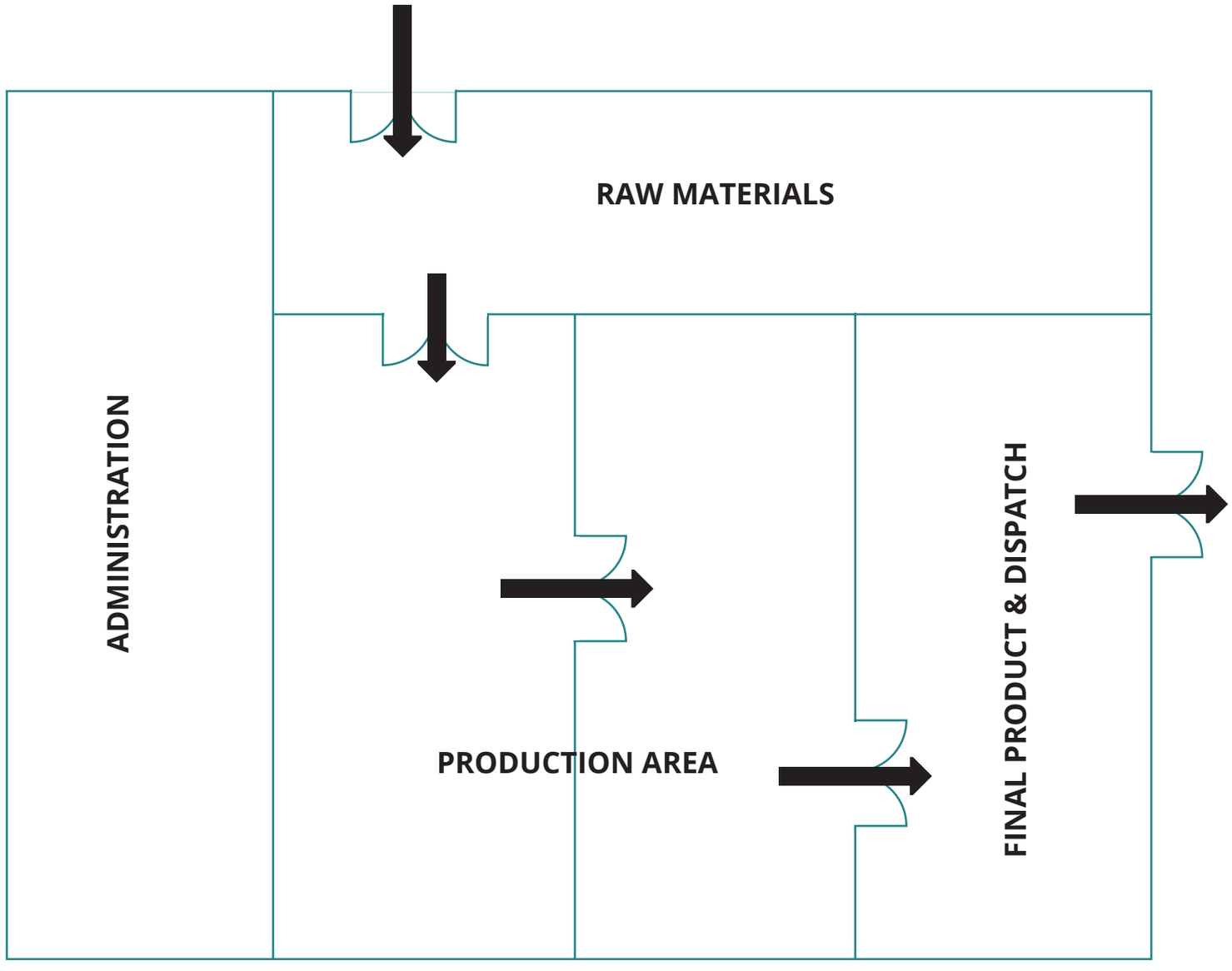
- Material flow should be directed from basic hygiene to high hygiene areas.

3.1 LOCATION AND STRUCTURE

Plant schematic to show the flow of raw materials/products through a production site

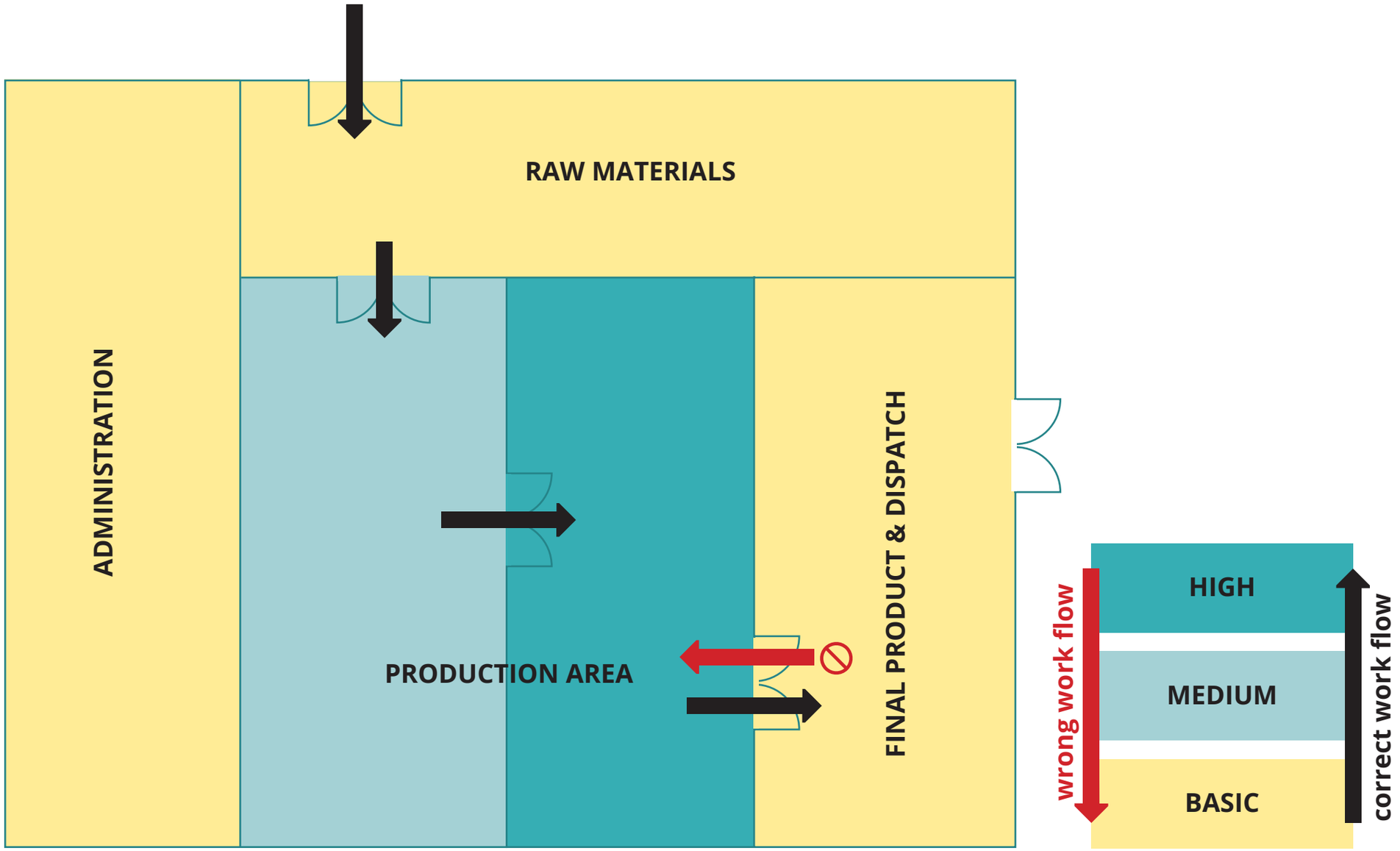
The flow of materials inside the establishment should be designed to minimize or prevent cross-contamination.

The flow of materials through the establishment should be determined by drawing a simple plan or plant schematic.



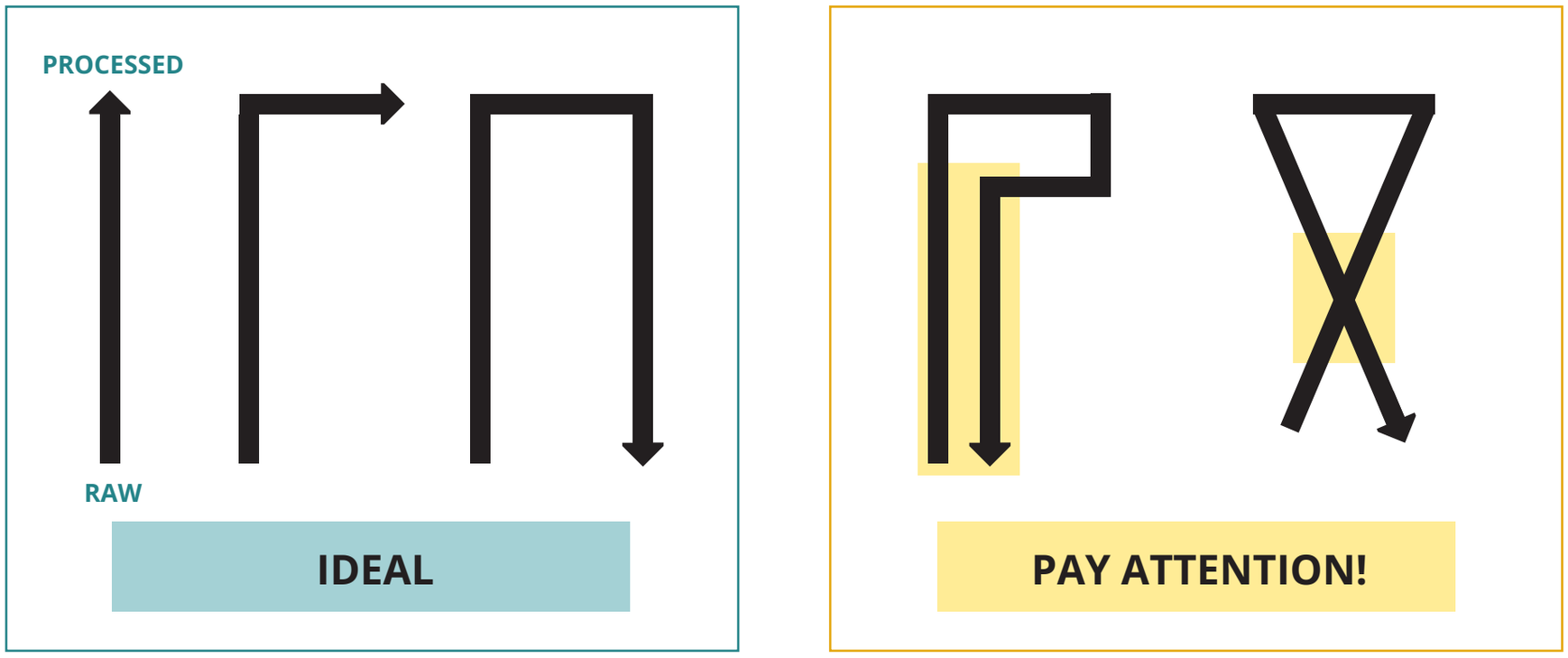
3.1 LOCATION AND STRUCTURE

Assign and organize hygiene levels in areas of the production site



3.1 LOCATION AND STRUCTURE

Cross-contamination is minimized by observing the ideal flow of the product



- The direction of the product flow through a factory should prevent raw or unprocessed products or waste from coming into contact with the final food products.

- Food waste, drainage and discarded outer packaging materials should flow from high hygiene areas to basic hygiene areas.

- Air should flow from high hygiene areas towards basic hygiene areas.

3.1 LOCATION AND STRUCTURE

Internal structures and fittings

Food processing establishments should be of a suitable size, construction and structure to allow for maintenance and sanitary operations to reduce the potential for contamination of produce or food contact surfaces. Also, the appropriate drainage is required in all building areas where normal operations release or discharge water or other liquid waste on the ground or floor of the building.

Ease of cleaning and sanitizing surfaces, windows and doors

Structures within food establishments should be soundly built and made from durable materials that are easy to maintain, clean and, where appropriate, easy to disinfect. In addition, they should be constructed of non-toxic and inert materials according to the intended use and normal operating conditions.

3.1 LOCATION AND STRUCTURE

Things to consider

- The surfaces of walls, partitions and floors should be made of waterproof materials that are easy to clean and, where necessary, disinfect.

- Walls and partitions should have a smooth surface up to a height appropriate to the operation.

- Work surfaces should be made of smooth, non-absorbent materials and be inert to food, detergents and disinfectants under normal operating conditions.

- Exposed utility service lines and pipes should be installed such that they do not prevent cleaning of the floors, walls, or ceilings.

- Windows should be easy to clean, constructed to minimize the build-up of dirt and, where necessary, be fitted with removable and cleanable insect-proof screens.

- Doors should have smooth, non-absorbent surfaces, be easy to clean and, where necessary, disinfect.

3.1 LOCATION AND STRUCTURE

Shatterproof fixtures and ceilings

Ceilings and overhead fixtures in all food preparation and storage areas and equipment and utensil washing areas can introduce hazards in food products if not designed, constructed and installed correctly.

3.1 LOCATION AND STRUCTURE

Things to consider

- The ceiling's surface should be smooth, light-coloured, durable, and non-absorbent.
- Ceilings and overhead fixtures (light fixtures, vent covers, fans, etc.) should be designed, constructed and installed so that they can be easily cleaned and repaired.
- Ceilings should be well sealed to prevent access by pests or contamination from the roof area.
- Ceilings (or, where there are no ceilings, the interior surface of the roof) and overhead fixtures should be shatterproof, where appropriate, and finished so that they do not shed particles.
- The drip or condensation from fixtures, ducts and pipes can contaminate food, food-contact surfaces and food-packaging materials. Therefore, ceiling and overhead fixtures should be constructed to prevent dirt from accumulating or condensation from forming.
- Protective screens and false ceilings should be avoided in food preparation or storage areas. If there are false ceilings, they should be sealed to prevent pests from entering.
- If electrical installations require protection, a periodic cleaning programme is necessary to remove the accumulation of dust, particles or debris that may contaminate foods.

3.1 LOCATION AND STRUCTURE

Drainage and easy to clean floors

Floors in food processing facilities and factories may introduce hazards to food products by being subjected to various sources of contamination, from the shoes of personnel, or food-by products such as blood, fat, etc. Floors should be constructed in a way that they can be well cleaned and maintained. Floors should be sloped toward a drain to avoid standing water. Broken flooring (e.g. tiles) should be repaired.

3.1 LOCATION AND STRUCTURE

Things to consider

- Floor or floor coverings should be tight, smooth and non-absorbent, in sound condition, durable and easy to clean, maintain and disinfect.

- There should be no cracks, crevices or other defects, dips or hollows. It is important that floors are maintained and in good repair.

- Floors should be made from materials that can withstand foot and equipment traffic and equipment weight without damage. Also, the risk of falling and slipping should be minimized.

- Proper floor drainage and a slope towards the drain are required to prevent water pooling when floors are cleaned by flooding the area or where discharging water or other liquid waste onto the floor is part of normal operations.

- Sealing coving at floor and wall junctures will help prevent water penetration at this point, avoid pathogen harbours and allow complete cleaning.

- Floor drains and outer openings should be protected and screened to prevent insects and rodents from entering through the sewers.

3.1 LOCATION AND STRUCTURE

Temporary or mobile food establishments and vending machines

Mobile or temporary food establishment units range from market stalls, street vending vehicles, vending machines and temporary premises such as tents and marquees. Such premises and structures should be located, designed and constructed, as well as is reasonably practicable, to prevent any food contamination and pest infestation.

Design and construction

The sources of hazards for temporary or mobile food establishments are very similar to permanent food establishments. Therefore, it is essential to pay special attention to the design and construction as well as to the structure of the exterior and interior surfaces, such as walls, floors and ceilings, to reduce the risk of food contamination.

3.1 LOCATION AND STRUCTURE

Things to consider

- The exterior surfaces of mobile food establishments should be weather-resistant and in compliance with regulations.

- Walls are required to protect against the elements, wind-blown dust and debris, insects or anything else that could contaminate food, food contact surfaces, equipment, utensils or workers.

- Screens are required on doors and windows to minimize the risk of insects.

- The interior structures should be made of a suitable material for the intended purpose that is durable and free from toxic substances.

- All food contact surfaces (including walls, floors and ceilings, where present) should be smooth, easily cleanable and impervious to moisture.

- The grooves between floors and walls should be sealed to prevent debris from accumulating and forming environments hospitable to insects and bacteria.

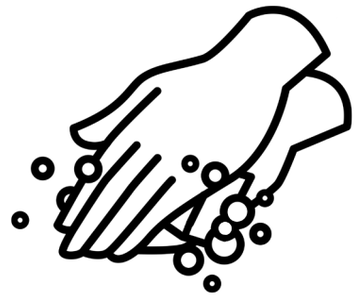
- Pushcarts, food delivery, and dispensing units should be placed on concrete, asphalt or on a similar non-absorbent surface that minimizes contact with dust and soils.

ESTABLISHMENT – DESIGN OF FACILITIES AND EQUIPMENT

3.1 LOCATION AND STRUCTURE

Hand washing facilities and toilets

Adequate facilities for washing hands and using the toilet should be provided in temporary and mobile food establishments, where appropriate. Handwashing is important especially after visiting the washroom or handling raw meat, to prevent infectious agents from being transferred to foods and the food processing area.



For additional information on hand washing , please consult the **Further reading** section accessible from the **SECTION LANDING PAGE**.

3.1 LOCATION AND STRUCTURE

Things to consider

- Handwashing stations should be located at the entry point of facilities and close to washrooms, but they should be separate from food washing facilities.

- Ideally, a handwashing basin will have running water or, if it is a container filled with water, the water should be changed frequently. It is recommended that low concentrations of sanitizer (e.g. <1 ppm hypochlorite) be added to the water in the container.

- Handwashing stations should be supplied with soap or detergent in a dispenser, individual disposable towels and a waste receptacle. In addition, handwashing signage, explaining the correct handwashing procedure, should be attached or in close proximity to the handwashing sink.

- Toilet facilities need not be provided within the establishment, but they should be conveniently located close to the establishment while not opening directly on to the food processing areas.

- Toilet facilities should be kept free from insects and other pests and be equipped with self-closing doors and/or toilet bowl lids.

3.1 LOCATION AND STRUCTURE

FBO RESPONSIBILITIES

Topic	Examples of what you should do
Location of establishment	Be aware of and document the previous use of the establishment, especially if it was not previously used for food manufacturing or food service. Make pest control plans that include information on the steps taken to minimize pest infestation. Ensure that waste is held in secure locations and is not accessible to pests.
Design and layout of food establishment	Draw a schematic of the processing line with product and worker flow. Make note of the necessary steps to avoid cross-contamination between waste, raw materials and the final product. Identify the location of wash stations, footbaths and washrooms. Ensure that the facility and equipment can be sanitized with no niches where pests or food residues could accumulate.

3.1 LOCATION AND STRUCTURE

FBO RESPONSIBILITIES

Topic	Examples of what you should do
Internal structures and fittings	Ensure that internal structures and fittings are made of non-toxic, inert, durable, easy to clean and safe materials. Follow the regulations for doors and windows, in terms of their size, number, location and the need for screening or curtains. Consider and address possible pest entry points, Consider the condition of the ceiling to ensure that it is not shedding particles. Ensure that the floor has good drainage and is sloped to prevent liquids from pooling.
Temporary or mobile food establishments and vending machines	Even though the food facility may not be in a fixed location, it still requires the same control for hazards. Follow the requirements for constructing, designing and locating temporary or mobile food establishments. Provide the appropriate facilities for toilets and washing hands.

3.2 FACILITIES

Facilities within the establishment, such as drainage and waste disposal facilities, cleaning facilities, personal hygiene toilet facilities, storage facilities, and equipment and systems responsible for temperature, lighting and humidity and air quality control should be well designed and ensure the safety and suitability of food.

Drainage and waste disposal facilities

There should be enough drains and the drains should be placed in locations that will minimize the pooling of liquids. Where possible, it is best to install drains that prevent backwash. Pipes transferring sewage should be separate from those serving drains within the food processing area.

3.2 FACILITIES

Designing drainage systems

Drainage and waste disposal facilities and systems should be designed and constructed in a way that minimizes the possibility of wastewater and sewage contaminating food or polluting the water supply.

Things to consider

- Drainage systems should be fit-for-purpose for transferring wastewater without contaminating the food processing area through leaks, aerosols, etc.
- Drains should flow from high-risk locations to low-risk areas and not the other way around.
- Backflow should be minimized by selecting a suitable drain design.
- Low and high-risk areas should each have separate drains that run toward a master collection drain.
- High-risk drains should enter the collection drain at a higher point than low-risk drains so that, if flooding occurs, low-risk areas will flood first.
- Design the drainage system with drain access points used for drain cleaning or unblocking (rodding) located outside high-risk areas.

3.2 FACILITIES

Plumbing

The plumbing system (e.g. fixtures, pipes, drain covers, vent pipe) should be designed and constructed to minimize contamination by flooding and aerosols. The plumbing system should also be maintained with leaks and blockages repaired quickly.

Things to consider

- Plumbing should carry sufficient quantities of water to the required locations throughout the food processing premises.
- Sewage and liquid disposable waste should be moved from the plant.
- Avoid constructing a source of contamination of food, water supplies, equipment, or utensils or creating unsanitary conditions.
- Provide enough floor drainage in all areas that are cleaned by flooding and where normal operations release or discharge water or other liquid waste onto the floor.
- There should not be backflow from or cross-connection between piping systems that discharge wastewater or sewage and piping systems that carry water for food or food manufacturing.

TIP

Backflow can be prevented by an air gap or by installing an approved backflow prevention device.

3.2 FACILITIES

Waste disposal

Waste should be managed to prevent it from contaminating the product or the processing environment. Personnel should be trained on proper waste handling, to ensure that waste is stored away from the food preparation area.

3.2 FACILITIES

Things to consider

- Containers for waste, by-products, and inedible or hazardous substances should be clearly identified, suitably constructed, and, where appropriate, made of impenetrable material. Waste receptacles should have lids and be made of rodent-resistant material.

- Containers to hold hazardous substances before disposal should be identified and, where appropriate, be lockable to prevent intentional or accidental contamination of food.

- The waste disposal site should be located away from the food establishment to prevent pest infestation.

- Septic, waste disposal and drainage systems should be designed and constructed in a way to minimize the risk of contaminating the water supply.

- Waste should be collected and disposed of by trained personnel and, where appropriate, disposal records should be maintained.

- A regular waste collection schedule is advisable.

3.2 FACILITIES

Cleaning facilities

Facilities for washing utensils, trays, containers and equipment parts should be separate from the food handling area because aerosols and splashing water can spread contamination. Special care should be taken with items from low-risk areas (e.g. raw meat preparation) that have a high probability of being contaminated with infectious agents. Washing areas should have running water and be separate from handwashing facilities.

3.2 FACILITIES

Water supply

Cleaning facilities should have the appropriate supply of hot and/or cold water, in quantities that facilitate cleaning and rinsing to ensure effective cleaning and safe food processing operations.

Dilute mixtures of chlorine bleach and water are commonly used to sanitize equipment and utensils in food processing operations. **Solutions used for sanitizing equiments are effective between 50-100 ppm hypochlorite and should not exceed 200 ppm hypochlorite.** Too concentrated of a solution can be harmful, but too little can be ineffective.

Things to consider

- The water supply should be fit-for-purpose, appropriate for the intended operations and come from a reliable source.

- Any water that comes in direct contact with food, food-contact surfaces, or food-packaging materials should be fit-for-purpose.

- Running water at a temperature suitable for the purpose and under pressure, as needed, should be provided in all areas where there is wet processing operations, cleaning equipment that uses water, or for employee sanitary facilities.

3.2 FACILITIES

Separate facilities for cleaning and washing

While washing tools and equipment, it is possible for contaminants to be spread by splashes and aerosols. Wash areas should be located and designed to reduce the risk of contamination reaching the food preparation area.

Things to consider

- Tools and equipment used for cleaning should be cleaned and replaced regularly.
- Facilities used for cleaning utensils and equipment should be separate from facilities for washing food.
- Tools and equipment used for cleaning should be dedicated to certain hygiene areas, to prevent cross-contamination between contaminated and clean spaces and the final food product.
- Tools and equipment used for cleaning highly contaminated locations in food facilities should also be stored separately from those used for clean areas.

3.2 FACILITIES

Food washing

Raw foods, such as fruits and vegetables, may contain soil, chemical residues and microbial pathogens. Therefore, it may be necessary to wash the food to remove soil and other contaminants.

Things to consider

- Water used for washing, rinsing, or conveying food should be fit for purpose, and, where necessary, treated.
- Water may be reused for washing, rinsing or conveying food if the water is fit for purpose and does not increase the risk of contaminating food.
- Facilities for washing food should be separate from facilities for cleaning utensils and equipment.
- Separate sinks should be available for hand washing and food washing.

3.2 FACILITIES

Personnel hygiene facilities and toilets

Appropriate hand washing and toilet facilities should be available so that an appropriate degree of personal hygiene can be maintained to prevent personnel from contaminating food. Such facilities should be suitably located and should not be used for other purposes such as for the storage of food or items that come in contact food.

TIP

Hands-free tap design
It is possible to spread infectious agents by touching the taps that turn water on and off. Hand-free devices are therefore preferred.

3.2 FACILITIES

Facilities for changing clothes

Facilities should be provided for personnel to store personal items, footwear, work, clothes etc., and be appropriate for the total number of personnel. Changing facilities may be a room, an enclosure or a designated area with lockers, shelves, coat hooks or cabinets. This area should not be used for any other purpose and should be effectively separated from food storage, food preparation areas, utensil rooms, cleaning equipment/supply storage area and utensil storage areas.

Things to consider

- Provide large enough changing facilities to accommodate the number of personnel.
- To minimize product cross-contamination, use a single entrance to the workplace for all staff, workers, visitors, contractors, etc.
- Clothing and shoes should be stored separately from work clothes and boots in changing rooms.
- The facility for cleaning and laundering industry clothing and footwear, if available, is usually located in changing areas.
- In food plants, the space dedicated to toilet facilities should not open to or lead directly to the food production areas.

3.2 FACILITIES

Hand washing and drying

Handwashing in the food industry is one of the first lines of defence in food safety. It is critical for reducing the transfer of faecal-oral pathogens from hands to food. As pathogens on the hands of personnel can transfer and contaminate food products, adequate facilities for washing hands should be provided.

Things to consider

- Hand washing facilities should be appropriate and convenient, they should be equipped with clean water at a suitable temperature, and include soap, and wash basins.

- Hand washing or hand sanitizing facilities should be set up near workspaces and be easily accessible at all times for employee use.

- Handwashing facilities should not be used for any other purposes.

- Hand dryers can be disposable paper towels, disinfection towels or suitable drying devices, and should not cause cross-contamination.

3.2 FACILITIES

Toilet facilities

Properly located and equipped toilet facilities are necessary to protect the equipment, facility and food from faecal contamination which may be carried by insects, hands or clothing. Toilet facilities that are kept clean and in good repair will minimize contamination.

Things to consider

- The toilet facility should not be located off the processing area, but it can be placed in the employee changing area.
- The doors and windows of the toilet facility cannot open directly onto the processing area.
- The toilet facility's walls, floors, doors and windows should be easy to clean and disinfect, and made of corrosion-resistant, impermeable materials.
- The toilet facilities are usually equipped with flushing and handwashing facilities, and the windows are insect-proof.

3.2 FACILITIES

Temperature control requirements

Temperature control is an important part of food processing. Storage areas for refrigerated and frozen foods should be able to maintain temperature and be monitored. Equipment used for cooking or thermal processing foods should be able to maintain temperature and be monitored.

Cooking equipment

Adequate cooking is an important step to eliminate harmful microorganisms in food, especially in high-risk foods (meat, poultry, seafood and eggs). Inadequate cooking can contribute to foodborne illness outbreaks. Choosing the correct cooking temperature and time combination, and using the appropriate cooking equipment is important to ensure that all parts of the food reach the necessary target temperature for a time to produce safe food.

3.2 FACILITIES

Things to consider

- Depending on the product, cooking equipment and facilities should be capable of achieving and maintaining a required minimum cooking temperature for a sufficient time under the intended cooking conditions.

- Cooking processes should be controlled by using thermometers to ensure that the process is maintained at a sufficiently high temperature and/or to ensure that the inside of a product has reached the correct temperature.

- Cooking/heating equipment and facilities should be constructed of materials that are smooth, durable, non-absorbent and easy to clean. If their design does not allow for easy dismantlement, cleaning in place operations should be installed.

cont.

3.2 FACILITIES

Things to consider

- Some cooking equipment (steam cookers, boilers, etc.) needs to be connected to the water supply or waste disposal lines. In such cases, plumbing systems should be designed in a way to avoid water pooling under the equipment and to eliminate the risk of a connection between the disposal line from the equipment and the sanitary sewer system.

- Proper ventilation systems should be installed to effectively remove odour, grease, steam and heat from cooking food.

- Cooking certain foods at a high temperature may form a layer of insulation that shields the inside from efficient heat penetration and protects any microorganisms present. In addition, frying at high temperatures will form chemicals that increase health risks. For example, cooking different types of meat at a very high temperature may form chemicals with a risk of cancer. Furthermore, there is evidence that acrylamide will form in some foods during certain types of high-temperature cooking.

3.2 FACILITIES

Refrigerating units

Refrigeration is fundamental to preventing microorganisms from growing in food products and to prevent food products from chemical deterioration. Food facilities should be designed and constructed with the correct temperature controls so that all food can be stored at the appropriate temperature to minimize the likelihood of contamination. Refrigeration also reduces the respiration rate of fruits and vegetables, slowing down the reactions that promote spoilage and extending the storage life of fresh produce and commercially processed foods.

3.2 FACILITIES

Things to consider

- Food storage refrigeration facilities should be designed and constructed in sufficient size to store perishable food and maintain it at a temperature appropriate to ensure the safety of the food. Food business operators should follow the relevant regulatory guidance, if available.

- When cold refrigeration storage or a quick cooler is used to cool unprotected food, air entering the freezer compartment should be filtered to remove dust and contaminants before the air enters the cold storage or quick-cooling cell.

- Ensure that the refrigeration equipment works properly and is well maintained.

- Refrigerators should be equipped with temperature monitoring and indicating devices that take temperature readings at an appropriate frequency.

- Cold storage facilities and refrigerators should be designed and built in a way to minimize condensation on products or equipment.

- Refrigerators should be cleanable and cleaned and disinfected regularly.

- Raw and cooked food should be refrigerated separately to prevent cross-contamination.

3.2 FACILITIES

Freezing equipment and unit

Freezing is one of the common food processes used to extend the shelf life of perishable foods by stopping the growth of microorganisms and slowing down the chemical changes that affect the quality of the food or cause it to spoil.

Things to consider

- Frozen cold storage should be designed, constructed and operated in a way that ensures that frozen food is kept frozen. Food business operators should follow the relevant regulatory guidance, if available.

- Different foods have different optimal freezing temperatures, making it essential that the correct temperature for all the food is maintained.

- The freezing compartment temperature should be maintained and checked periodically.

- Handling of frozen food should be done to avoid partial thawing, as this can result in bacteria to grow to harmful numbers and/or produce toxins.

- The internal temperature of freezers should be monitored and controlled by a temperature-recording device to show the accurate temperature within the compartment.

3.2 FACILITIES

Ambient temperature control

The temperature within the working environment may need to be controlled to prevent or slow the growth of infectious agents and also to protect worker safety. This is especially relevant to meat and dairy products, both of which can support the growth of infectious agents and need to be maintained at adequate temperatures and according to regulatory requirements, if available.

Things to consider

- The heating, ventilation and air conditioning or equivalent system, should be maintained to ensure that airflow is sufficient to reach all the areas within the food handling area.

- Minimize openings within the food processing area where cold air can escape or warm air can enter. For example, keep doors closed to avoid air exchange from the warmer to the cooler area.

- Ambient air temperature measuring devices should be part of maintenance and calibration programmes and provide accurate readings within the intended range of use.

3.2 FACILITIES

Air quality and ventilation

Air flow within a facility is important to avoid condensation, which can support the growth of microbes, especially moulds, and could drip onto foods or contact surfaces. The correct airflow can be achieved by controlling humidity and minimizing temperature fluctuations. The humidity level should be controlled to a setpoint depending on the product types.

The air should flow from high-risk areas to low-risk to reduce the risk of contamination through aerosols. Air should not be drawn directly into the facility from outside the facility without passing through air filters that are part of the food business' maintenance and cleaning programmes.

Minimize airborne contamination

Airborne contaminants could be present in the air as solids (dust) or liquids (condensation and water, bioaerosols). Pathogens can enter food processing plants through the air that flows through open doors, windows or other openings. They can also spread from contaminated areas (e.g. kill floors and rendering areas in meat processing plants) to clean areas through poorly maintained, inefficient and unhygienic ventilation systems.

3.2 FACILITIES

Things to consider

- Unfiltered air can be a source of microbial and chemical contamination for stored food. Therefore, the direction and frequency of air flows are critical to limiting and minimizing these hazards in food establishments.

- The outdoor air intake of mechanical ventilation systems should be located away from sources of pollutants, such as sanitary vents, combustion vents, garbage dumpsters, etc.

- Ventilation systems should be designed and constructed so that air does not flow from contaminated areas to clean areas. This can be done by creating higher pressure in higher hygiene areas.

- The systems should be easy to maintain and clean. Intake and exhaust air ducts should be cleaned, and filters should be changed. Otherwise, they will carry dust, dirt, and microorganisms and become a source of contamination.

3.2 FACILITIES

Removing odours

If necessary, mechanical ventilation of sufficient capacity should be provided to keep rooms free of excessive and obnoxious odours, smoke and fumes. These odours are potential sources of food contamination and can also be hazardous to workers.

Things to consider

- The ventilation system should be designed to prevent condensation in the exhaust duct upstream of the filters.

- The filters should be inspected, maintained and replaced according to a timetable and documented procedure.

3.2 FACILITIES

Humidity control

Controlling the air quality in the production areas, especially in relation to the humidity of the environment, is essential. The proper ventilation system will maintain a uniform environment by keeping an air balance between different areas in food processing facilities.

Things to consider

- A high degree of humidity could cause condensation on the food contact surfaces and promote the growth of bacteria and moulds, it can further cause the facilities and machinery to deteriorate.

3.2 FACILITIES

Lighting

Lighting is important for workers to carry out their duties safely and in accordance with good hygiene practices. Good lighting also makes it easier to clean, carry out inspections and to identify deficiencies in the foods during processing.

Lighting fixtures should be inspected frequently and should not pose a contamination risk to the food. For example, broken glass or brittle plastic can fall into food from suspended light fixtures.

3.2 FACILITIES

Lighting intensity, colour and direction

The amount of light that is considered adequate depends on the operation task in that area. The intensity, colour and direction of lighting used to illuminate each area should make it easier to maintain clean and sanitary conditions and it should provide good visibility for personnel to conduct their tasks properly. Insufficient or improper lighting can compromise sanitary conditions and the effectiveness of control measures.

Things to consider

- The intensity, colour and direction of lighting used to illuminate each area should be sufficient to detect hazards, deviations and defects in the foods.

- For example, the lighting should provide the visibility needed to grade or inspect food and processes for workers who are inspecting poultry carcasses for faecal contamination.

3.2 FACILITIES

Light covers and guard

Most lighting comes from bulbs or fluorescent tubes, although light emitting diodes (LED) technology is becoming more common. When light sources are made of glass or brittle plastic, it is necessary to use a guard or shatter proof material around the light fixture to minimize the risk of contaminating the food product or food contact surfaces.

Things to consider

- Light bulbs should be shielded, coated or otherwise shatter-resistant in case they break. Broken bulbs, glass, brittle plastic and other materials are potential physical hazards.
- Fixtures should be installed in a way that allows them to be cleaned to prevent dust and debris from accumulating. Dust and debris could fall from the fixtures and contaminate the food.
- Fixtures or guards should shield the light source, minimize glare, and allow light to pass through.
- Light fixtures should be inspected at an appropriate frequency to detect any break.

3.2 FACILITIES

Storage

Food should be stored and transported under conditions that protect against allergen cross-contact and biological, chemical and physical contamination, as well as against deterioration of the food and the container. Food storage facilities should be designed and constructed to facilitate maintenance and cleaning and prevent pest access.

Chemicals, sanitizers, lubricating agents or other hazardous materials should be stored in a secured area away from where foods are stored or processed.

Things to consider

- Storage can be temperature-orientated (ambient, chilled or frozen) or ingredient-related.
- Separate storage may be required for non-food ingredients such as packaging and cleaning chemicals.
- Storage should allow for raw and cooked foods or allergenic and non-allergenic food to stored separately.
- Separate, secure storage facilities for cleaning materials and hazardous substances should be available.

3.2 FACILITIES

Food packaging

Packaging materials should be stored in a way that prevents contamination with dust or chemicals, damage, and contamination by insects or other pests.

Things to consider

- Food packaging storage areas should be clean and dry, with facilities for preventing flies, insects and rodents.
- A certain distance between the material stack and the ground and wall should be kept.
- Food packaging material should be covered with a dust cover.
- Packaging storage spaces could be located inside or outside the building based on the type of packaging materials.

3.2 FACILITIES

Non-food chemicals

Chemical materials (including cleaning materials, lubricants and fuels) should be stored separately from food products. Food additives, processing aids and packaging materials should not contaminate food, equipment or utensils.

3.2 FACILITIES

Food ingredients

Food ingredients should be stored in a facility with sufficient capacity and in an environment that minimizes contamination and deterioration.

Things to consider

- Food ingredients should be stored in a clean, dry location where they are not exposed to splashing, dust or other contamination.

- Food ingredients should not be in contact with the floor and walls in the storage facility. The use of pallets that do not harbour pests is a good solution to store packaged food ingredients at a distance from the floor.

- Food ingredients should be stored in an environment that is temperature controlled and storage should further be subject to controls of how long the food ingredients has been in storage.

- There should be good ventilation to keep temperature and humidity consistent.

3.2 FACILITIES

Maintenance and cleaning

An appropriate maintenance and cleaning plan for storage areas will help ensure that food products are protected from contamination.

Things to consider

- Keep all storage areas clean and dry.
- Floors, walls, ceilings and shelving in coolers, freezers and dry storage areas should be cleaned regularly.
- Cracks and crevices in storage areas should be repaired.
- Doors and windows that don’t close tightly should be repaired.
- Shelves, carts, transporters and trays should be cleaned and sanitized regularly.

3.2 FACILITIES

Avoid pest access

Pests should be unable to enter all storage areas in a food establishment and the storage area should be kept free of any material or conditions that would encourage pests to nest or breed. Any potential nesting areas for pests should be controlled, cleaned and, if possible, eliminated. Items and materials should be stored in a way that allows the storage facility to be cleaned easily and inspected.

Things to consider

- Avoid false ceilings.
- Repair cracks and splits in walls, floors and ceilings.
- Fit covers over floor drains.
- Tightly seal expansion joints in the floors are check for pests regularly.
- Create access aisles between rows of goods on pallets.
- Rotate stock to prevent infestations by reducing the build-up of old products and materials.
- Inspect incoming ingredients, food and materials for signs of pests when they arrive.
- Avoid storing utensils, pallets, etc. outside since they could become nesting grounds for pests.

TIP

Store all food and materials on shelves or pallets and not on the floor.

3.2 FACILITIES

FBO RESPONSIBILITIES

Topic	Examples of what you should do
Drainage and waste disposal facilities	Provide and maintain the appropriate drainage and waste disposal systems and facilities. Evaluate the design to avoid contaminating food or the water supply and ensure the correct direction of drainage flow. Prevent backflow, cross-connections and a backup of sewer gases with the correct plumbing design. Maintain and check the plumbing facilities. Establish a regular waste collection schedule. Document and record waste disposal activities. Place the disposal sites far from the food processing plant.
Cleaning facilities	Provide adequate, suitably designated facilities for cleaning utensils and equipment, and separate sinks based on their usage (hand or food washing). Keep tools and equipment from highly contaminated areas separate.

3.2 FACILITIES

FBO RESPONSIBILITIES

Topic	Examples of what you should do
Personnel hygiene facilities and toilets	Provide the appropriate personal hygiene facilities for personnel. Provide handwashing and drying facilities and supply them with soap and water. Use hands-free tap designs when possible.
Temperature	Provide the appropriate facilities for thermal processing, storage or handling products based on the nature of the product. Control the ambient temperature where necessary.
Air quality and ventilation	Provide adequate means of natural or mechanical ventilation. Ensure the airflow direction controls the contaminating the food. Maintain and clean ventilation systems regularly.
Lighting	Provide enough natural or artificial lighting, taking into account the distance, intensity, colour and number of lights. Provide light covers and guards to prevent the risk of physical hazards.

3.2 FACILITIES

FBO RESPONSIBILITIES

Topic	Examples of what you should do
Storage	Provide the appropriate and, where necessary, separate facilities for the safe and hygienic storage of food products, ingredients, packaging materials and non-food chemicals. Store raw and cooked foods or allergenic and non-allergenic food separately. Maintain and clean the storage adequately and regularly. Prevent pests from entering and ensure they are not attracted to the environment. Place temperature/ humidity facilities where needed to keep products safe and suitable.

3.3 EQUIPMENT

All equipment and containers in a food processing operation should be designed and arranged to maintain food safety standards and to be readily accessible for visual cleanliness checks, and to enable thorough cleaning. The equipment and containers should be intended for food production. It is best to order from a reputable supplier who can deliver the correct replacement parts during the equipment's lifetime.

Food equipment and containers that have contact with unpackaged food should be designed and constructed to be:

- suitable for food contact;
- easily cleaned and/or disinfected, where necessary; and
- maintained and replaced, as necessary, to avoid contaminating food.

Food equipment and containers should be made of:

- non-toxic material; and
- durable material.

3.3 EQUIPMENT

Multiuse food-contact surfaces shall be:

- smooth;
- free of breaks, open seams, cracks, chips, inclusions, pits, and similar imperfections;
- free of sharp internal angles, corners, and crevices;
- finished to have smooth welds and joints;
- accessible for cleaning and inspection with or without disassembling;
- dried or drip-dried before being re-assembled;
- able to replace whenever cracked or heavily scratched (i.e. the surface of boards, plastic containers, glass containers); and
- have sufficient weight and thickness to withstand repeated washing.

3.3 EQUIPMENT

Equipment durability

Equipment and utensils shall be designed and constructed to be durable. Rusty equipment can lead to physical (metal splints may end up in foods), chemical and microbiological hazards. In addition, a damaged surface encourages the growth of microorganisms.

Things to consider

- Equipment and utensils shall be durable and retain their characteristics under normal use conditions and during cleaning and sanitizing if necessary.
- They have to be resistant to corrosion.
- They should also resist pitting, chipping, crazing, scratching, scoring, distortion, and decomposition.
- Materials used in the construction of utensils and food contact surfaces of equipment may not allow the migration of deleterious substances or impart colours, odours, or tastes to food under normal use conditions.

3.3 EQUIPMENT

Non-Toxic materials

Constituents of food contact materials that transfer from these materials into the food may affect the food's chemical safety and, in turn, human health, quality, taste, smell, and appearance. Therefore, all food equipment and containers should be made with non-toxic materials to prevent health safety hazards.

Food control and monitoring equipment

Equipment used to cook, heat, cool, store or freeze food should be designed to achieve the required food temperatures as rapidly as possible in the interests of food safety and suitability and to maintain food temperatures effectively. Such equipment should also be designed to allow temperatures to be monitored, where necessary, and controlled. Where appropriate, monitoring equipment should be calibrated to ensure that food-process temperatures are accurate. Where necessary, such equipment should have an effective means of controlling and monitoring humidity, airflow and any other characteristics likely to affect the safety or suitability of food.

3.3 EQUIPMENT

Monitor temperature

Temperature monitoring is essential for food safety during transit, processing and storage because of the potential survival or growth of pathogenic microorganisms and their significant effect on food suitability.

Things to consider

- A temperature monitoring system should be used to ensure that the foods are kept at appropriate, safe temperatures during transport.

- Temperature measuring devices should be easy to read and should be placed in a location that will give an accurate reading of the actual storage and processing temperature.

- Temperature measuring devices should be appropriately calibrated to ensure accurate readings, as an inaccurate thermometer could result in food being held or processed at unsafe temperatures.

- The food temperature will not necessarily match the ambient temperature of the storage unit. The food business should therefore undertake the effort to measure the effective temperature of the foods on occasion. This could be part of a validation and verification process.

3.3 EQUIPMENT

Monitoring humidity

Uncontrolled humidity in the food processing industries can cause condensation, microbial growth and unsanitary environments, increasing unwanted moisture in food, which will cause microbial and chemical spoilage. It is essential that humidity be kept at an acceptable range for high moisture products, such as meat or fruit, as storing or processing them in very low humidity will cause dehydration and weight loss in the product. It is essential that the proper equipment be used to monitor and control the humidity in food facilities.

3.3 EQUIPMENT

FBO RESPONSIBILITIES

Topic	Examples of what you should do
General equipment	Suppliers of equipment and containers that come in contact with food should be able to confirm in writing that the materials are food grade and suitable for use. The FBO has to establish a system to store this information. Equipment suppliers should provide written instructions on how to properly maintain and clean equipment, including instructions for disassembly, if required.
Food control and monitoring equipment	Documented procedures that describe how to calibrate monitoring equipment and tools and the appropriate frequency. Records showing when equipment has been calibrated and by whom.

FIND OUT MORE

For additional information on the following topics related to this section, please consult the **Further reading** section accessible from the **SECTION LANDING PAGE**.

What are the potential food safety risks linked to the location of the establishment?

Who can help with pest control and identifying possible harborage sites?

Is personnel provided with adequate toilets and hand-washing facilities?

How should calibration and maintenance activities be documented?

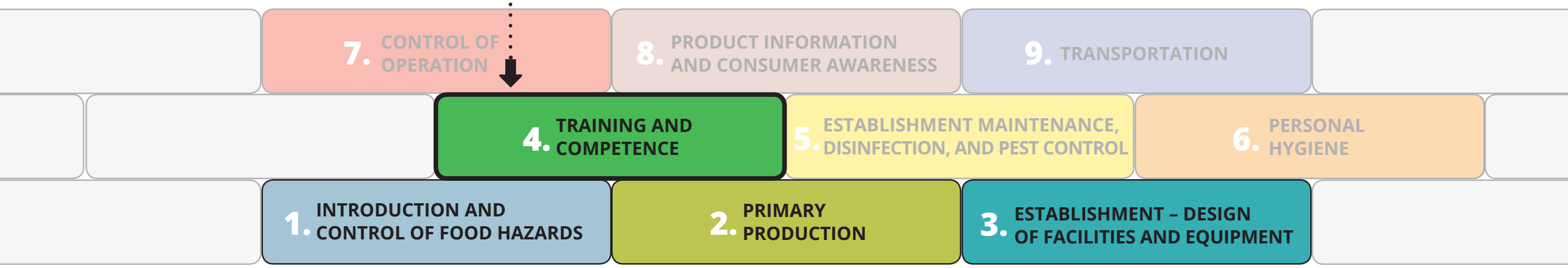
How to improve the flow of materials and staff in an establishment to lower the risk of cross-contamination?

Which monitoring equipment could help control the humidity and temperature conditions in the facility?

KEEP READING

The next section of the GHP toolbox is Training and Competence.
To continue reading, click on the highlighted brick below.

Click here for the next section



FEEDBACK ON THIS GUIDANCE MATERIAL IS ALWAYS WELCOMED!

Please contact us at: food-quality@fao.org

KEEP READING

GHP and HACCP Toolbox for Food Safety
www.fao.org/good-hygiene-practices-haccp-toolbox

FOOD SYSTEMS AND FOOD SAFETY –
ECONOMIC AND SOCIAL DEVELOPMENT
www.fao.org/food-safety

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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