

Bakery & Pastry Production

Level – II

Based on December, 2022 Curriculum Version II



Module Title: Transport and store Food

Module Code: CST BPP2 M04 1222

Nominal duration: 52 hours

Prepared by: Ministry of Labor and Skills

December, 2022

Addis Ababa, Ethiopia

Table Contents

Acknowledgment	3
Introduction to the Module	4
Unit one: Taking delivery of supplies	5
1.1 Information about the supplier.....	6
1.2 Checking incoming supplies.....	10
1.3 Inspecting Supplied items.....	11
1.4 Managing excess stock.....	15
Self-Check -1	19
Written Test	19
Unit Two: - Identify appropriate food transportation	20
2.1 Vehicle suitable for food transportation	20
2.2 Sanitation status and temperature of the vehicle.....	24
SELF-CHECK 2.....	28
Unit Three: Transporting food safely and hygienically	30
3.1.Packaging, loading, restraining and unloading food	31
3.2.OHS regulations.....	35
3.3 Recording food transportation	37
Self-Check -3	42
Written Test	42
Unit Four: Storing food safely and hygienically	43
4.1. OHS regulationsfor food storage.	44
4.2. Food storage conditions.....	47
4.3. Recording supply level.....	50
4.4. Environmental conditions for specific food types.....	51
Self-Check -4	60
Written Test	60
References	62

Acknowledgment

Ministry of Labor and Skills wish to extend thanks and appreciation to the many representatives of TVET instructors who donated their time and expertise to the development of this Teaching, Training and Learning Materials (TTLM).

Introduction to the Module

In Bakery & Pastry Production field: Transport and store Food helps to prepare ways of service, to apply welcoming customer, to demonstrate taking and processing order, to Transport and store Food , to clear tables and bill customers and to perform close down after service according to the service standard.

This module is designed to meet the industry requirement under the Bakery & Pastry Production occupational standard, particularly for the unit of competency: Transport and store Food

This module covers the units::

- Taking delivery of supplies
- Identifying appropriate food transportation
- Transport food safely and hygienically
- Store food safely and hygienically

At the end of this session/, the trine will be able to

- Identifying Information about the supplier
- Checking incoming supplies.
- Packaging, loading, restraining and unloading food
- Explain Store food safely and hygienically
- Recording supply level

Module Instruction

For effective use this modules trainees are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Do the “LAP test” giver at the end of each unit and

Read the identified reference book for Examples and exercise

Unit one: Taking delivery of supplies

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying Information about the supplier.
- Checking incoming supplies.
- Inspecting Supplied items.
- Managing excess stock.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify Information about the supplier.
- Check incoming supplies.
- Inspect Supplied items.
- Manage excess stock.

1.1 Identifying Information about the supplier.

A supplier is a person or business that provides a product or service to another entity. The role of a supplier in a business is to provide high-quality products from a manufacturer at a good price to a distributor or retailer for resale. A supplier in a business is someone who acts as an intermediary between the manufacturer and retailer, ensuring that communication is forthcoming and stock is of sufficient quality.

1.1.1. The Importance of a Supplier in the Product

Suppliers have a hugely important role at every stage of the product lifecycle. From sourcing raw materials to helping ramp up production, and to finding better options for raw materials as the market starts becoming saturated, companies need to work closely with their suppliers to get the best out of their products.

- **Compliance with local laws:** Suppliers should comply with all relevant laws and standards, including human rights protection and child labor.
- **Equitable transactions from all retailers:** Suppliers must provide equal opportunities for all retailers to do business with them. A retailer should not be rejected due to their location, or any other reason.
- **Best price possible:** Suppliers must guarantee the best price and quality to retailers to maintain trust among them. This will help ensure repeat business in the future.
- **No conflict of interest for suppliers:** This would include family members, friends, and new or old colleagues. This is to decrease the likelihood of unfair treatment among other customers.

The Role of a Supplier

The role of a supplier in a business can be a demanding one as retailers expect a certain level of quality, and manufacturers expect suppliers to sell a lot of stock. Due to this suppliers must be flexible and understand how to manage relationships.

Supplier Relationship Management

Supplier Relationship Management is the process of planning and managing all relationship with vendors that supply any products or services to a business. This may involve raw material suppliers, utility suppliers or cleaning services suppliers. It is important to manage these relationships so a business can ensure the efficient supply of products and services for the company.

Creating and maintaining a Supplier Management Process that explicitly outlines the route to take to manage a supplier is important so that a company can choose the right suppliers that suit the business needs. The Supplier Management Process goes further than just choosing the right vendor; it outlines the process of building trust with suppliers and improving on the services provided by them.

The Benefits of Supplier Relationship Management

Managing relationships is a huge part of any department but it is more so for suppliers as these are entities that are not internal to the company. Suppliers exist outside of the business meaning that the company needs to be careful with the information that it provides to the supplier. The business must strike the right balance as the supplier needs to feel like the business values them before they will provide excellent service seamlessly and go above and beyond the normal activities to impress the business. **Reduced Costs:** managing supplier relationships means that suppliers stay with the company for a long time and churn is kept to a minimum. Working with one or two suppliers who can provide many different materials is better than having many different suppliers. This means a company can work on improving the supplier services and reducing costs.

Foster Innovation: When a business works closely with a supplier they can work together to lead innovation. Through this, both parties can improve their offering exponentially.

Collaboration: As companies build strong relationships with their suppliers, feedback and open communication become easier. Collaboration becomes seamless in this way and the company can give observations to their suppliers about how to improve service to them and vice versa.

Process Improvements: As feedback becomes commonplace the business and suppliers start to understand the inner working of their relationship. The supplier will start to understand what products the business might be interested in, and the business will know the right time to order from their supplier so they receive the order on time.

Supplier Relationship Management Best Practices

- ✓ **Build Lasting Relationships:** If a company intends to use a vendor more than once it should strive to build a lasting relationship whereby they can pick up the phone and talk to their supplier easily. This relationship will ensure that they will understand the full capabilities of their suppliers so the business knows when they are asking too much from their suppliers. Building a strong

relationship will ensure that their suppliers will look after the business's needs in the future before others.

- ✓ Invest in Technology: With software for everything today it is easy to find the right supplier management software for a company that is tailored to their explicit needs. With this technology, companies can track suppliers, create a dashboard to have a snapshot of how everything is doing, and quickly discover pain points through simple to read data.
- ✓ Pay Suppliers On-Time: This seems like a no-brainer but paying suppliers on-time is a great way to maintain a good supplier relationship. Some companies poorly track deliveries and orders meaning that payments may be late. This leaves the supplier in a bad spot as their cash flow is not secure and they may not trust this existing customer as much as a new customer they acquire. Using tracking software and a good supplier management process, a company can ensure that payments are made on-time and suppliers remain happy.
- ✓ Streamline Supplier Agreements: Streamlined Supplier Agreements (SSA) mean that all suppliers receive the same treatment regardless of what service they provide. When onboarding new suppliers the process is a lot quicker as the agreement will be the same for all suppliers. Minor edits can be made of course but these can be signed off in a fraction of the time it takes to get sign off on a 10+ page document. This makes it easier to manage relationships as everyone in the department will know what the agreement looks like.
- ✓ Evaluate Risk: Companies should research suppliers before they do business with them to make sure they are financially stable. Businesses should always seek supplier references to inquire about particular concerns the business may have. Asking references how the supplier deals with increased capacity, are they consistent with delivery times and quality, is the supplier forthcoming with important information, the level of aftersales service, etc. is hugely
- ✓ Important for risk management. Evaluating risk before onboarding a supplier can mitigate uncertainties later.

The Difference between a Supplier vs Distributor

As highlighted above a supplier supplies a product or service to another entity, usually a distributor who will sell it to a wholesaler or retailer. Suppliers can also be the manufacturer of the product and the distributor of the product. More often they cannot take on the additional workload of distribution

so they outsource this activity to another company. A distributor, on the other hand, sources products from suppliers and sells them to a wholesaler or retailer at a slightly higher price to make a bit of profit for them. The main difference between these two groups is that one works more closely with the manufacturer (the supplier), and the other works closely with the retailer (the distributor).

Three key types of supplier information

Procurement has evolved over recent years from being purely transactional and tactical to taking on more strategic activities. Organizations have started to consider ways in which they can increase the value of their supplier relationships, which has led to the need for more supplier information, beyond basic contact and payment details.

This trend has been accelerated further by the introduction of various rules, regulations and policies. Governments have introduced legislation in a host of areas to protect citizens or to drive policy agendas, leading to greater information and data demands on both suppliers and buyers. Without this information, organizations leave themselves increasingly open to prosecution or fines.

- ✓ **Basic Business Information:** Relates to data about what the business does and items they supply, contact details, prices, references, certifications, payment details, and the signed contract. This information is mostly collected before the organization and supplier start collaborating.
- ✓ **Performance:** Data related to factors such as production and output information, KPIs, customer satisfaction, service-level information, delivery-related data, quality information, and contract compliance and progress reports. These are collected throughout the partnership.
- ✓ **Risk Management:** Data related to a supplier's financial situation as well as business approach and beliefs. This will include information about stance and practices on modern slavery, environmental concerns, health and safety, human rights issues, etc.

1.2 Checking incoming supplies.

During a recent audit, we received an observation relating to our incoming goods inspection process in the warehouse. Our current procedure requires us to check for damage and to assure the correct goods are received. We currently do not have a detailed description on how to perform this task, as we find this would be far too complicated to describe.

What you describe is often observed during audits. Let us first analyse why this is the case. Warehouse personnel are usually very experienced and therefore know what to look for when goods are delivered. This experience is shared with new staff members, albeit often on an informal and on-

The job basis. This is not to say that these persons do a bad job, but as you learned from your audit, this process has to be described in sufficient detail, and it must be documented.

As there will be many different types of packaging for the wide variety of goods that are delivered to a warehouse, you may find it difficult to provide a detailed enough description in your instructions procedure, without it becoming too complex and unwieldy.

- **There are solutions forth the instructions need to detail what to check, for example:**

- | | |
|--|--|
| ✓ Before unloading: | ✓ Stacked (not a jumble) |
| ✓ Correct license plate of the delivery vehicle | ✓ During unloading: |
| ✓ Correct name of delivery company | ✓ Correct handling of goods |
| ✓ Delivery papers complete and correct | ✓ After unloading: |
| ✓ Interior of the delivery vehicle clean, no odors/smells, | ✓ Any signs of damage |
| ✓ Dry (no condensation or puddles), and deliveries orderly | ✓ Any signs of tampering |
| | ✓ Correct labels |
| | ✓ Correct amounts |
| | ✓ In case of wooden pallets, correct treatment stamps applied. |

- Advantages of checking incoming supplies

- ✓ **Waste Minimization** - One of the most substantial advantages of make-to-order is that you will be able to reduce waste within your manufacturing operation.

This is because starting production after the order has been submitted helps clean up the entire production process. It allows manufacturers to eliminate excess costs, material, inventory, or other production processes from the operation. This allows items to be

Produced within a shorter time frame and be ready to send to customers just in time. Reduce the Risk of Inefficiency - Inefficiency in a manufacturing organization is a sure way to incur additional and unnecessary costs. When using make-to-order strategy, you will typically need to adjust your production process to ensure that there are no inefficient operations or steps. This will also prevent you from consuming capacity on resource to produce items that will not be sold if using make-to-stock strategy of push system.

- ✓ **Customizable Products** - Using a make-to-order strategy will allow you to offer Customizable products as production only starts after the order has been made. Customers will come to you when they wish to have a more personalized shopping existence and will tend to be willing to pay extra or wait a bit longer than usual due to the customization request. Having customizable products will ensure that the customer is able to pick exactly that they are looking for which will increase their satisfaction with your products and business.

1.3 Inspecting Supplied items.

An incoming inspection, also known as a receiving inspection or material inspection, validates the quality of purchased raw materials based on set acceptance criteria. It is performed by quality assurance personnel in the manufacturing facility to resolve quality issues during pre-production. Incoming inspection results follow an identification tagging system to determine required actions when an item is tagged as accepted, conditionally accepted, or rejected.

‘Goods receiving’ is the function of checking items delivered to the business, either coming in as new stock or as supplies. This includes inspecting the quality, condition, and quantity of any incoming goods, and allocating them to a space in the warehouse.

All items purchased by the business serve a specific function, whether they are supplies to be used internally, or stock to be on sold to customers. Keeping track of all items coming into the

warehouse ensures that that the right products are received and promptly stored in an appropriate place.

An incoming inspection checklist is used by quality assurance personnel to validate the quality of purchased raw materials based on set acceptance criteria. This incoming inspection checklist has been designed to make it easier for quality inspectors to determine inspection results and required actions based on the identification tagging system.

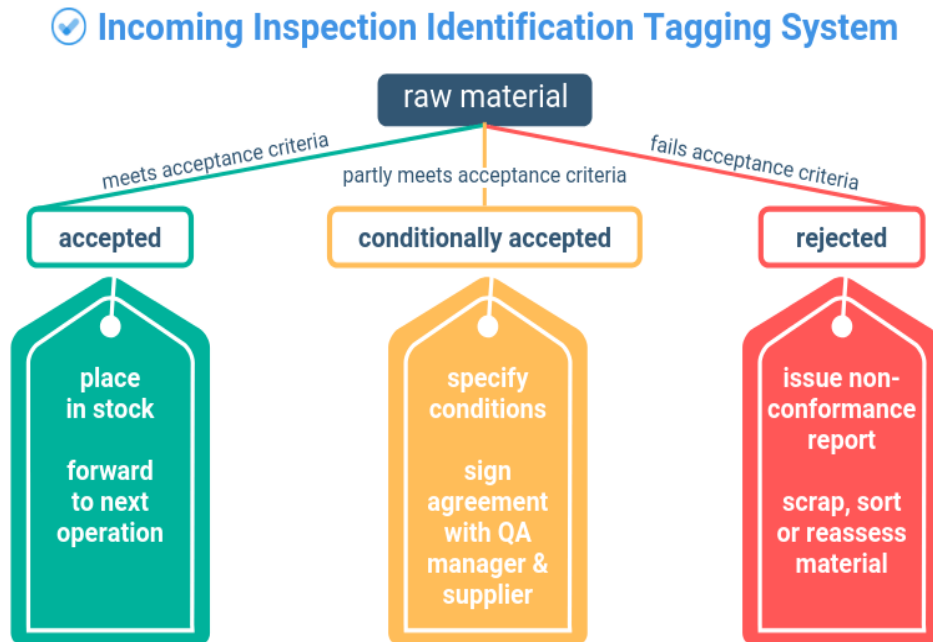
- **Use this mobile-ready checklist to easily perform the following:**
 - ✓ Specify the purchase order number, material description, and quantity
 - ✓ Capture and store unlimited photos of defects or tagged materials
 - ✓ Send real-time notifications for scheduled incoming inspections
 - ✓ Assign actions for accepted, conditionally accepted, or rejected materials
 - ✓ Complete the incoming inspection with digital signatures
- **Use Incoming Inspection Checklists**

Taking advantage of a mobile-ready incoming inspection checklist helps ensure the conformity of raw materials to purchase order specifications, reduce production costs, and manufacture high-quality products that meet or even exceed quality standards, customer expectations, and safety regulations.

- **Understanding the Identification Tagging System**

An incoming inspection checklist details exactly what quality assurance personnel should be validating—size, color, shape, markings, and packaging of sample material from the entire batch. The identification tagging system is used during the process of incoming quality control to express the acceptance criteria specified in the purchase order.

Each inspection result corresponds to the following actions:



Fig,1.1. Inspecting Identification Systems

A. Accepted

Place the accepted materials in stock or forward them to the next operation. When all raw materials or purchased components meet quality standards, manufacturers usually proceed with the first production run and perform a First Article Inspection (FAI) to confirm that the manufacturing process produces output that meets design requirements.

B. Conditionally Accepted

Quality inspectors should keep an eye out for minor or major defects such as functional and dimensional deviations, shipping damages, and improper markings to determine if the raw materials can be conditionally accepted. Specify the conditions for acceptance such as rework or replacement by the supplier and ascertain that the quality manager and a supplier representative sign in agreement.

C. Rejected

Quality inspectors should issue a Non-Conformance Report (NCR) for rejected materials and indicate if they will be scrapped, sorted, or reassessed against more specific acceptance criteria. Rejecting materials may cause shortages and destabilize the production schedule, but it prevents costly manufacturing problems such as mass-producing unsafe and defective products. Supplies receiving process receiving inspection checklist is used to assess newly-delivered materials from the supplier and either accept or reject them based on their condition. This checklist serves as a guide for quality assurance personnel in performing the receiving inspection procedure, which are as follows:

1. Match the delivery to a purchase order

The Purchase Order should also be used to check that each item matches the description and quantities ordered. Generally, the boxes or cartons will have a description of the item and quantities of its contents. Maintaining accurate reports is essential for accurate bookkeeping as well as resolving any disputes that may arise in the future regarding the items or supplier. If there is no purchase order or record of the order, check with your supervisor or purchasing department before rejecting the goods.

2. Check products are not damaged

Before accepting the delivery, it's important to conduct a quality check to ensure the items are not damaged or malfunctioning. It's not always feasible to open each carton and check every single item, particularly for large shipments. So in these cases you may wish to complete a spot check rather than open each and every Carton. Check for signs of breakage or faults, and ensure all items are as described on the purchase order.

3. Log received items into your inventory

Enter the items you have received into your warehouse management system as soon as possible, including the date and quantities received. This will allow the stock to be allocated to new orders right away.

4. Allocate storage space for goods

It's important to pack away a new delivery promptly to ensure no items become lost or damaged. Supplies should be distributed to the appropriate person in the business, or packed away in the usual

space to be accessed when required. For goods received in as stock, these items will need to be allocated a space in the warehouse for storage until ready to be picked for an order.

5. Notify your accounts payable department

Send a copy of the signed and dated consignment note to your accounts payable team. This information can then be matched with the invoice from the supplier to ensure payments are only made for items that were actually received. If any damaged items are found in the delivery, record the extent of the damage on the consignment note and immediately notify the supplier with details of the issue to discuss the next steps.

- Provide vital information such as: supplier name & address, purchase order number, and item details.
- Visually check for signs of shipping damages and provide photo evidence by attaching photos of the item
- Test if functions meet the declared specifications
- Check if dimensions are according to specifications
- Provide comments of defectives (if any)
- Validate the inspection by signing off with the name and signature of the respective personnel handling the inspection

1.4 Managing excess stock.

Excess stock is a common term used in inventory management for when inventory levels exceed forecasted demand. Excess stock is also known as overstock, stock surplus, excessive stock, or excess inventory. But, no matter what you call it, one thing that remains constant is the threat it represents to your company's bottom line.

Excess stocks in our inventory are the products that have not been sold and have exceeded their customer demands. These extra stocks will be lying in the warehouse for any future demand requirements. These overstock situations majorly happens due to factors such as over-buying, inaccurate demand projections, cancelled orders, bad economy state, unforeseen weather, causal reasons like sale in other competitive brand, or late delivery of goods from the supplier and more.

1.4.1 Common causes of excess stock

A. Excess stock due to inaccurate demand forecasting

Items will build up on warehouse shelves if you over-forecast the needs of the marketplace and order more inventory than you're likely to sell. It's therefore important to get your demand forecasts as accurate as possible. This involves identifying those with seasonality and upward/downwards trends

and adjusting the forecasts accordingly. You also need to account for external factors, such as competitor activity, for example if your competitors drop their prices or launch a new product, this could lead to a drop in sales of you own products.

- **Poor replenishment tactics and excess stock**

Inventory replenishment involves ordering the right amount of stock and the right time to meet forecasted demand. You can prevent a build-up of excess stock by continuously adjusting your reordering points and quantities in line with supply and demand variables.

- **Excess stock management and the product life cycle**

All products go through a life cycle – from market introduction, through maturity, to decline. Excess inventory often occurs during the declining stage of the product lifecycle, shown in the graph below. Whilst there's still typically demand for the product, it's beginning to phase out and if you fail to spot this you'll continue to order based on previous demand patterns. Inventory planners that cannot

actively monitor the demand stages of their SKUs run the risk of getting stuck with a large quantity of excess stock, due to inaccurate forecasting.

In a best case scenario, a company can hope to sell off most of the excess stock and break-even on their investment or only lose a small percentage of profit. But if excess stock is not liquidated, it typically transitions to obsolete stock, which almost always leads to a large and painful expense on the books.

1.4.1. Common misconceptions of excess stock

- **Excess stock achieves higher service levels (order fill rates) – efficiently**

Always having inventory on hand means always having products ready to fulfil sales opportunities – right? Whilst this may seem like a logical thought process, many businesses stumble by tying-up too much capital in excess stock to guarantee product availability. Having a 100% fill rate on all products is not always the smart thing to do when you're trying to

effectively manage your inventory costs and stock turnover. Smart inventory planners know they need to balance having low levels of

inventory while also ensuring products are available to meet demand. The process of achieving low inventory levels while maintaining high service levels is called inventory optimisation.

- **Excess stock allows higher safety stock levels (buffer stock)**

Don't confuse excess stock with safety stock. They are not the same thing! Safety stock is a strategic and calculated level of stock that helps reduce the risk of stock outs due to unknown situations. Safety stock is included in the reorder point formula to account for variables such as supplier lead times or demand fluctuations. Effective safety stock levels ensure there's always inventory available to meet sales demands and keep customers happy.

Safety stock levels should be adjusted based on demand forecasts, seasonality variances, trends, supplier lead times and a product's place in its life cycle. This ensures a business is not left with excess stock. Companies that leverage inventory optimisation software, such as Easy Stock, have the ability to more accurately calculate safety stock to ensure excess stock is avoided.

- **It's worth having excess stock for bulk purchase savings**

Most businesses will see savings when purchasing supplies in bulk quantities. They can also save on shipping costs e.g one large order is cheaper than adding up shipping and handling costs from multiple smaller batch orders. However, committing to large quantities comes with the risk of demand uncertainty for every product ordered.

Companies that can intelligently forecast their demand and strategically optimise their replenishment processes will see greater cost efficiencies, without burdening themselves with orders too large. The key is to find the optimal time when an item must be reordered and in what quantities, to ensure a continuous balance of inventory to meet demand. All whilst ensuring inventory isn't piling up in stock locations. Read our whitepaper on replenishment to find out how to set the most cost-effective reordering times and quantities.

1.4.3 Disadvantages of excess stock

Carrying excess stock levels has many cost implications. Below are three of the top reasons why you need a good excess stock management policy to ensure you keeping inventory levels healthy at all times.

- **High opportunity costs**

If you hold excessive levels of inventory it ties up business funds that could be invested in other areas, such as research and development or marketing. The cost of the inventory is not recouped until it is sold, and the longer this takes, the longer working capital remains unavailable.

✓ **Increased carrying costs**

The cost of warehousing can include the warehouse space, utilities and maintenance of the storage area. Some stock may also require additional maintenance, such as temperature control to preserve the quality of the material. Excess stock of slow moving products eats up space in your warehouse when you could be holding higher demand products instead. Inventory levels can be reduced by up to 30% by simply improving forecasting methods and replenishment practices.

✓ **Quality reduction & product degradation**

Storing items for longer than anticipated can lead to quality problems. In these situations, businesses may need to sell off stock at a reduced price or purchase new materials as replacements – both of which can be costly.

• **Excess stock levels are typically caused by three ways :**

- ✓ **Excess stock due to inaccurate demand forecasting** – Items will be built upon the warehouse shelf if you overcast the needs of the marketplace and order more inventory than needed. Hence, it is very important to get your demand forecasted as accurately as possible which involves the identification of the seasonality and upward or downwards trends and adjust the forecasts according to it. You also need to account for the external factors.
- ✓ **Poor Replenishment tactics and excess stock** – Inventory replenishment involves ordering the proper amount of stock at the right time and forecasting the demand at the proper time. Building up of excess stock can be prevented by adjusting the reordering points and quantities in line with supply and demand variables.
- ✓ **Excess stock management and the product life cycle** – All the products go through the product life cycle – like from the introduction of the market, through maturity, to decline. Excess inventory often occurs in the decline stage of the product life cycle. But there is still demand for the product, this is

The beginning of the phase-out and if you fail out of the spot, you will continue to order based on the previous demand patterns.

Self-Check -1	Written Test
---------------	--------------

Name.....Id No.....Time Allowed.....

Part I. True or False (each 2 point)

- What are the Excess stock levels typically caused by three ways?
 - Excess stock due to inaccurate demand forecasting
 - Poor Replenishment tactics and excess stock
 - Excess stock management and the product life cycle
 - All are correct
- What are the Disadvantages of excess stock?
 - High opportunity costs
 - Increased carrying costs
 - Quality reduction & product degradation
 - All are correct
- What are the Common misconceptions of excess stock
 - Excess stock achieves higher service levels (order fill rates) – efficiently
 - Excess stock allows higher safety stock levels (buffer stock)
 - It's worth having excess stock for bulk purchase savings
 - All.

Part II. True or False (each 2 point)

- 1.Kitchens need to order in a wide range of stock both food and non-food items.
- 2.It is important to check All the goods ordered when it have been received
- 3.Facilities must take all practicable measures to ensure they only receive food that is safe and suitable for human consumption
- 4. Food receiver when it receives purchased food he has to check package.
- 6. Monitering stock level used to manage stock level.

Unit Two: - Identify appropriate food transportation

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Vehicle suitable for food transportation
- Sanitation status and temperature of the vehicle.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify Vehicle suitable for food transportation
- Verify Sanitation status and temperature of the vehicle.

2.1 Vehicle suitable for food transportation

Food transport vehicles are used in catering services and for transporting food, drink and ready-to-eat meals in a number of places including airports, hospitals, ports, exhibition centres, historic town centers and home deliveries. Food transportation is the process of moving food to desired destinations from the food producer to its consumers. It is a crucial factor in maintaining food safety in food manufacturing businesses as it is not exempt from the risk of food contamination. It uses different modes of transportation including air, road, rail, and water. However, among these methods, trucking is the most common in the United States and it makes up around 70.5% of all food transportation.

2.1.1 Importance of Food Transportation

Finished products and raw materials have different lifespans depending on the items to be delivered. Keeping food fresh, safe, and quality assured is crucial for the business. Being unable to keep the product safe can lead to business disruption, lawsuits, and customer complaints. That is why it is important to choose the right method of transporting food

- It also helps food businesses to:
 - ✓ maintain its credibility in meeting food standards;
 - ✓ follow food safety transportation standards to avoid food contamination; and
 - ✓ Deliver goods to any part of the world in a timely manner.

2.1.2. Food Safety Transportation Standards

Food transportation should maintain food quality standards and keep a scheduled timeline to prevent food contamination specifically with easy-to-perish goods such as fruits, vegetables, meat, and others. Business owners should be aware of the food transportation requirements that they need to apply for their businesses. The Sanitary Food Transportation Act of 2005 requires that FDA prescribe sanitary transportation practices to ensure food—including animal feeds—transported by rail or motor vehicle should not be transported under conditions that may adulterate the food.

Vehicles and transportation equipment – Ensure all vehicles used to transport food are properly designed to secure its safety. Installing sensors would help to maintain the appropriate temperature for frozen products. Proper vehicle maintenance is necessary to preserve and maximize the performance of a vehicle to ensure roadworthiness to avoid transportation delays for time-sensitive or perishable food products.

Transportation operations – All precautionary measures should be in place including adequate temperature controls, avoiding raw food to touch on ready to consume foods, loading of non-food items in the same load or previous load, and preventing cross-contact to food allergen to prevent food contamination.

Training – Employees who are assigned to food transportation must learn sanitary transportation practices. Proper documentation of food safety training should be provided when the carrier and shipper agree that the carrier is responsible for sanitary conditions during transport.

Records – It is necessary to keep records of written procedures, agreements, and training to promote traceability and provide documentation of food business compliance to appropriate practices. The required retention time to keep a record should not exceed 12 months.

2.1.3 Food Transportation Issues

Different industries face various challenges, and the food industry is not exempt. In 2019, the United States encountered key challenges in moving around food such as driver shortages, environmental impacts, and sanitation standards compliance. These challenges made companies identify gaps and strive to improve their food transportation. That said, challenges are always present in the business, and here are other transportation issues that companies must be aware of:

- **Must Arrive by Dates (MABDs) and Retailer Chargebacks** – MABDs is a strict delivery date agreement between manufacturer and customers. It can be set depending on the

parameters such as pallet configuration, appointment scheduling, confirmation processes, business operating

hours, and preferred carriers that are agreed upon by both parties. Being unable to comply with the said dates considering the parameters set, incur fees which can lead to business disruption, decreased profitability, and customer dissatisfaction.

- **Refrigerated Shipping** – Perishability is one of the most common factors to consider when transporting foods. It is important to consider food lifespan and compute its food miles to determine the best transportation method. It is recommended to use transportation with freeze-ability or has control on temperature when shipping temperature-sensitive goods such as medical products, ice cream, meat, wine, and others. Bear in mind that the availability of refrigerated vehicles is also impacted by seasonality.
- **Less-than-Truckload (LTL) Shipping** – This is a good option for manufacturers who do not have enough freight to fill in a full truck, but it also involves high risks. A large mix of products loaded together may trigger threats of contamination. This type of shipping could also affect the MABDs.
- **Handling and Contamination** – Food handling is a process of preparing food that is safe for public consumption. It is necessary to comply with safe food handling processes to avoid contamination which may lead to outbreaks of foodborne illnesses e.g. salmonella. According to the World Health Organization (WHO), foodborne illnesses can cause long-lasting disability or even fatality. That is why it is important to keep the vehicle clear of debris, clean, and odor-free before loading the products. The presence of any cross-contaminant could spread throughout the
 - Packaging and spoil the goods being shipped. Multiple transfers of goods can also damage the packaging or the product itself, it is advisable to have direct consumer transactions to reduce the risk of contamination.

2.1.4 Best Practices When Transporting Food

Food handling, packing, and transporting are important factors of food safety. Being aware of the best practices and compliance with regulatory standards can help organizations ensure quality foods are being delivered to their customers. Here are the best practices when transporting food for these 3 key factors of food safety.

Product – the most important element of food delivery. It is valuable to preserve its quality and ensure it is delivered safely to the customers.

- Here are best practices when handling food that is being prepared for delivery.
 - ✓ inspect goods for insects and pests to avoid widespread infestation;
 - ✓ use airtight containers to store dried goods and avoid using cardboard boxes;
 - ✓ keep dried goods at least 15 centimetres from the floor;
 - ✓ discard damaged goods immediately to prevent contamination;
 - ✓ maintain the appropriate temperature and if possible keep goods in a well-ventilated area away from direct sunlight; and
 - ✓ Keep humidity levels as low as possible.

Transportation – an integral part of the modern food system, yet it represents a relatively small contribution to the energy use and associated greenhouse gas emissions of the U.S. food system. It is a fact that foods can easily be contaminated if the containers and vehicles are unclean. All transportation modes should be in good condition and have the capability to keep food at the right temperature.

- Here are best practices to secure food transportation:
 - ✓ choose the appropriate method of transportation;
 - ✓ ensure vehicle roadworthiness to avoid delivery delays;
 - ✓ keep it clean and in good condition in a way to minimize food contamination;
 - ✓ separate different types of food such as raw food and ready-to-eat food from non-food items; and
 - ✓ use insulating cargo blankets or pallet covers to protect the product against freezing temperatures
 - ✓ refrigerate certain types of food that is required to be kept at a low temperature

People – All staff and food handlers should be properly trained to maintain food safety and food hygiene. Employees should be careful in loading and transporting goods to ensure it stays intact to maintain the quality of the products.

- It is the employees' responsibility to:
 - ✓ secure proper loading and unloading of goods;
 - ✓ maintain good personal hygiene;
 - ✓ monitor sanitation associated with food transportation procedures; and

- ✓ Keep communications between shipper, transporter, and receiver.

- Auditor Help with Food Transportation

Through efficient means of transportation, food can travel thousands of miles to be delivered anywhere in the world. This process seems easy, but in reality, it involves a lot of risks that could affect the business if not properly implemented. With Safety Culture (formerly Auditor), an inspection app that is accessible through web and mobile platforms, can help businesses ensure compliance with sanitary regulations and standardize their food safety and quality. It aids in performing inspections to deliver accurate and comprehensive results.

- Auditor can help through the following benefits:
 - ✓ easily build and customize checklists according to your business needs;
 - ✓ capture photo evidence of non-compliant items, add annotations, and specify notes to further explain the details;
 - ✓ assign corrective actions in real-time while performing inspections;
 - ✓ generate comprehensive reports that are automatically stored in the cloud that can be accessed by any member of the organization anytime, anywhere;
 - ✓ provide real-time visibility and insights on food transportation with analytics; and
 - ✓ Free checklist templates available in the Public Library that can be used by any employee.

2.2 Sanitation status and temperature of the vehicle.

This guidance is intended for persons engaged in food transport, including persons who transport food (and store it during transport) as well as manufacturers or other persons who arrange for the transportation of food. Food safety should be the top priority for everyone involved in bringing foods from farm to table. These regulations and guidelines serve to improve food safety, prevent the spread of foodborne illnesses, and lower health risks.

The primary regulation that protects food from contamination during transport is established by the FDA Food Safety Modernization Act (FSMA) on Sanitary Transportation of Human and Animal Food.

- This rule aims to prevent:
 - ✓ Failure to properly refrigerate food
 - ✓ Inadequate cleaning of transport vehicles between loads

- ✓ Failure to properly protect food from outside influences and contamination
- ✓ Other practices that create food safety risks during transportation

The FDA regulation applies to all loaders, carriers, shippers, and receivers of food in the United States by rail or motor vehicle. It doesn't matter whether or not the food is meant for interstate commerce – the regulation still applies. It also applies to shippers from other countries that transport food to the United States by motor or rail vehicle or by ship or air, after which the food is transported by a motor or rail vehicle if the food is intended to be distributed or consumed in the US. Organizations that export food from the US to other countries or transport food through the US without distributing it in the States are covered by this rule until their shipments reach a US border

or a port. Each area of transportation of food – shipping, loading, carrying, and receiving – comes with its own set of rules and responsibilities. The responsibilities are determined by agreements

Between various parties that occupy these positions. A single company can take on more than one role – for example, a food service distributor will typically handle all four areas of responsibility.

2.2.1 Main Transportation Requirements

The FDA classifies the key requirements for food safety transportation into four major categories:

Vehicles and transportation equipment – The vehicles and transportation equipment used must be adequately cleanable and suitable. Each food product has a specific temperature at which it has to be stored. Each piece of equipment or vehicle must be able to maintain the required temperature at all

times. The design of these transportation elements must not cause the transported food to become unsafe in any way.

Transportation operations – These operations represent a set of measures that need to be taken to ensure food safety until the food product reaches its destination. They include preventing raw food from touching ready-to-eat food, separating non-food items from food products to avoid cross-contamination, preventing accidental incorporation of food allergens, adequate temperature controls, and more.

Training – The carrier and shipper can agree that the carrier is responsible for the sanitary conditions during transport. In that case, the carrier is obligated to provide necessary food safety training to its personnel in hygienic transportation practices.

Records – Carriers are required to keep records of written agreements, procedures, and training. The documents must be kept for no longer than 12 months from the date the covered activity occurred, though the exact retention period depends on the type of record.

2.2.2. Internal Transportation

Keeping food products free from contamination during transportation within the same facility is just as important as keeping them safe during transport from one location to another. Before the finished food product reaches the loading stage, it must be safely moved from the production to the packaging area and then to the loading docks.

The best solution for protecting food before packaging is to transport it via an enclosed conveyor belt. Cablevey conveyor systems offer various flexible solutions for your food manufacturing business that guarantee low material breakage and extremely low risk of contamination.

The food ingredients are moved through an enclosed tube from one machine to another, completely cut off from its surroundings. There are no loose elements that could break away or any hidden nooks and crannies where material could accumulate and become a breeding ground for bacteria.

Having a sanitary, contamination-free transportation system across the country won't mean much if your food gets contaminated during the production process. Investing in high-quality conveyor equipment that meets all the food safety standards is imperative for any food.

• Problem Areas

When considering the circumstances in which transport of foods might lead to contamination, there are several problem areas:

- ✓ Temperature abuse – improper temperature control or refrigeration
- ✓ Improper transportation or storage unit management – improper sanitation, cleaning of vehicles, disposal of wastewater, aluminum phosphide fumigation methods in railcar units, backhauling hazardous materials, not maintaining proper wash records, etc.
- ✓ Incorrect use of packing materials and poor pallet quality

- ✓ Poor practices, conditions, or loading equipment – improper sanitation, transporting mixed loads, inadequate loading practice, not using dedicated units, etc.
- ✓ Poor practices, conditions, or equipment for unloading – improper sanitation, letting raw materials sit on loading docks after work hours
- ✓ Poor pest control in transportation or storage units
- ✓ Drivers or employees with insufficient training and managers, supervisors, or owners with inadequate knowledge of food safety
- ✓ Poor construction and design of transportation units
- ✓ Poor employee hygiene

- ✓ Improper transportation or storage unit maintenance – causing gaps in doors, roof leaks, ice accumulation, condensation, etc.
- ✓ Inadequate policies regarding safe or secure food transport or storage
- ✓ Improper handling of products that have been returned, salvaged, destined for disposal, or reworked; improper handling of rejected loads
- ✓ Improper holding practices – leaving the product unattended, delayed holding of the product, poor throughput, and rotation, etc.

• Proposed General Solutions

To improve their compliance, motor carriers and rail carriers involved in food safety should implement broad preventive controls. They include:

- ✓ Sanitation (pest control, monitoring and ensuring the proper sanitation and condition of transportation units, and sanitation of loading and unloading procedures)
- ✓ Adequate temperature control
- ✓ Correct use of packing materials, good quality pallets – proper packaging of food products and transportation units
- ✓ Employee training and awareness
- ✓ Excellent communication between transporters, shippers, and receivers

SELF-CHECK 2

I. Choos The best Answe

NameId No.....Time Allowed....

1. -----What are used in catering services and for transporting food, drink and ready-to-eat meals in a number of places including airports, hospitals, ports, exhibition centres, historic town centres and home deliveries?
 - A. Food transport vehicles
 - B. Home Made Cake
 - C. HACP Control
 - D. All.
2. Which one is the Importance of Food Transportation?
 - A. maintain its credibility in meeting food standards;
 - B. follow food safety transportation standards to avoid food contamination; and
 - C. Deliver goods to any part of the world in a timely manner.
 - D. All.
3. What are the Food Transportation Issues?
 - A. Must Arrive by Dates (MABDs) and Retailer Chargebacks
 - B. Refrigerated Shipping
 - C. Less-than-Truckload (LTL) Shipping
 - D. Handling and Contamination
 - E. All.

Directions: Answer all the questions listed below.

1. Discuss possible hazards that may occur in a premise? (2 points)
2. Describe about microorganisms briefly (3 points)
3. How to transport Food item properly (5 points)
4. How to protect Food spoilage (2 points)
5. Write the HACCP principles(5
6. How to protect Food spoilage
7. Maintain personal hygiene
8. Proper storage of food
9. Do not store raw and cooked foods
10. Clean and sanitize preparing and cooking utensils
11. Avoid cross contamination of food
12. Write the HACCP principles
13. Conduct a hazard analysis
14. Determine CCP

Unit Three: Transporting food safely and hygienically.

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Packaging, loading, restraining and unloading food
- OHS regulations
- Recording food transportation

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Package, load, restrain and unload food
- Use OHS regulations
- Record food transportation

3.1. Packaging, loading, restraining and unloading food

Food Packaging is one of the most important processes in food industry which helps in maintaining the quality of food products during storage, transportation and distribution. The food packaging industry has revolutionized to a great extent in the recent years with advancement of novel food packaging technologies, such as active packaging, aseptic packaging, smart packaging, bioactive packaging, edible packaging which are research trends. Packaging is generally done as a final process where packed goods/products are further packaged into bigger boxes, courier bags, bubble envelopes, cardboard, cartons or whatsoever. However, both the term packing and packaging are commonly used interchangeably.

Food packaging is defined as a co-ordinated system of preparing food for transport, distribution, storage, retailing, and end-use to satisfy the ultimate consumer with optimal cost. Food packaging is an essential part of modern society; commercially processed food could not be handled and distributed safely and efficiently without packaging.

The World Packaging Organization (WPO) estimates that more than 25% of food is wasted because of poor packaging. Thus, it is clear that optimal packaging can reduce the large amount of food waste. Moreover, the current consumer demand for convenient and high-quality food products has increased the impact of food packaging.

The world's total food production has more than doubled over the past fifty years due to improved methods in animal husbandry, the use of advanced seed varieties and crop protection products that boost crop yields and quality.

Mass production of packaged food has been enabled by technological innovations in food production, processing and logistics with packaging playing a key role. The economies of scale involved and the intense industrial competition have made many products more affordable. Consumer demand for pre-packaged food continues to increase in advanced economies and a growing global population is also fuelling the demand.

Consumers always prefer safe food for their consumption. Due to the changes in consumer preferences, new inventions of food packaging technologies have emerged. This article describes different types of modern packaging technologies, their advantages, disadvantages, and their applications.

Food packaging can be defined as a coordinated system of preparing food for transport, distributing, storing, retailing and end-use to satisfy the ultimate consumer with optimal cost . When talking about the history of food packaging, it has been evolved with the changes in the lifestyles of the people. Earlier, for a very long period of time, people used to eat the things in their surrounding area that they live. After civilization people needed food packaging. Mainly the packaging was used to protect the food from deteriorative factors of external environment like relative humidity, heat, light, pressure, microorganisms and so on.

- Types of packaging
 - ✓ Primary packaging
 - ✓ Secondary packaging
 - ✓ Tertiary packaging
- **Primary packaging** is the material which comes in direct contact with the contents packed. It covers the product and holds it. This is usually the smallest unit of distribution or use. Example: Chips packet.
- **Secondary packaging** is the material present outside the primary packaging. It is also used to group primary packages together. Example: Paperboard cartons of breakfast cereals (like Cornflakes), cartons or trays of beverage cans.
- **Tertiary packaging** is the material which holds secondary packages. It is used for bulk packaging in order to ease handling, transportation, distribution, shipping or storage. Example: Wooden crates, cardboard cartons, etc.

In retail, restaurant and end use product distribution, the risk of microbial contamination from the trailer may be minimized by following leading practices that reduce contamination since products are contained in packaging and are not in direct contact with the trailer.

- **Common Loading/Unloading Hazards**
 - ✓ Truck drive-away (drivers leave before the load is completely on/off)
 - ✓ Trailer “creep” (unrestrained trucks creep forward due to movement entering and exiting trailer)
 - ✓ Falling cargo (heavy objects, wrongly distributed weight, not securely fastened, obstructed view)
 - ✓ Water egress in dock area (spills, trips, falls, wet loads, incoming rain)
 - ✓ Poor visibility

- ✓ Clutter
- ✓ Elevation (falls, trips, injuries) improve your warehouse operations.

The loading and unloading of cargo is a dangerous process that can cause serious injury or even fatality to warehouse workers if it is not performed with care. Docks can often get congested, tight, and busy, and there are a lot of things that can go wrong. Safety should always be the top priority for warehouse managers and employees.

Unprotected or poorly wrapped and / or packaged food may be vulnerable to microbiological contamination and cross-contamination. Use of the inappropriate wrapping materials may lead to chemical contamination. Unhygienic storage and assembly of wrapping and packaging can contaminate the materials and therefore the food. During transport food may be exposed to microbiological and physical hazards from the environment or through cross-contamination from other food. Poor cleaning or maintenance of transport vehicles may also give rise to chemical hazards. Procedures are needed to prevent or minimise the risk of all such hazards causing illness to consumers. Wrapping and packaging can control microbial spoilage by, for example, packaging meat in protective atmospheres using varying levels of oxygen (O₂), carbon dioxide (CO₂) and nitrogen (N₂).

3.1.1 Food-Grade Loading and Unloading Best Practices

Before you can begin the process of either loading or unloading a food-grade tanker, it's important to make a note of these six best practices:

A. Carriers Must Be Checked for Odors Before and After Washing

One of the most important practices that need to be adhered to has to do with all carriers/tankers' cleanliness and sanitation. Before loading anything onto a carrier or tankers, it's vital that you inspect it for any odd odors. These can be odors resulting from the previous shipment or just things that can be considered out of place, as these tankers should have been cleaned after they were unloaded.

This is important because odors can be indicative of potential contaminants left in the carrier/tanker, which could damage the integrity of the next shipment.

B. All Carriers Must Have a Wash Certificate/Ticket

Before the loading process begins, all carriers should be given either a wash certificate or ticket that provides the loading team with information on when the carrier/tanker was last used and provide proof that it was cleaned according to all sanitization regulations.

If there is no proof of cleaning and/or sanitization, then that particular carrier or tanker should not be used until it can be adequately cleaned/ sanitized. All Documents and Seal Numbers Need to Be Checked Before Shipping and Upon Arrival

Whether its bulk liquid transport or food-grade transport, it's vital that all documents be carefully reviewed for accuracy and all seal numbers be documented and checked both before shipping and Upon arrival. This information typically will come in the form of a bill of lading, which should have all pertinent information needed for inspection before departure and unloading.

C. Before Unloading, Site Should Be Cleared of All Unnecessary Debris and Personnel

Once all pre-departure checks have been completed, and the shipment has made its journey to its next location, the arrival site must be cleared of all unnecessary people, equipment, and other debris. This is a crucial step because it ensures the safety of the unloading team and other workers and also helps reduce the chances of damage to the shipment, which can lead to possible contamination of the product or complete loss due to spoilage/damage. Once the unloading site has been cleared of any potential hazards and all unnecessary personnel, the unloading process may begin.

- **All Safety Gear Must Be Worn at All Times**

Whether during the loading or unloading process, it's vital that all personnel are wearing all necessary safety gear at all times. This not only ensures the safety of the staff, but it helps protect the quality of the shipment. For instance, if your workers are loading crates of food, they need to be wearing the right protective gloves so that handling these crates doesn't cause cuts or lacerations and there is no cross-contamination of any bacteria or viruses on the workers' hands.

3.2. OHS regulations

The Occupational Health and Safety Act 2004 (OHS Act) is the main workplace health and safety law. The OHS Act seeks to protect the health, safety and welfare of employees and other people at work. It also aims to ensure that the health and safety of the public is not put at risk by work activities. It sets out key principles, duties and rights about OHS.

- **Work Safe's role**

Work Safe has many functions under the OHS Act. For example, we:

- ✓ monitor and enforce compliance with the OHS Act and regulations
- ✓ make recommendations to the Minister about the OHS Act, regulations and compliance codes
- ✓ promote public awareness and discussion about occupational health, safety and welfare issues
- ✓ publish OHS statistics

The Occupational Health and Safety (OHS) Regulation and the OHS provisions of the *Workers Compensation Act* contain legal requirements for workplace health and safety that must be met by all workplaces under the inspection jurisdiction of Work Safe BC. Some sections of the *Workers Compensation Act* and OHS Regulation have associated policies and guidelines.

3.2.1. The *OHS Regulation* ("*Regulation*") states:

- An occupational health and safety program as outlined in section must be initiated and maintained by each employer that has
- a workforce of 20 or more workers, and
- at least one workplace that is determined under section to create a moderate or high risk of injury, or
- The purpose of this guideline is to:
 - ✓ Provide criteria for counting workers in an employer's workforce for considering whether an occupational health and safety ("OHS") program is required under section of the Regulation
 - ✓ Provide WorkSafeBC prevention officers with factors to consider when exercising their discretion under section
 - ✓ Discuss benefits of OHS programs

- ✓ Provide additional information on occupational health and safety management systems (OHSMSs). Criteria for counting workers for the purpose of section In determining the number of workers for the purpose of section the following workers
- ✓ should be considered part of the employer's workforce, regardless of how they or their employers define their status:

- Benefits of an OHS program for all workplaces

Even though an employer may not be required to initiate and maintain an OHS program, OHS programs can provide a number of benefits. For example, OHS programs enable an employer to control its occupational health and safety risks, improve health and safety performance, communicate its health and safety commitments and policies to staff, and provide a framework for attaining its health and safety goals and objectives. Further, OHS programs assist with implementation by delineating roles, responsibilities, and accountability for tasks, including checking and corrective action as the program evolves. A properly implemented OHS program can be expected to reduce injuries and the associated costs of disability and lost production hours.

Occupational health and safety management systems

Whether for a small or large employer, occupational health and safety can be managed in the same way that the employer manages other facets of the organization's activities (e.g., quality, production, environment, finances, customer service, etc.). An OHSMS can help organizations reduce or prevent injuries, illnesses, and fatalities in the workplace by providing a framework for corporate behaviour in OHS management. An OHSMS relies on commitment, leadership, and worker participation to achieve its outcomes.

3.2.2. Purpose of guideline

- Provide background information on farm labour contractors (FLCs) and their role as employers of farm workers

- Describe circumstances in which the contractor has an obligation to establish a formal occupational health and safety program, and lists the elements that would typically be covered in the programs
- Describe circumstances in which informal programs are required, and what they would include
- Discuss the occupational health and safety responsibilities of growers who use contractors to provide services of farm workers in their operations
- Provide five examples of how the responsibilities of FLCs apply to the protection of farm workers, in comparison to the responsibilities of the grower: worker transport vehicles, personal protective equipment, first aid, protection from hazardous materials, and training

3.3 Recording food transportation

Food transportation is a vital process in food manufacturing and supply. It keeps the food industry running by moving food from producers to consumers. However, this process is not exempt from the risk of contamination. That's why it's important to know the best practices for food transportation.

In this article, we will discuss the significance of food transportation and six important tips to ensure a safer quality food transportation experience.

3.3.1. Food Transportation

Food transportation is the act of transporting food from the food producer to its desired destinations. This process plays an important role in maintaining food safety in the food manufacturing business. Transporting food involves different modes of transportation. These include road, water, air, and rail. But among these methods, trucking is the most common method, making up the majority (70.5%) of food transportation in the United States.

- Importance of Food Transportation

Raw materials and finished products have varying life expectations depending on the items to be delivered. Therefore, keeping food fresh and safe will ensure top quality, which is crucial for food

safety and quality standards. Failure to keep the goods safe will lead to business hindrances like the disruption of operations, legal issues, and customer complaints. Fortunately, you can avert these potential problems by choosing the right food transportation method. At the same time, it also helps food businesses in numerous ways, including:

- Deliver goods to any part of the globe quickly and effectively.
 - ✓ Standards of Food Transportation Safety

To ensure successful food transportation, the producers or food businesses should maintain food quality standards and keep up with the latest food safety practices. At the same time, you should also comply with the food transportation requirements.

The Sanitary Food Transportation Act (2005) requires that the FDA prescribes sanitary transportation practices to prevent food adulteration during transportation. This act explains the necessary practices, conditions, and procedures to prevent food products from contaminating during transportation.

- ✓ Vehicles and transportation equipment

Make sure all vehicles used to transport food products are clean and in good repair. This includes properly cleaning and maintaining equipment like refrigerated containers, ice chests, and other storage devices.

- ✓ Transportation operations

Sanitary transportation practices must be followed during loading, unloading, and while the food is in transit. These practices include preventing cross-contamination, maintaining proper temperature, and protecting food products from physical, chemical, and biological hazards.

- ✓ Communication

Drivers should be properly trained in food safety practices and be able to communicate with the shipper, carrier, and receiver. They should also have a clear understanding of the route they're taking and any potential food safety hazards along the way

- ✓ Training

Employees assigned to food transportation must learn sanitary transportation practices and be able to implement them properly. Proper documentation of food safety training is also necessary.

- ✓ Records

It's also essential to keep records of food transportation activities. This includes the driver's logs, shipping documents, and receiving records. These records should be kept for at least a year. By complying with these food transportation requirements, the FDA believes that food businesses can

ensure that the food they're transporting is safe and of high quality. It also guarantees that they maintain their credibility as a food business.

✓ Issues of Food Transportation

Various industries deal with different challenges, and the food industry is no exception. In fact, in 2019, the United States encountered food transportation issues such as handling and contamination, environmental impacts, driver shortage, and compliance with sanitation standards. However, these challenges also made companies react positively, identifying gaps and striving to improve their food

Sanitation standards. But despite that, there will always be challenges to face in the food business. Apart from the ones already mentioned, here are other transportation issues that food companies should be aware of:

✓ Refrigerated Shipping

One of the most common factors to consider when transporting food is perishability. This is why refrigerated shipping is often used for food products that must be kept at a certain temperature.

However, some challenges come with this type of transportation. For example, if the power goes out or the equipment fails, it can spoil food. That's why it's important to have a backup plan in place in case of an emergency.

3.3.2. Food Fraud

Food fraud is a type of crime that's on the rise in the food industry. It involves the misrepresentation of food products for financial gain. This can be done in several ways, such as selling fake organic food or selling expired food as fresh. Food fraud is a serious issue because it affects the companies

That are involved and can also jeopardize the safety of consumers. That's why it's important for food companies to be aware of the signs of food fraud and to have a plan in place to prevent it.

- LTL (Less-Than-Truckload) Shipping

LTL shipping is an excellent food transportation option for food manufacturers who don't have enough freight to fill in a full truck. However, it also involves some potential high risks. A large Mixture of food products loaded together may trigger contamination threats. In addition, this shipping type could also affect MABDs.

- The Best Practices of Food Transportation

Food handling, packing, and transporting are crucial parts of food safety. To ensure that your food products are safe and of high quality, here are the six best practices for food transportation.

✓ **Proper Documentation**

Keep records of all food transportation activities, including driver's logs, shipping details, relevant documentation, and receiving records.

✓ **Preserve the Product**

Preserve the food quality by ensuring that they are stored and sealed in proper containers. Also, ensure that they are stored in the appropriate temperatures and conditions.

✓ **Pest Control**

Pests can cause contamination and spread diseases, so keeping them out of your food products is important. To do this, you should regularly inspect your facility for pests and implement a pest control plan

✓ **Secure Transport**

Choose the most appropriate method of transportation for your goods. The one you select should have the capability to secure your food against contamination and spoilage.

✓ **Sanitation**

Maintain cleanliness in all areas of your food transportation process, from packaging to storage to Delivery. This includes regularly cleaning and disinfecting all surfaces, equipment, and vehicles.

✓ **Experienced People on the Job**

Workers, staff, and food handlers should have undergone proper food safety training. At the same time, they should also be trained in proper hygiene practices.

✓ **Safe Food Transportation, Storage and Handling**

To prevent foodborne illness by ensuring that proper food temperatures are maintained, cross-contamination is prevented during transportation, and proper food handling and storage conditions are followed for all Child Nutrition Programs (including the Special Milk Program, Fresh Fruit and Vegetable Program, After School Snack and supper meal).
Scope: This procedure applies to facilities or part of a facility where food is stored, prepared, or served such as on school buses, in hallways, school courtyards, kiosks, classrooms, or other locations outside of a dedicated cafeteria and kitchen area.

✓ **Verification and Recordkeeping:**

Before transporting food, individuals will record refrigerator temperature, food carrier temperature, food product name, time, internal temperatures, and any corrective action taken on the Hot and Cold Holding Temperature Log.

Upon service of food, school employees will record receiving temperatures and corrective action taken on the Receiving Log or Correcting Problems form. A designated individual will record air temperatures of all food storage areas, coolers, and cold holding units on the Food Storage Log. The foodservice manager will verify that employees are receiving foods at the proper temperature, following the proper receiving procedures, and taking the required storage temperatures by visually observing and monitoring receiving practices where possible or checking temperature logs. All logs are kept on file for a minimum of 6 months.

Self-Check -3	Written Test
----------------------	---------------------

Name.....Id No..... Time Allowed.....

- What are the tips to ensure a food transportation safe & quality food transportation experience?
 - Food Transportation
 - Records
 - Transportation operations
 - All
- Preserve the food quality by ensuring that they are stored and sealed in proper containers?
 - Pest Control
 - Secure Transport
 - Sanitation
 - All
- Verification and Recordkeeping can be fulfilled:
 - transporting of food
 - individuals will record refrigerator temperature
 - Food carrier temperature, food product name, time, internal temperatures, and any corrective action taken on the Hot and Cold Holding Temperature Log
 - All

II Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

- What is the importance of segregation of food and non-food items?
- What is SFTA? (5 points)
- Why should we need to control the temperature of food during transportation?
- Why food should needs to be packed during transportation?

Unit Four: Storing food safely and hygienically

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- OHS regulations for food storage.
- Food storage conditions
- Recording supply level
- Environmental conditions for specific food types

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Apply OHS regulations for food storage.
- Use food storage conditions
- Apply Record supply level
- Use environmental conditions for specific food types.

4.1. OHS regulations for food storage.

OHS, or Occupational Health and Safety, is a multidisciplinary practice dealing with all aspects of health and safety in the workplace, with a strong focus on preventing workplace hazards.

Occupational health and safety is a discipline with a broad scope involving many specialized fields. It encompasses the social, mental and physical well-being of workers that is the “whole person”. This unit aims at providing students with general background information on OHS, and on the magnitude and variety of health and safety problems worldwide. It would help develop an understanding of the ergonomic, physical, chemical, biological, psychological and social determinants of OHS.

Occupational health and safety is the discipline concerned with preserving and protecting human resources in the workplace.

What is Occupational Health is Occupational health deals with all aspects of health and safety in the workplace and has a strong focus on primary prevention of hazards. The health of the workers have several determinants, including risk factors at the workplace leading to cancers, accidents, musculoskeletal diseases, respiratory diseases, hearing loss, circulatory diseases, stress related disorders and communicable diseases and others.

4.1.1 Occupational Safety and Health Act of 1970 (OSH Act)

The Occupational Safety and Health Act of 1970 (OSH Act), covers all employers and their employees in 50 states of the U.S., the District of Columbia, Puerto Rico, and other U.S. territories. The employees of the U.S. Postal Service are also covered by the Act. The definition of an employer according to the Act is any “person engaged in a business affecting commerce that has employees, but does not include the United States or any state or political subdivision of a State.” The Act is applicable to employers and employees in fields such as manufacturing, construction, long shoring, agriculture, law, medicine, charity and disaster relief, organized labor, and private education. The Act establishes a separate programmer for federal government employees and covers state and local government employees through the states with in OSHA –approved plans.

4.1.2. The legislative requirements for food safety

The costs associated with poor food safety are both financial and social, and can affect both employers and employees. You can measure the performance of your catering operation by carrying out an audit of the documentation, practices and procedures which occur during the delivery, storage, preparation, cooking, cooling and serving of hot and cold food.

A. Food safety so important

- Good standards of food safety are necessary to prevent:
 - ✓ Food poisoning;
 - ✓ Food spoilage;
 - ✓ Food contamination;
 - ✓ Allergic reactions;
 - ✓ Loss of productivity;
 - ✓ Pest infestations;
 - ✓ Prosecution for contravention of food safety legislation; and Closure of catering operations by enforcement authorities. Result from poor food safety
- The costs associated with poor food safety are both financial and social, and can affect both employers and employees. The costs to the employer could include:
- ✓ Financial resulting from loss of working days if employees suffer food poisoning or an allergic reaction;
 - ✓ Compensation claims for loss of earnings;
 - ✓ Loss of reputation;
 - ✓ Decontamination, cleaning and replacement of equipment; and
 - ✓ Additional pest control.

B. Legislative requirements concern food safety

- Under the Food Safety Act 1990 a food business must not:
- Cause food to be dangerous to health;
- Sell food that is not what the customer is entitled to expect in terms of content or quality; and describe or present food in a way that is false or misleading.

- The other laws that you need to be aware of are:
 - ✓ The Food Safety and Hygiene (England) Regulations 2013;
 - ✓ The Food Hygiene (Scotland) Regulations 2006 (as amended);
 - ✓ The Food Hygiene (Wales) Regulations 2006; and
 - ✓ The Food Hygiene Regulations (Northern Ireland) 2006.
- These regulations make it a requirement for all food businesses to implement food safety management procedures based on Hazard Analysis and Critical Control Point (HACCP) techniques:
 - ✓ Identify points in those operations where food hazards may occur;
 - ✓ Decide which points identified are critical to ensure food safety;
 - ✓ Identify and implement effective control and monitoring procedures at critical control points (CCPs); and
 - ✓ Periodic review and analysis of food hazards, CCPs, and control and monitoring procedures, and also when there is an operational change.

- The Food Information Regulations 2014

Food Information Regulations 2014 provide details on the information which must be provided to consumers and how the information must be presented. It also confirms the 14 substances or products that cause allergies or intolerances.

- Measure the performance of your catering operation

You can measure the performance of your catering operation by carrying out an audit of the documentation, practices and procedures which occur during the delivery, storage, preparation, cooking, cooling and serving of hot and cold food. The audit should include an examination of the following areas:

- Management of food safety;
- Receipt and storage of food;
- Structural maintenance;
- Cleaning;
- Temperature control;

- Personal hygiene;
- Contamination control;
- Equipment;
- Pest control;
- Refuse disposal;
- Front of house; and
- Allergen management.

4.2. Food storage conditions

For retaining the quality and texture of raw material before processing or food product after processing, it is necessary to have them stored in condition which repress or hinders the growth of microorganism, helps in retaining flavor, color, texture and nutrients and reduces the chance of contracting food borne illness. When food is not properly stored or it is not used in a timely manner, it could become unsafe to eat as they could allow for contaminants to get into food by allowing for bacteria, naturally present in food to grow. To keep food safe during storage, make safe storage practices part of your food safety plan.

Foods are generally categorized into three stream of highly perishable foods, semi-perishable foods and staple or non-perishable foods, which makes easy to designate type of storage condition for each on basis of their perishability rate. Time and temperature can be set on the basis, before selling or before being used up, after which they should be discarded properly to prevent any cross contamination from them to healthy foods.

- Factors to be Considered
 - ✓ **Food Rotation:** The best advice in the effective use of a dry goods storeroom is to rotate. Hence it's advisable to have dates on all foods and containers so that FIFO can be employed. It takes a bit of imagination and craft to position foods within a storeroom to best implement this principle. Keep a handy and readily visible record of the “use by” and “sell by” dates of the received foods and the shelf life in general.
 - ✓ **Humidity:** Ideally, storage areas should have a humidity level of 15% or less and most packaging is designed for the food it contains and will remain in good condition for their given shelf-life in the absence of temperature and humidity abuse. For instance, the

cardboard box will help cushion jars and other glass containers from breakage. Oxygen is a major threat to the quality of food. The chances are that moisture-proof packaging is also airtight. The less head gas (<2% O₂) in a package, the longer its shelf life is maintained.

- ✓ **Temperature:** Keeping storerooms cool, dry and well ventilated is key requirement. The temperature should be between 50°F and 70°F. The cooler, the better. The storage lives of most foods are cut in half by every increase of 18°F (10°C). Cool storage reduces respiratory activity and the degradation of enzymes; it reduces internal water loss and inhibits the growth of decay producing organisms. For maintaining optimal temperature, adequate ventilation should be provided (some air exchange rate is absolutely essential). The storeroom should be free of un-insulated steam and water pipes, water heaters, transformers, refrigeration condensing units, steam generators or other heat producing equipment.
- ✓ **Sunlight:** Food products should be always avoided from storing foods in direct sunlight as sunlight promotes oxidation and the subsequent loss of the food's nutritional value and quality. Fat-soluble vitamins, such as A, D, E and K are particularly sensitive to light degradation. It is far better to block sunlight on windows and skylights and rely on artificial illumination for the time the storeroom is in use
- ✓ **Vermin:** To prevent the entry of insects, rodents and birds into the storeroom, doors and windows should be rodent and insect-proofed and kept closed whenever possible. Any opening to the outside should be sealed and all structural cracks and crevices promptly repaired. Bait boxes, if needed, should be regularly monitored and any damaged bait boxes and spilled bait should be carefully cleaned up and removed.
- **Types of Storage**
 - ✓ **Dry Storage:** For dry storage of food material storerooms needs to be cool, dry, and well ventilated. Dry stored food should be away from walls and at least six inches off the floor. They should not come in direct contact with sunlight. Durable containers that cannot be damaged by water or pests should be used for storing and temperature should be set between 10°C and 21°C and humidity levels should be maintained between 60% and 70%.

- ✓ **Frozen Storage:** Freezer temperature should be kept at -18°C and it should be periodically checked by placing a freezer thermometer near the front of the freezer. Freezers should never be overloaded with products. Frozen food deliveries should be placed in the freezer as soon as they have been inspected and no warm food should be directly put into freezer. Placement of food in store should be such that they allow for good air circulation. Defrosting of freezer at regular interval of time is very important.
- ✓ **Refrigerated Storage:** Temperature should be kept at 4°C or below and potentially hazardous food must be at 5°C or colder to prevent bacterial growth. Refrigerator thermometer should be placed on the top shelf near the door and should be checked periodically. Shelves should not be lined with foil because this prevents air circulation

- **Good Warehousing Practices**

- ✓ All items should be stored to avoid direct contact with the floor (e.g. on pallets, slip sheets, or racks). Sitting or standing on product shipping cases is not acceptable. Over stacking of product must be avoided.
- ✓ Products must not be stored immediately adjacent to containers for waste or non-product items (e.g. cleaning compounds).
- ✓ Soiled and dusty exteriors of cartons or other product containers shall be cleaned before they are conveyed into the warehouse or to customers.
- ✓ Broken or spilled product should be cleaned up in a timely manner.
- ✓ Doors and gates (e.g. cargo doors) should not be left open when not in use.
- ✓ Fork lift trucks (FLT) shall be in good repair, clean, free from leaks. FTL utilized inside a facility shall preferably be electric powered. Though Liquid Petroleum Gas (LPG) is also acceptable but gasoline or diesel powered FTL only allowed outside facility.
- ✓ FLT batteries shall be stored in a designated area in such a way as to avoid risk of material or product contamination.
- ✓ All materials and products should be properly identified and labelled.
- ✓ Activities like eating or drinking, chewing gum or tobacco, smoking, holding objects in the mouth (e.g. toothpicks), and spitting shall not be allowed.
- ✓ Controls shall be in place to ensure that employees wash their hands when necessary.
- ✓ Garbage facilities / compactors shall be adequately covered.

- ✓ Pallets must be stored in areas that are free of moisture, dirt and litter and free of bird, insect or rodent contamination.
- ✓ Pallets should not be stored outside.
- ✓ A pallet inspection program should be in place to verify that pallets are suitable for use.

4.3. Recording supply level

Food records can be used to describe a population's intake (e.g., Great Britain's cross-sectional National Diet and Nutrition Survey) (see Choosing an Approach for Dietary Assessment).

Food records can be used to examine relationships between diet and health or other variables, in which diet is the independent variable (see choosing an Approach for Dietary Assessment).

Another legal requirement is that food firms maintain records relating to the manufacture, processing, packing, distribution, receipt, holding, or importation of food products. The purpose is to assist in determining whether anything has happened to the food or been done to the food that would render it unsafe (i.e., adulterated). Accordingly, firms must maintain records and government authorities may access the records.

The food industry also is demanding that food businesses retain records which buyers (other food processors?) can access or rely on to assure that the seller has taken reasonable steps to reduce the risk of a food borne problem. Although this web site focuses on the expectations imposed by statutory and regulatory law, it is important to realize that food buyers also are imposing contractual expectations on food sellers, including the expectation that the seller have records to adequately document how the product being sold had been handled by the seller.

- **The Reason for Records**

Food businesses maintain detailed records for several reasons, such as, document how the food was handled and labeled to establish that the food was not adulterated or misbranded while under the control of the food business. Food businesses also maintain records of who they received the food from (previous source) and who received the food from the business (immediate subsequent recipient). This second purpose of records is to facilitate traceability.

4.4. Environmental conditions for specific food types

All food should be safe and free from contamination and spoilage at all points in its journey from its source until it reaches the consumers. However, food contamination is a serious public health problem in Ethiopia, resulting in foodborne diseases that affect many people every year. Hence, awareness of potential sources of food contamination is an important component of good nutrition and good health. In this study session we are going to concentrate on food contamination by microorganisms, chemicals and physical factors.

Food may be contaminated by different microorganisms or by chemicals that can cause health problems for anyone who eats it. In Study Session 9 you will learn in detail about foodborne diseases. But first you will be introduced to the basic principles of food microbiology in this study session, and about the ways in which food becomes contaminated by different microorganisms, chemicals and physical objects. You will also learn about the causes of food spoilage and its consequences for health.

4.4.1 Infectious agents and foodborne diseases

- **Infectious agents** are organisms that can be passed to, and between, people in the process of **infection** transmission. Those that cause diseases are often referred to as **pathogens** ('pathogenic' means disease-causing). Many infectious agents (bacteria, viruses, fungi and protozoa) are microorganisms that are too small to be seen except with a microscope; the adult stages of disease-causing parasites (e.g. worms) may be seen with the naked eye, but their eggs and immature stages are microscopic.
- **Microbiology** is the science that deals with the study of microorganisms. Although infections often result in disease, it is possible to be infected with a pathogen and still appear healthy. This is either because the disease has not yet had time to develop, or because the person's immune system is keeping it under control. However, the infectious agent can still be passed on to others, for example by spreading into food handled by the infected person. The majority of foodborne diseases (those caused by infectious agents transmitted to people in the food we eat) are due to bacteria.
- **Bacteria** are the most abundant of all organisms. Bacteria are unicellular organisms (made of one cell) and are very small in size, ranging from 0.5 to 5.0 micrometres (μm). Bacteria reproduce asexually. This means that they don't need a partner to reproduce, but simply divide

into two, producing two new bacteria. There are pathogenic bacteria capable of causing human illness and food spoilage, but there are also beneficial species of bacteria that are essential to good health and a healthy environment. For example, beneficial bacteria live in our gut and help us digest our food; some bacteria are used to produce foods such as yoghurt and cheese; and others break down wastes in the environment. Temperature, humidity, oxygen and water are important for bacteria to grow and multiply. Under favourable conditions a growing bacterial population can double at regular intervals ranging from about 15 minutes to several hours. This means that the numbers of bacteria in food can increase rapidly and soon become hazardous to health, particularly if the food has a favourable temperature and water content. In the next section, we look in detail at factors that can promote or delay bacterial growth in our food.

- Factors affecting the growth of microorganisms in foods
 - A. Extrinsic factors
- **Extrinsic factors** are factors in the environment *external* to the food, which affect both the microorganisms and the food itself during processing and storage. Extrinsic factors include temperature, humidity and oxygen.
- **Temperature**

Different microorganisms grow over a wide range of temperatures. Some microorganisms like to grow in the cold, some like to grow at room temperature and others like to grow at high temperatures. This is of paramount importance in food safety, because if you know the temperature growth ranges for dangerous microorganisms it helps you to select the proper temperature for food storage to make them less able to grow and reproduce.

- **Humidity**

The humidity of the storage environment is an important factor for the growth of microorganisms at the food surfaces. If you store food in a dry atmosphere, microorganisms are less able to grow than if the food is stored in a humid (moist) environment. Therefore, dry conditions are better for food storage than moist conditions.

- **Oxygen**

Many microorganisms need oxygen in order to develop and reproduce: these are called **aerobic** microorganisms. A good example is *Escherichia coli*, a faecal bacterium which grows readily on

many foods. If you keep food in a low oxygen environment, aerobic bacteria cannot grow and multiply. Conversely, there are some microorganisms that grow without oxygen, called **anaerobic** microorganisms. An example of this is *Clostridium botulinum*, the bacterium causing botulism, which can survive in very low oxygen environments such as tinned foods.

- **Intrinsic factors**

Intrinsic factors exist as part of the food product itself. For example, meat has certain characteristics that may promote the growth of certain microorganisms. The following common intrinsic factors affect the growth and multiplication of microorganisms in foods.

- pH

The scientific term **pH** is a measure of how acidic or alkaline an environment is, on a scale that has 'neutral' (neither acid nor alkaline) at pH7. Environments that are acidic have pH values below 7; those that are alkaline have pH values above 7. Most microorganisms grow best at close to the neutral pH value (pH 6.6 to 7.5). Only a few microorganisms grow in very acid conditions below a pH of 4.0. Bacteria grow at a fairly specific pH for each species, but fungi grow over a wider range of pH values. For example, most meats naturally have a pH of about 5.6 or above. At this pH meat is susceptible to spoilage by bacteria, moulds and yeasts; however the pH of meat can be lowered by pickling, which makes it less favourable as an environment for microorganisms to grow in.

Moisture content (water activity)

Microorganisms need a moist environment to grow in. The water requirements of microorganisms are described in terms of **water activity** (represented by the symbol a_w), a measure of how much water is present. The water activity of pure water is $a_w = 1.00$. Most foodborne pathogenic bacteria require a_w to be greater than 0.9 for growth and multiplication; however, *Staphylococcus aureus* may grow with a_w as low as 0.86. But even *Staphylococcus aureus* cannot grow and multiply in drier food like bread, which has $a_w = 0.7$, although fungi can (Figure 8.1).

- **Nutrient content**

In order to grow, multiply and function normally, microorganisms require a range of nutrients such as nitrogen, vitamins and minerals. Microorganisms therefore grow well on nutrient-rich foods.

- Structure of food items

The natural covering of some foods provides excellent protection against the entry and subsequent damage by spoilage organisms. Examples of such protective structures are the skin of fruits and vegetables such as tomatoes and bananas.

- Routes of microbial contamination of food

Bacteria are a major source of microbial contamination of food, i.e. the undesired presence in food of harmful microorganisms or the harmful substances they produce. Viruses, parasites and fungi are also able to contaminate food and cause foodborne illnesses in humans. Microorganisms can enter food through different routes.

Air and dust

Microorganisms are found everywhere in our environment. Many types can be found in air and dust, and can contaminate food at any time during food preparation or when food is left uncovered (Figure 8.4). Imagine a kitchen where food is prepared and stored in rural communities, and think how easily microorganisms in the air and dust could contaminate the food.

Food handlers

The term **food handler** can be applied to anyone who touches or handles food, and this includes people who process, transport, prepare, cook and serve food. The presence of microorganisms on the hands and outer garments of food handlers reflects the standard of hygiene in the environment and the individuals' personal hygiene (as you learned in earlier study sessions). The microorganisms transmitted to foods by food handlers may come from the hides of animals, soil, water, dust, gastrointestinal tracts and other environmental sources. In food preparation at home, foodborne microorganisms can be introduced from the unwashed hands of people who are infected by bacteria and viruses, and who cook and serve the food to family members.

- Food utensils

Food utensils are cutting boards, knives, spoons, bowls and other equipment used in food preparation, which may become contaminated during food processing and preparation. For example, in families where there is no access to running water, the food utensils may not be properly cleaned, stored and handled, and may become a major route of food contamination.

- Cross-contamination

Cross-contamination of food is the transfer of harmful microorganisms between food items and food contact surfaces. Prepared food, utensils and surfaces may become contaminated by raw food products and microorganisms. These can be transferred from one food to another by using the same knife, cutting board or other utensil without washing it between uses. A food that is fully cooked can become re-contaminated if it touches raw foods or contaminated surfaces or utensils that contain pathogens.

- For example, you should never:

- ✓ allow raw meat to touch cooked meat
- ✓ put cooked meat on a cutting board that has just been used for raw meat without cleaning it first (Figure 8.5)
- ✓ Store raw meat on a shelf above cooked meat so that it could leak blood and raw juices on to the cooked meat below.

- Unsafe temperature

An unsafe temperature for food storage is a major factor in food contamination. Many microorganisms need to multiply to a very large number before enough are present in food to cause disease in someone who eats it. However, if bacteria can have warm, moist conditions

- Poor personal hygiene

Poor personal hygiene of food handlers is another major factor in food contamination. The most important contaminants of food are the microorganisms excreted with faeces from the intestinal tract of humans. These pathogens are transferred to the food from faecal matter

- Avoiding food contamination

You now know that food can be contaminated from sources in the natural environment, people, food preparation surfaces and utensils, raw and uncooked food, animals, pests, and waste material. To prevent contamination, food production and preparation operations need to be carefully controlled.

- Microbial food contamination

Food handlers should follow these strategies:

Page 55 of 64	Author/Copyright : Ministry of Labor and Skills	Serve food and beverage to customers Level - II	Version -1 December, 2022
---------------	--	--	------------------------------

- ✓ Thorough hand washing before and during food preparation, especially after using the toilet, and handling raw food or waste.
- ✓ Soap/ash sanitiser and clean water should be available for hand washing at convenient locations.
- ✓ Sick food handlers should not prepare food! One sick person can cause a foodborne disease outbreak, particularly where people are in crowded or unsanitary living conditions.
- ✓ Raw and cooked foods should be separated, because raw foods are a source of microorganisms and can recontaminate prepared foods.

- **Chemical contamination of food**

Attention also needs to be given to possible chemical contamination of food. Food can be contaminated through the misuse or mistaken handling of chemicals, including pesticides, bleach and other cleaning materials. All chemicals (detergent, disinfectant, sanitiser) used in the food preparation area should be removed before food preparation begins, to prevent any chemical contamination of the food.

- **Possible sources of chemical contamination are:**

- ✓ reusing containers which have been used for chemicals (Figure 8.7)
- ✓ using chemical sprays (e.g. to kill cockroaches) in areas where food is exposed
- ✓ Accidentally adding chemicals which have a texture similar to table salt or sugar during food preparation; they should always be stored separately.

- **Physical contamination of food**

Physical contaminants include stones, pieces of glass, and metal. Physical contamination can occur at any stage of the food chain: for example, stones, bones, twigs, pieces of shell or foreign objects can enter food during handling and preparation. These materials should be removed, if possible, for example by sieving or picking out the items with clean fingers.

- **Food spoilage**

Food spoilage is the process of change in the physical and chemical properties of the food so that it becomes unfit for consumption. Food spoilage is any undesirable change in food. Most natural foods have a limited life: for example, fish, meat, milk and bread are perishable foods, which means

they have a short storage life and they easily spoil. Other foods also decompose eventually, even though they keep for a considerably longer time. The main cause of food spoilage is invasion by microorganisms such as fungi and bacteria.

- **Microbial spoilage**

Microbial spoilage is caused by microorganisms like fungi (moulds, yeasts) and bacteria. They spoil food by growing in it and producing substances that change the colour, texture and odour of the food. Eventually the food will be unfit for human consumption.

When food is covered with a furry growth and becomes soft and smells bad, the spoilage is caused by the growth of moulds and yeasts (look back at Figure 8.1). Microbial spoilage by moulds and yeasts includes souring of milk, growth of mould on bread and rotting of fruit and vegetables. These organisms are rarely harmful to humans, but bacterial contamination is often more dangerous because the food does not always look bad, even if it is severely infected. When microorganisms get access to food, they utilise the nutrients found in it and their numbers rapidly increase. They change the food's flavour and synthesise new compounds that can be harmful to humans. Food spoilage directly affects the colour, taste, odour and consistency or texture of food, and it may become dangerous to eat. The presence of a bad odour or smell coming from food is an indication that it may be unsafe. But remember that not all unsafe food smells bad.

- **Physical spoilage**

Physical spoilage is due to physical damage to food during harvesting, processing or distribution. The damage increases the chance of chemical or microbial spoilage and contamination because the protective outer layer of the food is bruised or broken and microorganisms can enter the foodstuff more easily. For example you may have noticed that when an apple skin is damaged, the apple rots more quickly.

- **Chemical spoilage**

Chemical reactions in food are responsible for changes in the colour and flavour of foods during processing and storage. Foods are of best quality when they are fresh, but after fruits and vegetables are harvested, or animals are slaughtered, chemical changes begin automatically within the foods and lead to deterioration in quality. Fats break down and become rancid (smell bad), and naturally-occurring enzymes promote major chemical changes in foods as they age.

- **Enzymic spoilage (autolysis)**

Every living organism uses specialised proteins called **enzymes** to drive the chemical reactions in its cells. After death, enzymes play a role in the decomposition of once-living tissue, in a process called **autolysis** (self-destruction) or **enzymic spoilage**. For example, some enzymes in a tomato help it to ripen, but other enzymes cause it to decay (Figure 8.8). Once enzymic spoilage is under way, it produces damage to the tomato skin, so moulds can begin to attack it as well, speeding the process of decay.

Appearance of spoiled food

Spoiled food is generally more a problem of appearance than a problem of disease causing. In food spoilage, the changes in appearance or texture of the food, such as rottenness, softness and change in colour, taste or odour are usually obvious, whereas in contaminated food such characteristics may not be noticed. A large majority of the microorganisms responsible for food spoilage are not pathogenic to humans. However, you should advise people in your community that they should not eat food that is spoiled because it is not nutritious and may make them sick (cause vomiting).

B. Factors affecting food spoilage

Finally, we turn to the factors that can increase or delay the process of food spoilage. They include its water content, environmental conditions, packaging and storage.

✓ Water content

The amount of water available in a food can be described in terms of the water activity (a_w).

The water activity of most fresh foods is 0.99. This means that they have very high water content and can support a lot of microbial growth.

✓ Environmental conditions

No matter whether food is fresh or processed, the rate of its deterioration or spoilage is influenced by the environment to which it is exposed. The exposure of food to oxygen, light, warmth or even small amounts of moisture can often trigger a series of damaging chemical and/or microbial reactions. Changing the environment can help to delay spoilage. For example, storing foods at low temperatures reduces spoilage because both microbial and enzymic decay is faster at higher temperatures.

✓ Packaging and storage

Packaging is a means of safeguarding food when it is raw, or after it has been processed or prepared. It helps to protect food against harmful contaminants in the environment or conditions that promote food spoilage including light, oxygen and moisture. The type of packaging is a key factor in ensuring that the food is protected. Packaging of foods in cans, jars, cartons, plastics or paper also serves to ensure food safety if it is intact, because it provides protection against the entry of microorganisms, dust, dirt, insects, chemicals and foreign material.

Self-Check -4	Written Test
---------------	--------------

Name.....Id No.....Time Allowed.....

1. What are the factors that affecting food spoilage?
 - A. Water content
 - B. Environmental Condition
 - C. Packaging and storage
 - D. All
2. What the Factors affecting the growth of microorganisms in foods
 - A. Extrinsic factors
 - B. Temperature
 - C. Humidity
 - D. All
3. Which one true about the Infectious agents and foodborne diseases?
 - A. Infectious agents
 - B. Microbiology
 - C. A & B
 - D. All
4. Which one true about the Good Warehousing Practices?
 - A. All items should be stored to avoid direct contact with the floor (e.g. on pallets, slip sheets, or racks). Sitting or standing on product shipping cases is not acceptable. Over stacking of product must be avoided.
 - B. Broken or spilled product should be cleaned up in a timely manner.
 - C. All materials and products should be properly identified and labelled.
 - D. All are correct

II. Directions: Answer all the question listed below.

1. What are the conditions considered during food storage? Explain in detail
2. What is the appropriate food storage temperature?
3. Why should one need to control the storage temperature of food items?
4. What is the advisable temperature to store potentially hazardous food items?

References

- <http://www.dol.gov/compliance/guide/osh.htm>
- <http://www.iosh.co.uk/index.cfm?go=publications.main>
- https://unevoc.unesco.org/fileadmin/user_upload/pubs/AB5_HealthSafety.pdf
- Fuller, John; 1980 (1st edition); *Gueridon and Lamp Cookery*; Hutchinson
- Johnston, R and Clark G, 2008 (3rd Edition), *Service Operations Management*. Pearson Education
- Kotschevar, Lendal and Luciani, Valentino; 2006 (2nd edition); *Presenting Service: The Ultimate Guide for the Foodservice Professional*; Wiley
- Lillicrap, Dennis and Cousins, John; 2010 (1st edition); *Essential Food and Beverage Service: Levels 1 and 2*; Hodder Arnold
- Walker, John R; 2008 (5th Edition); *Introduction to Hospitality*; Prentice Hall

1. Developers' Profile

No	Name	Qualification	Educational background	Region	College	Mobile number	E-mail
1	Mohammed Liben Mohammed	Hotel and Tourism Sector head	<ul style="list-style-type: none"> ➤ BA degree in Hotel and Tourism management ➤ MA degree in Disaster Risk Management 	Somali	Jigjiga Polytechnic college	0992326557	cherechaw@gmail.com
2	Abreham Mayza Mengesha	Instructor	Bed degree in Hotel and Tourism	SNNP	Arba minch Polytechnic college	0913711922	Abrehammayza9@gmail.com
3	Zelalem Almaw Endalew	Instructor	➤ BSC degree in Food science and post harvest technology	Amhara	Bahir dar Polytechnic College	0918012521	Parazolla25@gmail.com
4	Hiwot Tedla Belay	Instructor	BA degree in Accounting and finance and diploma in Hotel Management	Hareri	Harer Polytechnic College	0913789086	hiwietaba@gmail.com
5	ZuryashWork Belay Nigatu	Instructor	BA degree in Hotel Management	Addis Ababa	TTI	0911643817	zwb@gmail.com

