Ministry of Agriculture
Animal and Plant Health Regulatory Directorate






Meat Transport and Storage Guideline

(for abattoir and airport cargo terminal workers)

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Foreword

This technical document entitled “Meat Transport and Storage Guideline” is one of the documents in a series of guidelines and Standard Operating Procedures (SOPs) developed by the Ministry of Agriculture (MoA) in collaboration with the Ethiopian Sanitary and Phytosanitary and Livestock and Meat Marketing (SPS-LMM) Program. SPS-LMM program is financed by USAID and is implemented by the Norman Borlaug Institute for International Agriculture, Texas A&M University System. The main goal of the SPS-LMM program is to increase exports of meat and livestock to benefit Ethiopian livestock producers and exporters and to promote national economic development.

This guideline and SOP is intended to assist export abattoir operators, meat truck drivers and air port cargo terminal workers in ensuring meat hygiene and safety during transportation and storage.

At this point, the Animal and Plant Health Regulatory Directorate (APHRD) would like to thank the SPS-LMM program and USAID for developing and publishing this guideline and SOP.

Last but not least, I would like also to thank Drs. Wondwosen Asfaw and Nega Tewolde for preparing this guideline and SOP.

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1. Introduction

Meat is susceptible to contamination from a wide variety of physical, biological and chemical hazards. Because of its moisture, pH levels and high protein content, meat provides ideal environments for the growth of bacteria. Hence, meat is highly vulnerable, particularly, to microbiological (germ) hazards and must be carefully handled, transported and stored to prevent contamination. During transportation and storage, the key issue is to maintain proper refrigeration temperatures and to keep the cold-chain from breaking during steps such as loading, unloading, palletization, etc.

This guideline is designed to aid meat truck drivers and air port cargo terminal workers in ensuring meat hygiene and safety during transportation and storage. It provides a list of precautionary measures that can be taken to prevent meat contamination during loading, unloading, transportation, in-transit storage, etc

2. Meat transport vehicles

Currently, meat is transported from export abattoirs to the airport by trucks. Meat is then held at handling facilities at the airport. Because transportation and storage are vital links in meat hygiene and safety, effective control measures are essential at each point to prevent contamination.

2.1. Vehicle compliance requirements

- Transport vehicles, containers, and conveyances should be designated and marked “for food use only,” and be used only for transporting foods. If feasible, they should be restricted to a single commodity. This reduces the risk of cross contamination from previous cargos.

Fig 1. Dedicated meat transport truck

- Vehicles used for the transport of meat and edible products must be used exclusively for this purpose and must be clean at the point of loading.
- The cargo space must fulfill the following.

    - Totally enclosed, capable of being locked and if required, sealed.
    - Completely separated from the driving cab;
    - Dust and vermin proof.
    - Does not transmit odor or taste.
    - Capable of withstanding repeated cleaning and sanitizing.
    - Allow visible contamination to be easily seen.
    - Waterproof and with a closable drainage outlet.
    - Adequately insulated and/or mechanically refrigerated to ensure that the temperature of the meat does not rise more than 2°C during transportation;

- Internal surfaces including the floor must be light colored, impervious, corrosion resistant, non-toxic and made of a durable material that can be sanitized easily.
- Floor to wall and wall to wall junctions must be rounded.
- Should have an overhead rail for carcass transport.
- Vehicles should be designed and built to make locking and sealing easy, protect the cargo against extremes of heat and cold, and prevent infestation by pests.
- Vehicle design should permit effective inspection, cleaning, disinfection, and temperature control.
- Interior surfaces should be made of materials that are suitable for direct food contact. For example, the surfaces may be made with stainless steel or be coated with food-grade epoxy resins.

2.2. Sanitation and maintenance of vehicles

- Meat and meat product transportation vehicles, accessories, and connections should be kept clean and free from dirt, debris, and any other substance or odor that may contaminate the product.
- Vehicles must be cleaned out and air dried daily. They should be disinfected as needed. Vehicle floors and walls can be washed and disinfected using soaps and detergents and leaving it in contact for 10 minutes.
- The type of meat product to be transported and the cleaning procedure used should be recorded on daily and between shipments.
- Water used to wash vehicles should be at least 82°C and used together with an approved sanitizer to reduce the

number of microorganisms and dissolve any fat particles adhering to interior surfaces of vehicles.
- Only meat should be transported in the loading bay.

2.3. Examine vehicles before loading

- Trailer or truck body should be sufficiently insulated and be in good repair with no holes in the body that might allow heat, dust, or other adulterants to enter the cargo area.
- Trucks and trailers should be checked for residues of previous cargos.
- They should be checked for residues from cleaning and sanitizing compounds.
- The cooling unit must be in good repair and operating. Both truck drivers and plant personnel should check the functioning of the trailer refrigeration unit.
- Vehicle thermometer and thermostat settings should be checked before loading to enable meat and meat products to be maintained at the required temperature during transport.
- Trailers and trucks should be pre-cooled for at least 1 hour before loading to remove residual heat from the insulation and inner lining of the trailer as well as from the air of the trailer. During pre-cooling, the doors should be closed and the temperature setting of the unit should be no higher than -3˚C.
- Trailers should be inspected prior to loading to determine that the air chutes are properly in place and that the ribbed floors are unclogged so that adequate air circulation can occur.
- Trailer doors and seals should be examined to ensure that they can be secured and that there will be no air leaks.
- When shipping a mixed load of products, such as both frozen and refrigerated products, it may be necessary to use a trailer with compartments that accommodate different temperature or other handling requirements.

Fig. 2. Examine vehicles before loading!

3. Loading meat

- Meat should be at the desired temperature before loading.
- Check the pH of sampled meat and should be below 6 and results should be recorded.
- Loading should be done preferably in the evening or early morning to minimize the likelihood of products warming.
- Loading surrounds and equipment should be ensured that they are clean from possible contamination.
- Rough offal should not be loaded in the same loading space as carcasses, portions or red offal, unless such rough offal is kept in clean, waterproof containers with tight fitting lids.
- Rough offal only, may be transported in enclosed vehicles if held in clean containers without lids, if no spillage and splashing occurs.
- No cartooned products should be loaded in the same loading space as exposed meat.
- No unwrapped meat shall be loaded directly onto the floor.
- Workers should wear clean protective clothing (refer to Personal Hygiene Guideline).
- Random inspection of approximately 10% of the load should be carried out to check hygiene and/or contamination of meat.
- Chilled red meat carcasses, sides and quarters must be suspended without touching the floor.
- If meat is outside the temperature specification or contaminated, it shall not be loaded.
- Frozen red meat carcasses, sides and quarters may be stacked if adequately wrapped and packed;
- Loading time should be kept as short as possible to prevent temperature changes (increases or decreases) that could threaten the safety or quality of the meat.
- Close doors immediately after the truck/trailer has pulled away from dock.
- The load out checks and any action taken should be recorded on Vehicle Log Sheet. This procedure is to be carried out on each load out.

4. Transporting meat

- Responsible personnel should make sure that vehicle refrigeration units are operating satisfactorily.
- Meat and meat products are not removed from a chiller for transport unless all their surfaces are visibly dry.

- Protect products from exposure to environmental contaminants such as microbes, dust, moisture, or other physical contamination.
- Maintain the cold chain to ensure meat and meat products are kept at appropriate temperatures continuously throughout all phases of transport. This includes monitoring the temperature of the vehicle during transport.
- Meat and meat products must be kept refrigerated and protected from temperature changes. All persons involved in the transportation, storage, and handling of these products are responsible for keeping them at appropriate temperatures and preventing any break in the cold chain.
- Appropriately packaged meat and meat products can be stacked, provided that air circulation is sufficient to maintain the temperature of the products during shipment.
- The entry into meat transport vehicle of odors, smoke, dust and other environmental contamination should be effectively prevented during transportation.
- When meat is transported, the temperature must be maintained at the following levels:

    - Below 7°C for chilled meat.
    - Below minus 12°C for frozen meat.

- Air temperature of the meat carrying compartment should be monitored and recorded on the Vehicle Temperature Log during transportation.

5. Unloading meat

- Air temperature of meat compartment should be monitored on arrival.
- The condition of the meat should be checked for contamination.
- The findings should be recorded on the Vehicle Log Sheet.
- If the temperature or condition of meat has deteriorated, report APHRD inspectors for corrective actions which may include:

    - increasing refrigeration settings
    - disposal of meat if spoiled and cleaning of vehicle of any contamination.

- The cold chain of the meat should be maintained by minimizing the time of unloading and unloading meat in an appropriately chilled environment.

- Unloading should be done preferably in the evening or early morning to minimize the likelihood of meat warming.
- Workers should wear clean protective clothing (refer to Personal Hygiene Guideline).

6. Cold chain requirements at airport

- Once a meat shipment is accepted by the Federal Meat Inspectors, it should be immediately transferred to the cargo or placed in the airport storage facility.
- Before storing, the storage freezer should be checked to assure it is in good working order.
- No substances known to be toxic or harmful should be stored or maintained in the meat storage areas.
- A refrigerated room used for the storage of chilled carcasses, sides, quarters or portions shall be maintained within the range of 1 to 5°C
- A refrigerated room used for the storage of offal shall be maintained at a temperature below -2°C. If the offal is stored for longer than 72 hours the temperature should be maintained below -10°C.
- A refrigerated room used for the storage of a frozen carcass, side, quarter or portion, shall be maintained at a temperature below -10°C.
- Adequate and proper cold air circulation is required for maintaining the desired uniform temperature in all areas of the freezers and refrigerators where meat is stored.
- Proper temperatures in refrigerated and freezer spaces should be Freezer: -30 to - 18oC (-22 to 0oF) or lower; Refrigerator: 4 to 6oC (40 to 43oF).
- Relative humidity should be maintained at 85 to 90 percent in refrigerated spaces.
- The rotation of stock throughout the cold chain should be organized according to the first in-first out (FIFO) rule: the first lots to be stored are the first to be dispatched.
- All chilling, freezing and cold storage facilities for meat must comply with the Structural requirements set by MoA.
- Chillers and freezers must be equipped with dial thermometers or where required by the competent authority, continuous thermo-recorders, to give an accurate indication of the air temperature within the room.
- A chiller or freezer must have a visible permanent notice fixed to the outside, stating:

    - The capacity of the room;

    - The type of product which may be chilled, frozen or stored in it;
    - The maximum permissible product load in kilograms or number of carcasses for that room;
    - The end temperature required for the meat in degrees Celsius and the minimum period of time, in hours, which is necessary for this temperature to be achieved; and
    - In the case of a storage chiller or freezer, the maximum permissible mean temperature value at which meat may be introduced.

- Chillers must be sanitized before a fresh load of meat is loaded.
- Freezers must be defrosted and thoroughly sanitized at least once a year or more often if required by a regulatory inspector.

7. Dispatching meat for freight

- Cargo pallets, load securing devices, and loading equipment should be kept clean and free of potential food contaminants and be regularly washed and sanitized.
- Equipment used in transferring meat and meat products, such as hand trucks, containers, conveyors, and forklifts, should be well maintained and kept in a sanitary condition.
- Loading time should be kept as short as possible to prevent temperature changes (increases or decreases) that could threaten the safety or quality of the meat.
- Loading to the plane should be done preferably in the evening or early morning to minimize the likelihood of products warming.
- Meat returned to an abattoir or cold storage facility may be received only after re-inspection by the regulatory inspector, and may only be sorted and salvaged for human consumption under conditions determined by the registered inspector.

Annex 1. Calibration of thermometers

- Mix ice and water in a thermos flask or an appropriate receptacle, allowing 5–10 minutes to equilibrate.
- Stir the closed receptacle for at least a minute to aid equilibration.
- Carefully insert the testing thermometer into the ice water slurry, ensuring the thermometer is inserted sufficiently into the slurry.
- Gently swirl the receptacle for a minute.
- After a further minute record the temperature of the thermometer. The testing thermometer should read 0 ˚C.
- Place the calibrated thermometer inside the meat-carrying compartment next to the vehicle's thermometer probe. After a minute check that the vehicle's thermometer has the same reading as the calibrated thermometer.
- Calibration is carried out at least once every 12 months and results are kept.
- If the thermometer reading differs from 0˚C more than 1˚C the thermometer is recalibrated.
- If there is still a difference in the accuracy of the thermometer:

    - the difference is noted, or
    - an adjustment is made to the thermometer by the adjustment nut at the back of the thermometer.

- any corrective action is noted in the Vehicle Calibration Record.
- If it can not be calibrated, replace the thermometer.