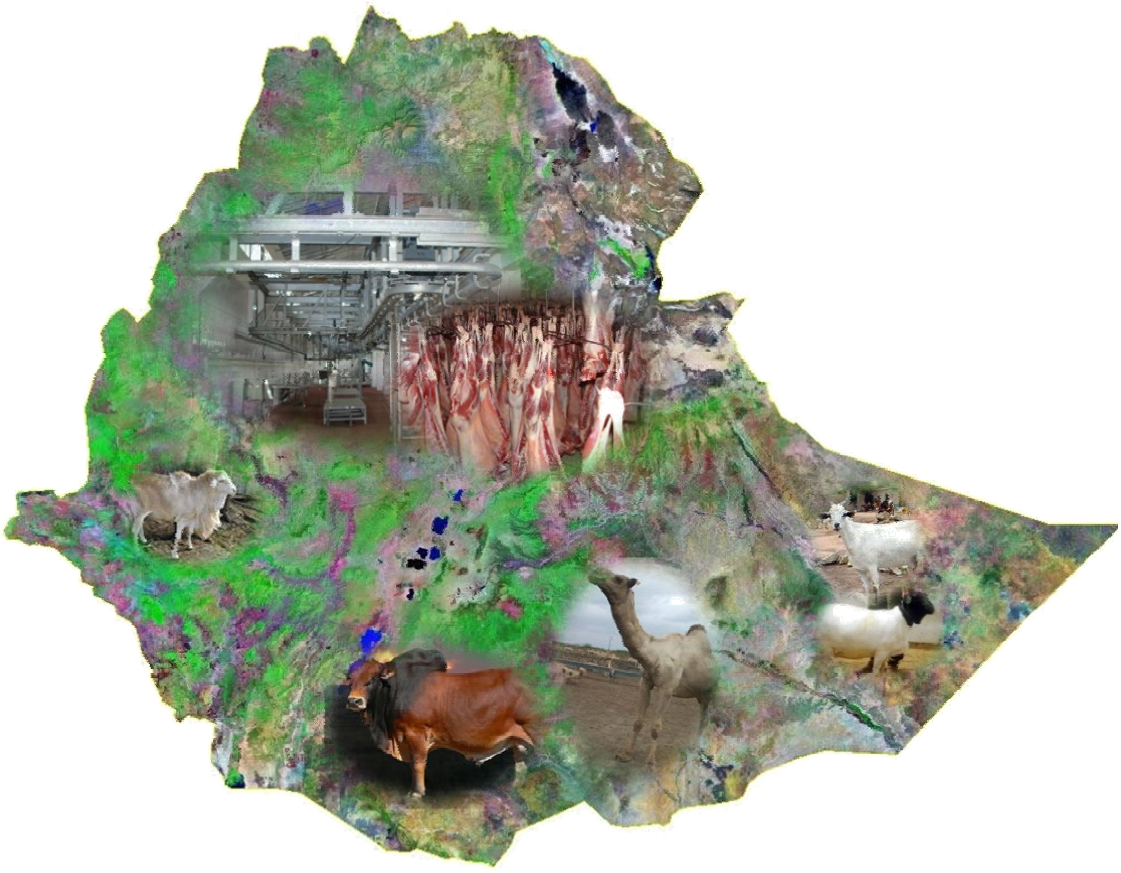
**Ministry of Agriculture and Rural Development Animal and Plant Health Regulatory Directorate**

# Construction Guideline 2

(for export abattoirs)



**November, 2008**
**Addis Ababa,**
**Ethiopia**

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## List of acronyms

| | |
|---|---|
| % | Percent |
| $^{o}$C | Degree Celsius |
| ASTM | American Society for Testing and Materials |
| Cm | Centimetre |
| cm² | Square centimeter |
| e.g. | For example |
| FRP | Fibre reinforced panels |
| H | Height |
| kgf/cm2 | Kilogram-force/square centimetre |
| L | Length |
| lux | SI unit of luminance |
| m | Meter |
| m² | Square metre |
| MoARD | Ministry of Agriculture and Rural Development |
| PVC | Polyvinylchloride |
| UV | Ultraviolet |

## Foreword

This technical document entitled "Construction Guideline 2, for Export Abattoirs" is one of the documents in a series of guidelines and Standard Operating Procedures (SOPs) developed by the Ministry of Agriculture and Rural Development (MoARD) 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.

The guideline is intended to provide inspectors and management of licensed export abattoirs with broad principles and minimum standards for plant design, layout, construction and facilities which facilitate the production of safe and wholesome meat for international markets.

The guideline includes criteria for site selection, layout and design, general and specific requirements for establishing export abattoirs in the country.

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. Nega Tewolde and Wondwosen Asfaw for preparing this guideline and SOP.

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# 1. Introduction

Concurrent with growth in international trade of livestock products, consumer preference for safe and wholesome food has increased quite considerably. Contamination of livestock products can occur at various stages in the supply chain i.e., production, processing and distribution. By practicing good abattoir hygiene and slaughtering techniques, the levels of carcass contamination can be kept low.

The design and layout of an export abattoir and its equipment shall facilitate the hygienic processing of meat and meat products and any inspection or auditing necessary during or after production. For this reason, the location, design, layout and construction of abattoir premises and the choice of fixtures, fittings and equipment are crucial to ensure that the abattoir can operate under hygienic conditions and produce meat safely. An abattoir should be designed to ensure the flow of operations from the live animal holding area through to shipping areas. Each function in the slaughter process has a fixed status in terms of "Clean" and "Dirty" areas which are separated by “Distance**”**, “Physical Barriers**”** and in certain cases by “Time**”**. In other words, meat products should proceed progressively through cleaner areas of the operation, without backtracking to areas where the product was previously handled. The layout of the premises and building must be designed so that the production process moves in one direction without any cross flow of products, which may adversely affect the hygiene of the product. For instance, live animals are received at the "Dirty" end of the abattoir and meat is out loaded from the “Clean” side of the abattoir. In planning an abattoir, provisions for expansion should not disrupt the flow of operations or interfere with efficient processing.

In general, this document will be used by inspectors and management of licensed export abattoirs as a guideline to plant layout, construction, facilities and equipment. Apart from this, it is intended to provide broad principles and minimum standards that will facilitate the production of safe and wholesome meat, meat products and byproducts.

Therefore when constructing a standard export abattoir, due consideration should be provided to the following issues. Unless and otherwise stated, this guideline refers to cattle slaughterhouses.

# 2. Site Selection

The choice of a suitable site for an abattoir is the most important aspect. Therefore, the factors listed below must be taken into account when selecting an appropriate site.

## *2.1. Environment*

- No source of contamination (e.g. objectionable odors, smoke, flying ash, etc) should occur in the environment where an abattoir is placed. E.g. a paint factory, foundry, sewage farm, river, residential area, etc.
- Abattoirs are classified as light industries and can cause water pollution. Therefore, abattoirs should be located at reasonable distances away from any river.
- The site where an abattoir is going to be established must be free from big trees that may harbor scavenging birds.

### *2.2. Geological structures and features*

- Drainage is affected by the nature of the soil e.g. sandy or loom, by the water table and the slope of the surface. Therefore, the site which is selected for the establishment of an export abattoir must promote good drainage systems.

### *2.3. Site dimensions*

- An abattoir site must be large enough to allow abattoir and allied activities to be correctly situated and oriented and provide also possibilities for future extensions.
- Lairages must not be situated on higher ground than the buildings, nor must they be closer than 10 meters so as to avoid wash down or cross contamination.
- Multiple building establishments of an abattoir must be located within one piece and self enclosed.

### *2.4. Services*

- *Water supply***:** An adequate supply of potable water must be available. Consideration should also be given to the storage and treatment of water.
- *Effluent disposal***:** An effective system for the disposal or removal of effluent and satisfactory means of garbage disposal must be provided.
- *Power source***:** There must be a reliable source of stand-by power for cooling, heating of water, lighting, as well as for the partial or total mechanization of the abattoir.
- *Access roods***:** Access roads to abattoirs should be at least compacted grovel rood as per the Ethiopian Rood Authority's Rural Road Standard (RR10). Roadways on the premises must be properly graded, compacted, dust proofed, and drained. The building verge, main internal access road, loading bays and all areas serving vehicular traffic must be either paved or tarred.
- *Isolation***:** An abattoir should be far from residential areas, social services and airfields (according to Ethiopian air transport authority regulation). A minimum buffer distance of 500 m downwind of an abattoir and 1000 m for a rendering plant is recommended to the nearest residence or residential area.
- *Abattoir compound***:** There has to be a separation either through fence or wall between the clean and dirty areas of the abattoir compound corresponding with the abattoir's internal separation.
- *Abattoir boundary fence***:** The abattoir boundary fence must be either masonry wall or wire mesh with iron poles of about 2 meters high.

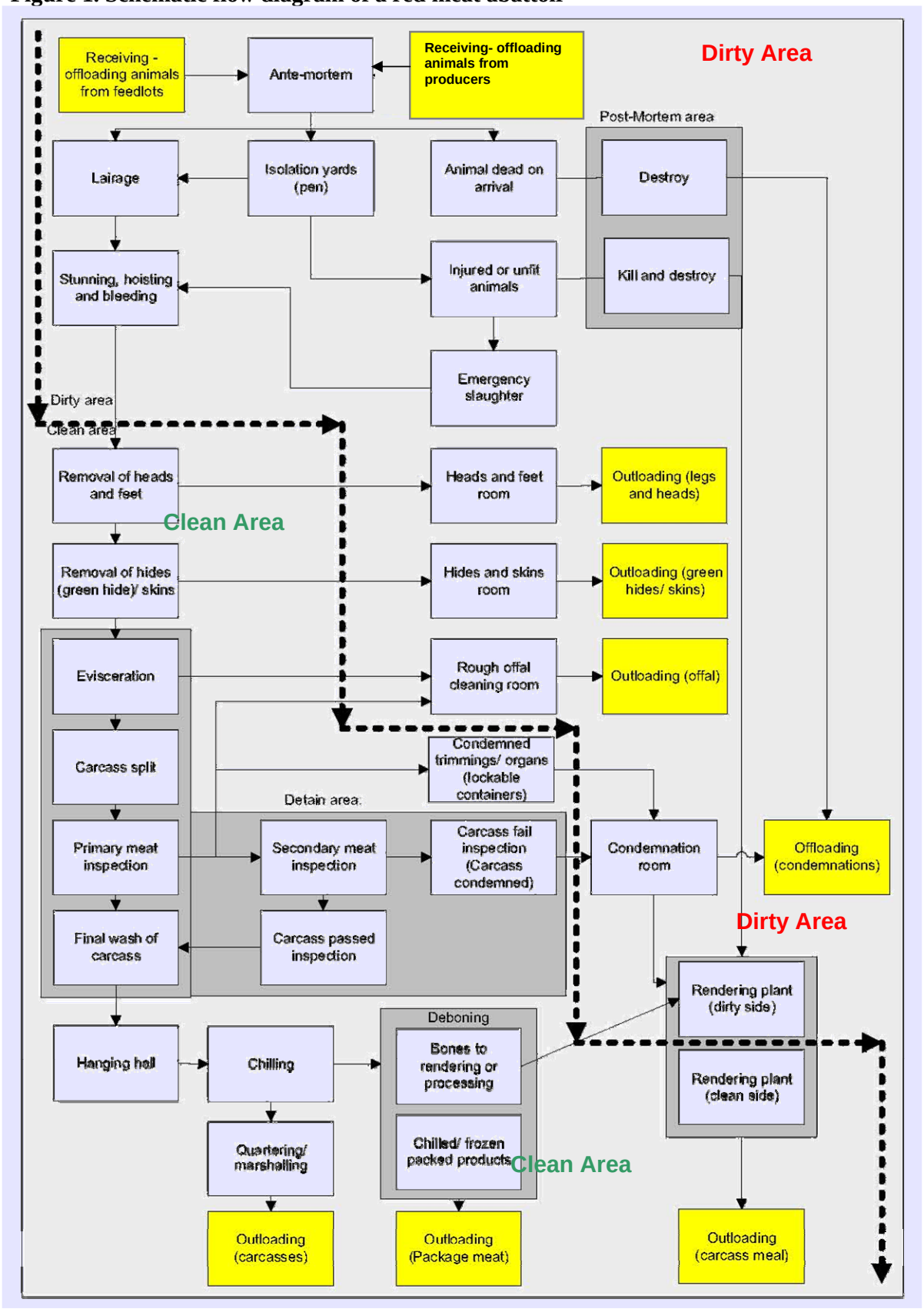
## 3. Layout and design

Because of the specialized knowledge required to design and construct a durable and well laid out export abattoir, the applicant should seek advice from MoARD.

In general, an export abattoir shall be designed to facilitate hygienic operations by means of a regulated and one way flow of process; from the arrival of raw materials through to the packaging and shipping of finished product. For example, it should be so designed that there is progression from the point where live animals are received through the slaughtering, dressing, chilling, processing, packaging, storage for finished products and shipping areas to the loading docks. As a result,

- Areas where animals are kept shall not open directly into areas where food or packaging material are handled or stored.
- Shipping and receiving areas shall be separated from processing rooms in order to prevent contamination.
- In planning an export abattoir, every effort should be made to provide for future expansion of all segments of the operation without causing serious congestion or other disruption to the flow of operation.

**Figure 1. Schematic flow diagram of a red meat abattoir**



## 4. Blueprints (plans and specifications)

A competent architect, engineer, or other person experienced in slaughterhouse design should be employed to prepare drawings and specifications. Drawings must be scaled (not less than 1:100, except for the "Site Plan") and include the following.

a. Each drawing must have a title block providing the legal address of the establishment, date, designing company name, the scale, and the compass North point.

b. The "Site Plan" shall show the entire premises. It must include the boundaries of the plant property, location of all buildings and location of the plant in respect to other buildings or structures, parking areas, loading and unloading areas, rail sidings, streams, catch basins, potable water sources e.g. water wells, storage tanks, the route of water and sewer lines including grease traps where applicable and drainage systems and surfacing materials e.g. gravel, pavement etc.; railway lines, character and surfacing of roadways, driveways, streets, parking, alleys, neighboring businesses, power lines. The "Site Plan" must also designate the limits of the official premises.

c. A floor plan showing the purpose for which each room or areas is to be used, maximum room temperature for each meat product handling area, air flow and ventilation, location and size of floor drains, location and size of direct drains for equipment using water; skylights, vents, air intakes, and other pertinent information; curbing, gutters and slope of floor towards drains and the hot and cold water outlets; location of walls, partitions, windows, doors, posts, conveyor rails and all equipment located on the floor, wall, or suspended from the ceiling e.g. draw-off fans, refrigeration units; hose bibs, sanitizers and hand wash stations, the exterior elevations of the building, showing doors, windows, platforms; flow of all products including edible meat and non-meat product(s), packaging materials, other incoming supplies, inedible meat product(s); and employee traffic throughout the establishment.

d. A cross section of the plant showing ceiling heights, rails and other pertinent information, among others, to show the relationship of all the different levels of the establishment; cross-sections of all types of walls referenced to actual location within the establishment; and cross-sections of all work stands and lifting platforms along the slaughter and processing lines.

e. Exterior elevations of the building shall show doors, windows, platforms, etc. and must correspond to the information provided under (c) above.

f. Schedule(s) shall show room internal finishes, door sizes, construction and type of door frames, lighting intensity for each room, etc.

g. An equipment layout with accompanying "Flow Charts" of operations. The design and construction of the equipment must be shown and, where necessary, cross sections provided to show method of construction and operation; and where the plans refer to alterations or changes within an existing plant, sufficient description should be made of the surrounding rooms as well as those above and below, the location of all equipment should be shown where possible in relation to the product and employee flows; the equipment location must also correspond to the appropriate parts of the project description.

h. Plumbing plan(s) shall show the location of all sewage lines (including their sizes), hand wash facilities, toilets, urinals, water fountains, hot water sanitizer(s), floor drains (including their size and connections), cross section(s) of the typical floor drain(s) including a P-trap, primer where applicable and vent, curbing, gutters, slope of floors towards drains, potable and non-potable water lines (including their connections and outlets), tool washing facilities, hose stations, water storage tanks, (if applicable, including location, size and construction material), steam lines and connections.

i. Proposed renovations, modifications or additions to existing registered establishments are required to attach copies of plans of the existing layout and construction to explain the nature, extent, and effect of proposed changes.

## 5. General requirements

Materials used to construct an export abattoir should be strong, durable, and promote satisfactory maintenance inside and outside the plant. Masonry and steel construction are proved to be the most acceptable.

### *5.1. Suitability of construction materials*

- Floor, wall and ceiling materials, as well as coatings and joint sealants must be of an approved type. Generally they must form a durable smooth impervious surface which is readily cleanable and not slippery.
- Approved finishing materials are indicated under each specific topic.

### *5.2. Water supply*

- Average potable (drinking) water requirements per day per head of cattle and shoats kept in lairage is 45 and 5 litters, respectively.
- Abattoirs require a water supply of at least 900 litres per slaughter unit. One slaughter unit is 1 bovine (cattle) and 15 sheep/goats. The water must be available at an effective pressure and be protected against pollution. Water distribution plan should be available for normal cleaning (holding pens 10%; slaughter and dress 20%; offal area 25%; chilling 8%; ablution 7%) and hot cleaning (warm water 25% and steam 5%).
- Non-potable water should never be used in the production process. All hoses, taps and cross-connections should be equipped with anti-backflow devices. When hoses are not in use, there should be hose reels to store hose pipes away from the floor unless vertical (drop down) hoses are provided. A map of the water distribution system should be available for inspection and indicate the source, storage, treatment and the distribution of both potable and non-potable water within the factory.
- Different colour-coded pipelines must identify those carrying hot and cold potable water.
- Sufficient potable water supply either from municipal or private well source or both should be available.
- Before establishing the abattoir, the potability of the well water should be approved by public health laboratory by conducting bacteriological and chemical tests.
- Where the supply of potable water is derived from a private well, adequate protection must be provided to the well head to prevent contamination of the water supply. For

this reason, wells should be bore-holed at about 300 meters away from waste water treatment plant. Similarly, storage tanks must be located and constructed in such a way as to prevent contamination.

- There should be a metric device for adding chlorine in the correct concentration. Where automatic chlorinators, ozonization and UV light equipment are used, proper functioning of the equipment must be displayed to plant personnel and inspection staff.
- The distribution of water throughout the works should be in a range of 0.8 to 1.2 bars.
- Water from municipal source or deep wells should be pumped up to elevated reservoirs whose capacity must be adequate for at least 12 hours supply of the abattoir.
- Standby pumps are required to use in case of pump failure.
- Water supply pipes should preferably be laid parallel to and away from waste disposal pipes.

### *5.3. Hand lavatories, hand dips, drinking fountains, sanitizers and hose connections*

- Hot and cold-water hand washing facilities must be easily accessible to all processing and slaughtering areas.
- To facilitate room and equipment clean up, an adequate number of conveniently located hose connections for rooms and equipment clean up must be provided throughout the abattoir facilities. The use of long hoses should be avoided. Suitable racks or reels for hose storage should be in place.
- Hand-washing facilities of the remote-control type, (foot or knee operated or sensor) must be provided at the entrance and in all slaughtering and processing areas.
- Sanitary drinking fountains, with the overflow connected directly into a drain, should be conveniently located in work and welfare rooms.
- Sanitizers of rust-resistant material, of appropriate size, capable of maintaining water at a temperature of $82^{o}$C, and fitted with an overflow connected directly to a drain, must be so located as to permit sanitizing of knives, saws and other tools.
- Hot water of at least $82^{o}$C shall be available at hose outlets to sanitize equipment during slaughter, evisceration, and processing operations, whenever equipment is contaminated with diseased animal tissue or other contaminants. But in other areas, water at a lower temperature may be utilized, provided acceptable cleaning and sanitizing agents, which are effective at a lower temperature, are utilized.
- Temperature indicators capable of being read at a distance (e.g. dial type thermometers), shall be installed at hose outlets or at the source of supply of hot water.

### *5.4. Equipment*

- Equipment should be of easily cleaned, simple design and made of non-corrosive and rust-resistant material such as stainless steel.
- Softwood floor racks and pallets are permitted only in dry storages.
- The use of wood in meat production and handling areas is prohibited for purposes other than those mentioned.

5.4.1. Equipment construction and design

- Stainless steel, like ordinary steel, oxidizes but instead of a common rust, a thin, dense, chrome oxide film forms on the surface as an armour against corrosion attack. When this oxide film on stainless steel is removed, it reforms immediately by combining with oxygen. Stainless steel's usefulness depends on its corrosion resistance. Because nickel is not added to stainless steel of the 400 series, the resistance of oxidizing conditions is reduced. Therefore, stainless steel used in meat packing plants should be of 300 or 18/8 series.
- Equipment should be designed for ease of cleaning and inspection. To facilitate dismantling, quick opening devices that require simple or no tools should be provided.
- All welded equipment, including tables and bins, should have continuous smooth and even welded joints.
- Junctions and corners should be coved with a minimum radius of 0.6 cm to facilitate cleaning.
- Contamination by drippings from bearings, lubricants, gears, and motors must be prevented.
- Drip pans, if used, must be easily accessible for inspection and removable for cleaning.
- When using grinders, metal detectors should be provided to reduce the number of foreign particles in meat products and to protect the equipment.
- Pumps, piping and other conduits must be easily dismountable and easily cleaned by means of dairy or sanitary-type fittings.
- Rust-resistant metal chutes must be accessible for thorough and regular cleaning. Long chutes are discouraged, but if used, should be dismountable for cleaning.
- Chutes leading from edible to inedible products departments should be hooded.
- Stationary equipment must be installed away from walls and ceilings to provide sufficient access for cleaning.
- Where stands are necessary for the proper conduct of work, they should be of tile, concrete, or rust-resistant metal and be capable of being readily maintained in a clean and sanitary condition.
- Permanently mounted equipment should either be installed at sufficient distance away from the walls and floor to permit cleaning and inspection or be completely sealed to the walls or floor.
- Copper is not acceptable for equipment which contacts edible meat products. Copper piping should not be used when ammonia refrigeration is utilized.
- Cadmium is not acceptable in the construction of equipment used for handling edible meat products.
- Lead shall not be used in the construction of equipment contacting edible meat products.
- The use of aluminium should be limited to applications where the metal does not directly contact the meat.
- Equipment with painted surfaces contacting meat products is not acceptable.
- The use of containers or equipment made of enamel ware or porcelain is not acceptable for any purpose in connection with the handling and processing of meat products.
- Portable equipment used for collecting, holding and transferring condemned and other inedible material must be of industrial grade, non toxic plastic or rust-

resistant metal, water-tight, covered, and distinctly and uniformly marked for identification.

5.4.2. Cleaning of equipment

- Hot and cold water must be available in all workrooms.
- Portable equipment should be cleaned in a designated room to minimize exposure of meat products to splash contamination.
- The cleaning room must have adequate lighting, ventilation, drainage and an exhaust fan to remove steam vapours. High-pressure spray cleaning equipment should be installed.
- Inedible holding containers must be thoroughly cleaned in the inedible department before being returned to the edible department.
- All knives, scabbards, steels, hooks, aprons and other tools must be stored on conveniently located rust-resistant racks or multiple scabbards, and not in clothes lockers.

### *5.5. Drains*

- Overhead drain lines should be avoided in the slaughter and processing rooms.
- Adequate drainage must be available throughout the establishment.
- All drain lines should be sloped at least 2 cm per meter and have an inside diameter not less than 10 cm, be deep-seal trapped, properly vented to the outside air, and equipped with effective rodent screens.
- Drains should be of metal (cast or galvanized iron pipe) or PVC.
- Properly constructed valley drains are permitted in slaughter and evisceration areas, if they are an integral part of the floor.
- Properly sloped gutter or channel drains are also permitted in slaughter and evisceration areas, if constructed of pre-cast metal, vitreous tile or the like, and covered with removable sectional grated covers. The sections of the covers should not be longer than 120 cm. In many instances, it is necessary to provide a continuous flow of water within the gutter, to allow the heavier waste products to move.
- Drain inlets should be at least 30 x 30 cm or equivalent, with a minimum free area of 30% of the total areas where significant amount of water is being discharged during operations or sanitations. As a general rule, one drain inlet should be provided for each 40 $m^2$ of floor space.
- Drain covers shall be provided with apertures having a minimum size of 4 $cm^2$. Screw plugs or other acceptable alternatives should be provided where water seal may evaporate in the traps (e.g. storages, drying rooms and freezers).
- All coolers and freezers must be properly drained.
- The number of drain inlets and their size must be increased in areas of high water discharge, to provide proper and constant removal of the fluid wastes.
- Equipment discharging a large volume of water shall be provided with direct drainage, preventing water from flooding the surrounding areas.
- Where several 10 cm drainage lines discharge into one trunk line, the trunk line must be proportionately larger, to handle efficiently the fluids discharged into it.
- Floors should slope uniformly to drain inlets, with no low spots to collect liquids.
- Toilet and urinal drain lines should be separate and apart from other drain lines.
- All drain inlets must be provided with solid traps, and prevent access of vermin and obnoxious odours.

### *5.6. Sewage disposal*

- Connection into a municipal system is not recommended. There should be private means of disposing off plant effluent which complies with local municipal requirements.
- Any waste treatment plant should be at least 50 meters away from the slaughter hall and accessories.
- Septic tanks and soak pits shall be located on lower points relative to water wells.
- Septic tanks and soak pits must be located separately from water wells at a distance of at least 50-100 meters.
- Dry animal and other solid wastes ought to be avoided according to sanitary and environmental protection principles of the Ethiopian Environmental Protection Authority.

### *5.7. Disposal of paunch and intestinal contents*

- Proper means for the emptying, transferring out of the building, collecting and removal from the premises of disposal of paunch and intestinal contents must be provided in the inedible section of the plant to ensure that no objectionable condition occurs.
- Solid waste must be handled with proper container for removal. The rest wash and liquid waste must be dumped out or drained as appropriate.

### *5.8. Catch basins*

- All catch basins, grease traps, interceptors and other means of separating organic matter from the plant effluent shall be located in an inedible section of the establishment or outside.
- These facilities must be so constructed as to be readily maintained in a clean and sanitary condition.
- The effluent in catch basins must be skimmed regularly to remove organic material in a fresh state.
- The area surrounding an outside catch basin should have an impervious surface and shall be sloped towards the catch basin.

### *5.9. Lighting*

- A three-phase grid electricity supply and/or appropriate diesel engine is required.
- All rooms and areas of the establishment must be properly lighted, either naturally or artificially or both.
- The intensity of the illumination shall not be less than
    - 540 lux at all inspection sites.
    - 110 lux in all areas where edible products are handled, at the working surface level.
    - 110 lux in coolers, at the level of the front shank of carcasses when the room is full with carcasses, and at the lowest level of open product storage (offal).
    - 220 lux in offal coolers, at the packaging point/table level and
    - 220 lux in all workrooms, at the working surface level (e.g. slaughter floor, processing areas, boning/cutting rooms, etc).

- Special attention must be given to the amount and direction of lighting in inspection areas, to prevent glare while providing the required maximum illumination. Readings should be taken at a height of 1 m from the floor or at the level at which the work is conducted.
- Where natural light is provided, it should be by means of glass blocks or other acceptable transparent or semi-transparent material. Normal non-colour corrected lights are acceptable.
- Light sources and fixtures must not be a potential source of contamination to meat products. In this regard, design and location of light sources and fixtures are important considerations. Therefore, there should be shatterproof protective shields for lighting equipment at the work room and it should be moisture proof.

### *5.10. Ventilation*

- In planning and designing a plant's ventilation system, care and attention must be taken to separate departments and control air movement and eliminate undesirable conditions such as steam, excess moisture, odours, dust, dirt or variations in temperature.
- Adequate means must exist to provide sufficient exchange of air, and to keep air fresh, free of odours, steam and vapour in all parts of the registered establishment.
- In refrigerated workrooms, mechanical ventilation shall be sufficient to keep walls and ceilings free of condensation.
- Proper location of air intakes and use of effective filters is essential to prevent the introduction of air contaminated with insects, dust, smoke, objectionable odours, etc.
- Air must not flow from a microbiologically less clean area towards a "cleaner" area (e.g. from the kill floor to the processing areas).
- High-temperature edible and inedible rendering equipment, driers and evaporators must be equipped with condensers. All equipments that produce heat, steam, vapour, smoke or odour must be properly vented.

### *5.11. Walls*

- To promote acceptable sanitary maintenance, it is essential that walls be of smooth, hard and impervious material (e.g. accepted prefabricated panels or food grade epoxy), and be free of pitting, indentations, cracks, crevices and ledges.
- All corners and wall-floor junctions, except for office space, shall be coved with either a round cove with a radius of at least 2.5 cm or a minimum 3.5 cm face chamfer with open angles of 1350.
- Wall surfaces should be white or light-colored for light reflection and to promote sanitation.
- All concrete joints must be smooth and flush.
- Walls made of prefabricated panels or covered with fibre reinforced panels (FRP) shall be protected at the base with $45^{o}$ sloped curbs that protrude from the wall surface a minimum of 50 mm and have a minimum height of 400 mm to protect them from damage. The curb construction shall be smooth, impervious, and free of cracks, chipping or other surface defects.
- While the surface finishes are of the utmost importance, one must also be concerned about the durability of the underlying structures (e.g. metal lathing rather than gypsum

lathing; metal support rather than wooden support). Wooden support structures are liable to absorb moisture and become weak and a reservoir for microbial growth.
- Walls should be provided with suitable sanitary-type bumpers or sloped curbs to protect them from damage by hand trucks or lifters.

### *5.12. Ceiling*

- To promote acceptable sanitary maintenance, it is essential that ceilings be of smooth, hard and impervious material free of pitting, indentations, cracks, crevices and ledges. Ceiling surfaces should be white or light-coloured for light reflection and to promote sanitation. It should be made of water proof materials so that foreign substances and dust can not attach to it.
- The height of ceilings of 3 m or more is suitable. Ceilings of rooms, such as livestock receiving, slaughtering and dressing require a height of at least 5 m. The ceilings which support overhead rail systems must accommodate the minimum required heights for rails. In addition, the height of ceilings must accommodate a minimum required access for cleaning and inspection of processing equipment. Such access shall not be less than 0.8 m.
- Ceilings of interlocking, rust-resistant metal sheeting, such as heavy gauge, heavy duty, galvanized steel, anodized aluminium or stainless steel, are acceptable if fastened to metal infrastructure by acceptable means. When galvanized metal is used, the zinc coating must be at least ASTM A525M grade 350.
- Open joist construction of ceilings is permitted in evisceration areas and also in carcass coolers where a carcass check trim station precedes further carcass processing or shipping. This type of ceiling is not permitted in other areas where there is exposed meat product handling. The open joist construction must be treated to prevent rusting and corrosion, spaced 0.9 m or more on centre, constructed as not to collect and harbour dust, and be readily cleaned and maintained in a sanitary condition.
- While the surface finishes of ceilings are of the utmost importance, durability of the underlying structures should be ensured.
- Materials those are absorbent and difficult to keep clean such as wood, plasterboard and porous acoustic-type boards are unacceptable.

### *5.13. Floors*

- All floors of workrooms must be of hard, impervious material such as dense, acid-resisting, non-dusting and waterproof concrete, masonry floor tile, vitrified bricks or acceptable synthetic materials.
- Floors shall be properly graded (1% toward as many drain inlets as may be necessary) for an effective removal of all fluid wastes.
- Floors of freezers are to be provided with adequate protection to preclude damage due to frost penetration into the underlying soil.
- Floors must be free of cracks and open joints.
- Floor drainage channels must drain from clean to dirty areas.

### *5.14. Doorways and doors*

- Doorways must be wide enough to facilitate the movement of product, equipment and personnel.
- Doorways, through which product is transferred must be at least 3 m wide so that there is no contact between doorjambs and the means of conveyance or product. In general, the minimum acceptable width for doors passing carcasses, smokehouse trees or trucks, or palletized product must be 0.3 m wider than the widest equipment moving through the door.
- Doors should be self-closing and of construction able to withstand the rigours of normal use.
- Doors should be of rust-resistant metal.
- The door jambs shall be of rust-resisting metal or metal clad.
- The juncture between the wall and the door jamb shall be effectively sealed with a flexible sealing compound.
- All doors leading to outside must be self-closing and lockable.
- Transparent swinging doors can be provided for internal movement in a given sanitary standard area (in dirty, clean or hygienic).
- Inter-sanitary area movement should only be through “fast-through” doors.

### *5.15. Stairs*

- All stairs in product-handling departments should be of impervious material with solid treads, closed risers and curbed sides of at least 5 cm in height, measured at the front edge of the tread.
- Catwalks or mezzanines above processing areas should be of solid masonry or metal construction with raised edges.

### *5.16. Paint*

- In general, painting is not recommended, due to the possibility of flaking and chipping.
- Lime wash is permitted only in livestock pens and drive chutes.
- Work surfaces of equipment and meat product containers must not be painted.
- Rough and epoxy gluing of the floor and walls up to a height of 2-3 meters is recommended.

### *5.17. Screens and insect control*

- Effective screens should be placed on all windows, doorways and other openings to prevent flies, insects or rodents from entering the plant.
- Fly chaser fans, ducts, or other similar devices are encouraged over the outside doorways of all shipping and receiving areas.
- Fly and insect control must also occur in the livestock section and plant surroundings.

### *5.18. Rodent proofing and control*

- Concrete or masonry and steel construction throughout, metal or metal-clad doors and door jambs, heavy metal screening of all accessible apertures and screening of sewer lines, will do much to prevent entry or habitation of rodents in a registered establishment.

### *5.19. Roadways*

- To prevent the collection of water or dust, roadways on the premises must be properly graded, dust-proofed and drained.

### *5.20. Separation*

- The establishment should be separated into “Clean” and “Dirty” areas as indicated in figure 1, where necessary, using distance, physical barrier and/or time.
- No portion of an establishment must be used as living quarters unless it is permanently separated from the establishment by a wall, floor and ceiling.
- The registered establishment shall be separate and apart from any non-registered slaughter or meat processing establishment or from any other non-compatible operation.
- A retail sales outlet may be operated at an establishment. The retail facility must functionally be separated from and should not allow public access through or into any other areas of the establishment.

### *5.21. Interior woodwork*

- Interior woodwork is permitted in administrative areas of the plant and in dry storage rooms.
- Smooth sawed or planed lumber shall be used for such interior woodwork.

### *5.22. Outside premises*

- These should be maintained in a clean and sanitary condition at all times, free of debris, dust, litter and other material likely to be a breeding place for flies, rodents and the like, or be the cause of any other objectionable conditions.

## 6. Specific Requirements

### *6.1. Premise*

- Abattoir premises must be fenced with lockable gates in order to control the unauthorised entry of vehicles, persons and animals.
- Prevailing winds must not blow from the "dirty" side to the "clean" side.
- Natural slope should allow that rainwater and runoff from the dirty area must not flow into the abattoir, nor must they flow from the dirty to the clean side of the premises.
- Tanks for the collection of effluent and pre-purification plants must be situated at the lowest point of the site, on the dirty side.
- There should be water storage, chlorination and pressure tanks. These must be on the clean side, preferably at the highest point.
- In order to control access roads and ensure staff separation, the "clean" and "dirty" areas of the premises must be physically separated.
- Vehicles which offload live animals, load intestines, heads and feet as well as vehicles removing paunch contents, condemned material and refuse in the "dirty" area should

not have access to areas where meat vehicles and staff who handle meat are to be found.

- Traffic areas in the abattoirs must have a surface that is dust and mud free, readily cleanable and well drained. The traffic zones of abattoirs must have a permanent surface. Planting of grasses and trees is not encouraged as these might attract insects.
- The abattoir compound needs to be partitioned in dirty, clean and hygienic areas with respect to the very internal partition of the abattoir. The partition shall be a properly structured, see-through material and provided with lockable gates to allow authorized cross from one area to the other.
- Specific areas such as collection points for manure from holding pens and paunch contents must also be paved, drained and provided with kerbstones.
- The main gate(s) to the abattoir should have disinfectant tubs 3m X 1m X 10-30 cm (30 cm deep at the centre) to rinse vehicle tyres.
- The length of the disinfectant tub(s) at each entrance gate to the slaughter hall shall be as wide as the entrance door.
- Cold and hot water point, pressure of 0.8 to 1.2 bar or 14 kgf/cm2 at the nozzles must be installed for cleaning meat transporting trucks.
- The truck washing area should be connected to the main drainage canal.

### *6.2. Reception*

- The reception area should have offloading platforms alongside the truck reception point.
- The length of the platform should correspond to the total length of all trucks. Docks of different heights or adjustable ramps should be provided to accommodate vehicles of varying heights.
- The unloading facilities shall be so constructed that unloading can be carried out without having a gap between the vehicle and the unloading dock. The sides of any ramps should be high enough to prevent the escape or injury of animals. Ideally, the unloading dock area should be level.
- The angle of ramp slope should not exceed $25^{o}$ from the horizontal. The platform should slope at the ends to ground level of not more than 8%.
- The sides of any ramp should be high enough to prevent the escape or injury of animals.
- Facilities shall be provided for the unloading and conveyance of crippled animals directly to the bleeding rail in a humane manner. Where these facilities are not practical, suitable facilities shall be provided for the immediate "on-the-spot" stunning and bleeding; or stunning followed by the conveyance of the stunned animal directly to the killing floor for bleeding.

### *6.3. Livestock pens (lairages)*

- Livestock pens, chutes and/or squeezes must be provided at all slaughtering establishments.
- Chutes, ramps and inclines should be cleated or "stepped" and have a reasonable incline to prevent slipping, falling or injury.
- All floors, alleyways and chutes must be impervious, paved, properly drained and scored to prevent slipping. The floor area should have rough cement mortar finishing with 1% slope to the drainage canal.

- Covered pens must be provided to ensure adequate protection of livestock received for slaughter; uncovered pens may be used to hold the overflow.
- Separate pens must be provided where mixing of species occurs at the same time.
- Watering and feeding facilities must be provided in all holding pens. There should also be adequate water supply for clean-up. There should be drainage for each pen by means of individual inlets or valley-type drains.
- There should be ample hose and water outlets for cleaning of all pens and runways.
- As ante-mortem inspection requires observation of animals in motion, adequate space must be provided in the form of an alleyway, which can regulate their movement. Adequate covering and protection must be provided in order to facilitate ante-mortem inspection under hot or rainy weather conditions.
- Adequate lighting should be provided with an intensity of at least 540 lux for the ante-mortem inspection points.
- Ante-mortem facilities should ensure protection of inspection personnel against injury.
- Hand wash and boot cleaning facilities must be available for inspection staff upon entry and exit from the livestock area. Adequate facilities for changing and storing outer protective clothing must also be available.
- A small rust-resistant metal cabinet, equipped with lock and key, should be provided for the exclusive use of the inspection staff, for the storage of supplies such as ear tags, thermometers, stethoscopes, inspection documents, etc.
- Partitions and gates of rust resistant metal pipe or tubing are preferred. Smooth sawed lumber is the minimum acceptable. Protruding nails, bolts etc., which might cause injury, are not permitted.
- The partitions of each pen should have tubular iron pipe poles of least 1.8-2 m high for cattle and 1-1.5 m for sheep and goats and purlins spaced at 20-50 cm from the floor to the top as required.
- Gates should be provided with means to prevent reversal of animals.
- Roofing should be weather proof that is against heat.
- If the lairage is to have a wall, the wall should be finished with fine cement mortar.
- There must be an open space between the wall and the roof of the lairage for ventilation.
- Each pen should be supplied with concrete water troughs at about 50 cm from the floor, with 60 cm width and 25-40cm depth across the length of one side of each pen.
- Metallic hayracks should be installed in those pens in which the animals stay until before 24-72 hours of slaughter at about 60-100 cm from the floor across the length on the opposite side of the water supply line.
- Area of about 3.25 m2 and 0.55 m2 per head of cattle and shoats is required, respectively.
- The livestock holding pen capacity at the establishment shall be sufficient to hold the number of animals slaughtered during one half slaughter shift. The capacity of each livestock pen shall indicate on the establishment drawings.

### *6.4. Isolation Pen*

- Isolation pen should be shaded and have feeding, watering and cleansing and drainage facilities.
- The drainage of isolation pens should prevent the possibility of spread of infection via fluid waste material.

- The isolation pen for each species of animals shall be constructed at least 50 m away from lairage and slaughter hall.

### *6.5. Pre-slaughter holding pens*

- Pre-slaughter holding pens should have a half shift holding capacity, be constructed of acceptable masonry and metal construction with adequate lighting and ventilation.
- To prevent dust and odours from entering the stunning and bleeding areas, pre-slaughter holding pens must be completely separated from the stunning and bleeding areas.
- These pens must be constructed and drained to permit daily floor washing.
- Must be connected to the slaughter hall with race having a minimum length of 10 m.
- The width of the path (race) leading from pre-slaughter holding pens to stunning box or directly to the slaughter hall shall not be greater than 90 cm for cattle and 35 cm for shoats (should not allow the direction reversal of animals).

### *6.6. Stunning, hoisting and bleeding areas*

- Stunning and bleeding areas must be constructed to ensure humane treatment of animals, and that the operations can be conducted and maintained in a sanitary manner.
- Stunning boxes should be excluded from the slaughtering floor, except for the door opening, in order to reduce hazards by possible aerosol contamination.
- Stunning and bleeding operations must be separated from areas where beef or shoat blood is collected.
- These areas must be equipped with hand washing and sanitizing facilities.
- Stunning boxes should allow that only one animal at a time be placed in them.
- The design of chutes, stunning boxes, restraining devices and other facilities shall be such that animals are provided with good footing and that direction reversal and injury is prevented.
- The provision of adequate restraining facilities for the ritual slaughter of all slaughter animals is a mandatory requirement. The restraining pen for Islamic slaughter shall be semi-rotary casting pen for cattle while sheep and goats can be slaughtered on a slaughtering conveyor.
- The floor of the stunning box is recommended to be 35 cm raised above the floor and should have a distance of about 0.9 m between the front and back ends of the stunning pen and any wall or obstruction. There should be a clear space of 3 m between the exit door of the pen and opposite wall or blood trough. An area of 4.5 x 3 m is required for safe working.
- A hoist hook should be set 1.8 m from the rotating exit door of the pen towards the back legs of the ejected animal.
- A landing area shall be provided in front of the stunning box, to receive stunned animals.
- An upward curved falling trough at the discharge of the stunning box needs to be provided so as to insure a gentle fall of animals.
- The landing area should be laid to falls of 50 mm in 3 m and should be kept dry as much as possible. It shall be separately drained and sufficiently separated from the bleeding area.

- The bleeding area should allow simultaneous bleeding of 2-3 cattle or 3-6 sheep and goats per line (8 m rail length).
- Bleeding areas shall be curbed and steeply graded to the blood and wash-up drains.
- The blood drain shall be of sufficient size to prevent blockage due to clotting (diameter of 33 cm or more) and sloped not less than 17 cm per meter to the discharge point.
- The bleeding trough should have smooth impervious surface and be made of either smooth concrete or rust resistant metal.
- If blood is to be collected for further use, there must be blood tank. If blood is not to be collected for further use, it has to be led to an open canal that ends up in a cesspool.

### *6.7. Slaughter and dressing hall*

- The rooms and areas shall be of sufficient size to provide adequate space for all phases of dressing and inspection operations in proper sequence and relation.
- The equipment and the layout for carcass dressing rooms must provide inspection stations that are accessible by inspectors.
- All equipment should be rust-resistant metal or other accepted material. All equipment should have an acceptable design, sufficient capacity and have a satisfactory layout for all phases of the operation.
- A held rail must be provided for all carcasses requiring inspection or further trimming. A switch off rail, which leads directly to the inedible room, should be provided for condemned carcasses.
- The floor should be finished entirely with grooved glazed tile.
- The wall must be free of pitting, indentations, cracks, cervices and ledges up to the level of rail(s) (3.7m), hard and imperious material (e.g., accepted prefabricated panels or glazed tile) and of smooth finishing to its 2/3 height with the same floor finishing (i.e. epoxy) for cement walls while sandwich panels don't require painting.
- The canal shall be open top covered with stainless steel grill.
- The hook of the hoist should be stainless steel.
- To dress carcasses of more than one compatible species of animals concurrently on the same floor, the facilities should be designed to provide for adequate segregation and physical separation.
- Stationary or elevating type platforms should be located away from the dressing rail to avoid common contact of skinned portions of carcasses. A rust-resistant protective guard shall be provided to prevent footwear contact with carcasses.
- There must be sufficient, strategically located equipment sanitizing units, hand washing facilities with disinfectant, drinking fountains and hot and cold water outlets for clean-up purposes.
- Suitable facilities and floor space must be provided for dehorning, removal and thorough washing of heads and their preparation for inspection.
- The identity of heads and all parts of the animal must be maintained until final disposition of the carcass. There shall be no drip contamination from one head to another.
- Head meat and tongues are frequently exposed to contamination and there should be a system to avoid all such contamination and maintain all portions in a sanitary condition. There should be separate chillers for head meat and tongues.

- All cattle and shoat hides removed from the carcasses on the dressing floor must be removed from the floor to properly constructed and hooded chutes or bins.
- Trimming, fleshing and grading of hides must not be done on the killing floor but in separate rooms designed for this purpose or in the hide-curing room.
- The slaughter hall must be furnished with wash hand basin(s) and disinfectant, pressurized water hoses of 0.8 to 1.2 bar (14kgf/cm2) and knife sterilizing boxes at every work stand (platform).
- Adequate washing and sanitizing facilities for viscera inspection trucks or a stationary inspection table of each about 0.9 m length shall be provided. The hose used for sanitizing inspection trucks shall be equipped with a dial-type thermometer, to ensure that hot water having a minimum temperature of $82^{o}C$ is used.
- Facilities such as racks, or trays, or equivalent means shall be provided to accommodate and maintain the identity of organs and parts detained for veterinary diagnosis.
- A check-trim station shall be provided at a point prior to the final carcass washing station. This check-trim station shall be equipped with an adequate platform, to facilitate trimming of the dressed carcass.
- Facilities on the dressing floor should provide for the prompt removal of edible and inedible offal to their respective destinations.
- Properly constructed trucks or hooded chutes shall be provided for the prompt removal of hides and pelts, as required.
- For both moving-type and gravity-flow dressing rails, carcasses must be adequately spaced to prevent any contact between them at least until post-mortem inspection is completed. Beef carcasses should be spaced using rail stops of at least 1.5 m on centre.
- Adequate mechanical or operational measures must be incorporated to prevent the splashing and cross-contamination of carcass for both moving-type and gravity-flow dressing or bleeding rails.
- Pressure spray-washing equipment shall be used to remove blood and bone dust at the final carcass washing station.

**Table 1. Carcass spacing on the rail**

| | Dressing | Initial Cooling | Chilling or Freezing |
|---|---|---|---|
| Cattle | 1.8m | 0.5 m | 0.5 m |
| Sheep & goats | 1 m | 0.3 m | 0.3 m |

- Rails and rail support systems should be easily cleanable types and constructed from materials which resist corrosion.
- Supporting beams for rails must present surfaces, which are free of crevices.
- The rail heights shall accommodate the following minimum distances from the carcass suspension contact point to the floor. All rails shall have a minimum distance of 2.75 m from walls and pillars for cattle and 2.5 m for sheep and goats in the slaughter and dressing hall.

**Table 2. Rail height and spacing guidelines**

| Species | Bleeding | Dressing | Coolers | | |
|---|---|---|---|---|---|
| | **Minimum distance from top of rail to floor** | **Minimum distance from top of rail to floor** | **Minimum distance from top of rail to floor** | **Maximum distance from top of rail to shackle contact point on carcass** | **Minimum spacing (distance) from walls, pillars, etc** |
| Cattle | 3.7 m | 3.1 m | 3.1 m | 30 cm | 60 cm |
| Calves | 3.7 m | 2.4 m (or above level of inspection platform) | 2.4 m | 30 cm | 60 cm |
| Sheep and goats | 2.4 m | 2.0 m (or above level of inspection platform) | 2.0 m | 30 cm | 60 cm |

- The distance between double rails should be 1.5 m in the slaughter hall, but double rails leading to storage, treatment and dispatch facilities shall be spaced at least at 1 meter apart for both species.
- Hangers and hooks for liver, heart, lung, and spleen should be installed in the slaughter hall.
- Platforms, ladders, tables, chutes and similar equipment shall be rust resistant, smooth and have non-absorbent surface.
- The rails of the production room, refrigeration and freezing rooms should be connected with loading ramps for meat transportation vehicles.

### *6.8. Meat inspection points*

The following requirements apply to establishments that are registered to slaughter specific classes of food animals.

6.8.1. Head inspection point

- Head inspection point shall be located immediately after the head preparation and washing operations are performed by a plant employee.
- The minimal unobstructed space (length) for this inspection point is 1.5 m per inspector.
- When racks or conveyors are used for head inspection, the heads shall be spaced at a distance sufficient to prevent the contact of one head with another. A minimal distance of 0.6 m center to center is recommended for beef heads.

6.8.2. Viscera inspection point

- Viscera inspection point shall be located immediately after the evisceration of the animal.
- Every registered establishment slaughtering cattle at a rate of 25 or more per hour shall provide a moving top evisceration table.

- The minimum unobstructed space (length) for this inspection station is 2.5 m. Where multiple viscera inspection stations can be consolidated, 1.5 per inspection station is acceptable if all other ergonomic factors are met.

6.8.3. Carcass inspection point

- Carcass inspection point shall be located immediately after the carcass splitting operation and prior to any trimming being performed on the carcass.
- The minimum unobstructed space (length) for this inspection station is 2.5 m.
- The online carcass inspection point shall be adjustable to accommodate inspectors of different heights. The point shall be capable of being positioned so the eyes of the inspector are level with the lumbosacral area (rump) of the carcass.

6.8.4. Veterinary held rail inspection point

- Veterinary held rail inspection station shall be located as close as possible after the carcass rail inspection station and prior to company in-house trimming, inspection and final carcass wash. This station is to be independent from the operator's carcass trimming/re-processing station.
- The minimum unobstructed space (length) for this inspection station is 2.5 m.
- The veterinary held rail inspection point shall be equipped with an adjustable stand that enables the veterinarian to perform a safe and thorough inspection (visually, by palpation and/or incision) of all carcass surfaces including extremities.
- A switch-off rail, which leads directly to the inedible room or to a suitable truck or chute, should be provided for condemned carcasses.

### *6.9. Detained rooms*

- The wall of the detained rooms must be epoxy paint of up to 2 meters high from the floor.
- The floor of the rooms shall be grooved glazed tile.
- There should be a rail system connected directly from the slaughter hall.
- 5-10 head hangers with hooks and 3 x 2 m (L x H) shelf with horizontal partitions at 50 cm intervals.
- Furnished with stainless steel or marble topped inspection table.

### *6.10. Condemned and inedible rooms*

- The condemned rooms should be built in such away that the inspector can have a closer look and control over it.
- The room must be provided with a self closing door.
- The wall and floor of the room shall be epoxy resin surfaced and cement screed respectively.
- The room shall be equipped with clearly marked water tight container(s) to ensure their use for no other purpose and be furnished with hand wash basin, equipment sanitizing facilities and pressurized hot and cold water supply.

- Each room should have adequate space which allows effective segregation of inedible and condemned parts.

### *6.11. Hide, skin and feet rooms*

- Hide and skin rooms or storage areas must be properly ventilated so that they do no affect the air quality entering other areas of the plant.
- The floor of each room must be finished with cement screed with a slope of 2% to the drainage canal.
- The wall of the room should be epoxy painted.
- The drainage canal in the rooms shall be open top covered with iron grill.
- There should be hand wash basin(s) with hot and cold water supply.
- The rooms should be provided with stainless sliding metal chute.
- They must be located in the inedible section of the establishment with only the very minimum of connection with the carcass dressing room or area.
- Receiving platforms and fleshing tables should be of suitable metal construction.
- Shipment must be by direct access to the inedible loading dock or to an area designed solely for this purpose and separate from edible areas. Hides must not pass through other storage areas.
- Salt facilities for curing hides should not be part of the plant.

### *6.12. Carcass Coolers*

- All coolers have a certain maximum capacity which is dependent, not only on the refrigerating capability of the unit, but also on the provision of an adequate circulation of air. Overcrowding reduces the effectiveness of refrigeration units, not only by being too much heat generated from freshly introduced carcasses but also by interference with air circulation. Therefore, the holding capacity of all carcass chilling and holding rooms shall be indicated on the establishment drawings.
- These rooms must be designed in a manner which ensures that all products are cooled.
- The floor of the cold rooms must be resistant to blood, fat, acid, and non-slippery.
- Polystyrene of corrugated iron sheet roof should be at least 10 cm thicker than polystyrene used for wall and floor.
- The wall must be finished with epoxy.
- The hangers in the cold room should be stainless steel.
- Equipment designed to promote rapid and thorough chilling, such as racks, shallow trays, etc., shall be provided.
- The doors of the cold room shall be resistant to temperature variation and air tight with rubber gaskets and be made of non rusting material.
- The entrance of the cold storage should be along the dispatch hall.
- A suitable area must be designated in a cooler for chilling and storing "held carcasses" and parts. This section should be segregated from the remainder of the cooler and sealed or locked. A sufficient length of side rail, equipped with lockable devices (i.e. lockable rail) may be sufficient for these purposes.
- All cold storage rooms should be equipped with a thermometer, thermograph and alarm systems on the exterior wall next to the door.

### *6.13. Offal Coolers*

- When harvested for food, adequately refrigerated and constructed rooms must be provided to lower the internal temperature of offal to $4^{o}$C or lower as quickly as possible after evisceration.
- When edible offal is stored on the premises for more than 24 hours after harvest, the rooms used to store the edible offal shall be kept at a temperature of 1°C or less, as measured in the warmest spot in the room.
- Equipment designed to promote rapid and thorough chilling must be used when handling offal.

### *6.14. Freezers*

- Floors shall be properly insulated and constructed to eliminate possibilities of frost damage.
- Floor and wall racks shall be provided with proper air circulation, as required.
- All sharp (blast) freezers shall be capable of maintaining temperatures of $-25^{o}$C or lower.
- Holding freezers shall be capable of maintaining temperatures of $-18^{o}$C or lower.
- All freezer rooms shall be equipped with thermometer and thermographs.

### *6.15. Head preparation rooms*

- Should be adjacent to the bleeding and flaying area and possibly connected with a conveyor or with sliding chute.
- The wall of the room must be epoxy paint 2 meter high from the floor.
- The floor of the room shall be grooved rough epoxy paint with 2% slope.
- The room should have an open drainage canal top covered with iron grill.
- 2-3 shielded head washing cabinets and equipment sanitizing facilities should be available.
- There should be hot and cold pressurized water supply.

### *6.16. Offal preparation rooms*

- The rooms shall be adjacent to the casing cleaning rooms.
- The floor of the rooms should be grooved glazed tile with 2% slope to the drainage canal.
- The wall of the room must be epoxy paint 2 meters high from the floor.
- The drainage canal of the room should be open top covered with iron grill.
- The rooms should have rust resistant metal sliding chutes to the slaughter hall.
- The room shall be furnished with wash hand basin(s), hot and cold water supply, and pressurized water hose 0.8 to 1.2 bar, sterilizing box(s) and stainless steel or marble topped offal preparation table.

### *6.17. Cutting and de-boning rooms*

- The cutting and de-boning room should be sufficient in size to accommodate carcasses from one shift of production.
- Equipment and tools should be food-grade (stainless steel, plastic, or rubber) and not include any wood products.
- The area should be furnished with wash hand basin(s), pressurized water hose 0.8 to 1.2 bar, stainless steel or hard plastic (Akron) food grade-topped table(s), sterilizing box(es) and hot and cold water supply at strategic locations.
- This room should be enclosed and refrigerated to 10°C or less with adequate lighting (540 lux) to safely process meat products.

### *6.18. Vacuum packaging Area:*

- The vacuum packaging room is where the boneless beef will be transported, either manually or automatically for packaging.
- Vacuum packaging of small quantities of beef could be done with a simple machine and limited automation.
- Vacuum packaging of large quantities of beef requires the use of automation and conveyors.
- The layout requirement for the vacuum packaging area will include bag loaders, vacuum packaging machines, steam shrink tunnels, bag blow-off tunnels.

### *6.19. Weighing, labeling and pack off rooms*

- The pack-off area is where vacuum packaged beef will be transported, either manually or automatically, for boxing.
- This area should be separated from the production area by a wall or “pass-through” enclosure to maximize sanitation.
- The pack-off area should be refrigerated to 10°C or less, with adequate space.
- Under ideal circumstances, boxes would be delivered to this room assembled and via conveyor belt. Boxes should not be stored in this area.
- The wall should be finished with epoxy paint until 2 meters high from the floor.
- Its floor shall be a grooved cement-tile with a slope of 1% to the drainage canal.
- Weighing machine should be available.

### *6.20. Dispatch*

- Carcass in the dispatch area should be hanged on stainless steel hangers directly connected to the loading ramp.
- Shipping areas or docks must be of sound construction, properly drained, and located so that edible and inedible shipping and receiving areas are physically and operationally separated from each other.
- A satisfactory dock seals and a canopy or roof overhang must be provided at edible loading and unloading bays to protect against dust, meat condensation, etc.
- Edible shipping and receiving areas and docks should be refrigerated or designed such that meat products pass directly through to either the truck or holding cooler.
- The whole wall of the dispatch area should be finished with epoxy resin.
- The floor must be grooved cement tile with a slope of 0.5% to the drainage canal.

# 7. Other Facilities

### *7.1. Employee welfare rooms*

- Must have separate washrooms and dressing rooms for both sexes.
- The lunchroom and cafeteria may be combined.
- Access from a meat handling area shall be through a hallway or vestibule. No direct access is permitted.

### *7.2. Inspectors' office*

- Office amenities and facilities for the protection and storage of clothing, equipment and supplies of inspectors shall be provided.
- The inspectors' office should be located in the same general area as company offices.
- The operational area of the registered establishment is not a satisfactory location for the inspectors' office.
- The minimum office space requirement for a private office is 11 m² for one inspector and 1.4 m² for each additional inspector.
- There shall be an adjoining toilet and wash and dressing room facilities.
- One shower facility is required for every ten inspectors.
- The room should be furnished with shelves and lockers.

### *7.3. Washrooms toilets and urinals*

- The construction of washrooms must be of smooth, hard, impervious material such as glazed tile or smooth, steel, trowelled cement plaster, with properly drained floors.
- They shall be of adequate size for the maximum number of employees.
- Doors are to be self-closing and solid except for those requiring a louver section in the lower panel for ventilation purposes.

| No. of Employees (Per sex) | No. of toilets (Per sex) |
|---|---|
| 1-9 | 1 |
| 10-24 | 2 |
| 25-49 | 3 |
| 50-100 | 5 |
| Over 100 | 1 for each additional 30 employees |

- Urinals can be supplied under condition as above with 1 stall for 40 men.
- In female washrooms, a urinal may be substituted for a toilet.
- Toilets and urinals for male and female should be separately constructed in an area that does not bring ill effect on the products of the abattoir and should be furnished with high or low cistern flush.
- The floor of the toilets and urinals must be at least cement tiles.
- The wall, at least 1.5 m high from the floor shall be constructed with ceramic tiles.
- The toilets and urinals ought to be furnished with hand washing facilities equipped with liquid soap dispenser or solid soap holder, nail brushes, disposable towels or air drying equipment and tissue paper hunger. They should have rodent and insect proof devices. The water taps should operate in a semi-automatic or automatic ways.

- Toilets and urinals must be connected with roofed corridor to the abattoir and the walkway should be paved.
- Hand lavatories, of the remote-controlled or timed type, must be sufficient in number to meet the needs of the maximum number of employees.
- There shall also be a sufficient number of showers, where slaughtering operations are conducted.

### *7.4. Dressing rooms*

- Dressing rooms must be separate from but communicate directly with washrooms.
- The floors need not be drained but the finish must be amenable to thorough cleaning.
- Individual lockers for the use of employees shall have a $45^{o}$ slope and should have a floor clearance of not less than 35 cm. An elevated, concrete base, 15 cm high, with lockers properly anchored and sealed at the base-locker junction, is also acceptable.
- All lockers shall be of metal construction and properly ventilated.
- Cloth racks with overhead hat racks and suspended boot racks, with 35-40 cm floor clearance, of all rust-resisting metal construction may be used.
- Changing room(s) and shower(s) must be attached with slaughter hall and accessories.
- The shower(s) should be attached with changing room(s) and must have floor at least cement tiles and wall 2 meters high epoxy paint finishing.
- There must be separate changing room(s) and shower(s) for male and female workers.
- Separate changing room(s) and shower(s) should be available for employees working in areas other than the edible sections of the abattoir such as inedible and condemned rooms, lairage, etc.
- The shower(s) room(s) shall be furnished with chrome plated metal or plastic towel hanger and ceramic soap holder.
- Shower(s) attached with changing room(s) should be constructed at a rate of 1 to 15 workers for up to 100 workers and at rate of 1 to 30 workers for more than 100 workers.

### *7.5. Equipment store*

- The equipment store should be attached to the slaughter hall.
- The wall of the equipment store must be trowelled cement plaster, light plastic paint.
- The floor can have cement tile finishing.
- The equipment store should be furnished with metal shelves, painted with synthetic anti-rust paint.

### *7.6. Dry storage rooms*

- These rooms must be so constructed as to be readily maintained in a clean and sanitary condition and also to protect against dust, moisture and other undesirable conditions.
- There shall be adequate wall and floor racks and shelves.
- When provisions are made to store supplies on permanent racks, space clearance from the floor of a minimum of 30 cm shall be provided.
- The stock room should be attached to the packing area.
- The wall shall be finished at least with light plastic paint.
- The floor must have cement screed finishing.

- The room need to be equipped with metal shelf (ves).
- Supplies such as wrapping materials, cartons, stockinet and plastic bags, used to package meat products can be a source of contamination. Therefore, storage rooms must be constructed, operated and maintained to keep these materials in a sanitary condition at all times.

### *7.7. Laboratory*

- The floor must be at least cement-tile.
- The wall shall be at least white oil paint finishing and the ceiling can be chip wood.
- Hot and cold water supply should be available in the laboratory.
- The laboratory should be constructed by dividing a testing room and inspector's office separately.
- The laboratory should be equipped with the necessary instruments, devices and reagents.

### *7.8. Clothes washing & ironing room*

- The room must be supplied with hot & cold water and laundry facility.

### *7.9. First aid accommodation*

- The first aid accommodation should be available as per the standards and authorization of the Ministry of Health.
- The first aid accommodation must be kept in appropriate and accessible places.

### *7.10. Fire protection equipment*

- Portable cylinder (fire extinguisher) with chemical substance should be available as per the standards and authorization of the Fire Brigade Station.
- The fire extinguisher(s) must be kept in appropriate and accessible places.

### *7.11. Incinerator*

- The incinerator should be built on the leeward of the abattoir and height of the chimney should be higher than the height of the abattoir.
- The incinerator could be built either from metal or bricks.
- Its size should be enough to incinerate whole carcass of cattle at a time and must be at least 50 m away from the slaughterhouse and service facilities.

### *7.12. Waste disposal system*

#### *7.12.1. Waste Treatment*

- Human waste from toilets, showers and lavatories shall be dealt separately by collecting in a septic tank extended to soak pits.
- Wastewater from slaughter hall, lairage and other processing wastes must be led to waste water treatment plant by a piped system.

*7.12.2. Drainage*

- Piped waste disposal system should include manhole and other sewer appurtenance.
- Manhole covers must fit the manhole and be sealed with cement mortar when closed.
- The slope of floors shall be at least 0.5%, but for wet operation areas it should be 1%.
- The drainage canal in the slaughter hall should be open top covered with iron grills.
- Where drainage pipes are required at least one inlet shall be provided for every 40 m2 of floor area.
- The external drainage must be closed pipe system.
- Drainage should be fitted with traps (U-shaped traps) to prevent backflow.

### *7.13. Energy production unit*

- Packaged boiler, refrigeration units and an electric generator or connections to the public supply should be housed in separate rooms.
- Hot water heaters or heat exchangers for the abattoir supply shall be located in a central boiler room.
- The diesel engine room should be built separately on the leeward of the abattoir.

### *7.14. Boiler room*

- The boiler room shall be adjacent to the sterilization room.
- The wall and the floor should be finished with oil paint and cement screed respectively.

### *7.15. Sterilization room*

- The sterilization room must be adjacent to the slaughter hall or any of the accessories.
- The room shall be equipped at least with autoclave(s).
- The wall and floor should be finished with oil paint and cement screed; respectively.

### *7.16. Emergency slaughter house*

- The facilities, fittings and finishes would match those of the main slaughter hall.
- The cattle unit would be equipped with floor pulling ring, hoist and rail system, cradles and equipment sterilizer and hand washing facilities.
- The shoats unit would be the same except that it would not have a pulling hoist or rail system.
- The units should be equipped with stainless steel table, drain hole, pressurized cold and hot water supply.

### *7.17. Post-mortem inspection area*

- There should be a post-mortem inspection area for animals arriving dead or which die in lairages.

### *7.18. Maintenance workshop*

- For an efficient operation, all export abattoirs must have electrical and mechanical maintenance workshop.

### *7.19. Feed store*

- There should be hay or feed store not far away from the lairage.

## Annex 1. List of equipments for slaughtering operations

- Stunning gun, electrical head tongs or simple stunning equipment for direct blow; or ritual slaughtering device.
- Breast bone saw
- Dehider (circular disc)
- SIG knife dehider
- Horn cutter
- Leg cutter
- Loin dropper
- Beef splitting saw
- General purpose reciprocating saw
- Breaking saw
- Dehider blade reconditioned
- Knife grinding machine
- Disinfection box (sterilizer)
- Oesophagus closing device
- Knives:
    - sticking: 16 cm sharpened on both sides
    - skinning: 16 cm curved
    - a sharpening steel
    - oil or water sharpening stone
    - scabbard and belt for holding knives
- Meat saw (hand or electric) and cleaver
- Block and tackle or chain hoist strong enough to hold the weight of the animal to be slaughtered
- Pitch, chocks or skinning rock (dressing cradle)
- strong beam, tripod or track 2.4-3.4 m from the floor
- Spreader - gambrel or metal pipe
- Several buckets
- Working platforms.

Other useful additional equipment includes:

- Stunning pen
- Bleeding hooks (for vertical bleeding)
- Blood-catching trough
- Wash trough (for tripe).

The following items are necessary for sanitation of hands and tools:

- Hand wash-basin
- Sterilizers
- Disinfectant

## Annex 2. List of equipments for cutting and boning operations

- Circular saw machine
- Various sets of cutting knifes
- Security clothes
- Manual labeller
- Skin hammer
- Stainless steel hooks
- Pneumatic cutter
- Hand spraying pump
- Mobile belt conveyor
- Cutting tables
- Knife sterilizer
- Hand wash basins
- Ice machines
- Angle meat grinder
- Frozen meat cutter
- Floor and suspended wall amounted weighing scales
- Small wagons
- Cabinets
- bag loaders
- vacuum packaging machines
- steam shrink tunnels
- Bag blow-off tunnels.

## Annex 3. Requirements for licensing a new or existing export abattoir

The following is the list of information that one must submit to the MoARD for review and approval before starting modification to an existing or construction of a new export abattoir. Drawings must be drawn to scale. Information related to the requirements of an export abattoir is provided under the guideline.

a. Name, Physical and Moiling Addresses of the existing or proposed abattoir, and name of the applicant or operator.

b. Activity Summary: a site plan of species of animals you plan to slaughter, list of products that you intend to produce, their respective volumes, anticipated slaughter day(s) and hours, and anticipated schedule of other operations.

c. Site Plan: a site plan showing the boundaries of the site; location of the structure or proposed structure in respect to other buildings or structures; streets, driveways and parking sites; railway lines; sewer lines; wells; gas and water mains and power lines. The scale and the north point shall be shown.

d. Floor Plan: a floor plan of each level of the plant, showing the purpose for which each room or area is to be used, location of walls, partitions, windows, doors, posts, conveyor rails and equipment on the floor or in an elevated position, e.g., draw-off fans, refrigeration units.

e. Water Outlet and Drain Layout: a floor plan showing the location and size of floor drain inlets and drains, location and size of direct drains for pieces of equipment using large amounts of water, curbing, gutters, and slope of floor towards drains, hot and cold water outlets, water flow (entry into the plant from the main when water is coming from a municipal source) or the location and type of well, the location, size and construction material of water storage tanks, (if applicable), potable and non-potable water sources and their lines throughout the plant, etc.

f. Exterior Elevation: the exterior elevations of the building, showing doors, windows, platforms, etc.

g. Cross-section: a cross-section of the plant showing ceiling heights, rail heights and other pertinent information.

h. Roof Plan: a roof plan showing skylights, vents, drainage and other pertinent information.

i. Schedule of Finishes: a schedule of room "finishes" on or attached to the plans, including a schedule of door sizes, construction and type of door frames, etc..

j. Equipment Layout: an equipment layout with accompanying "flow charts" of operations. The design and construction of the equipment must also be shown and, where necessary!, crass-sections provided to show method of construction and operation; and

k. Flow Diagrams: production flow diagrams that indicate employee traffic patterns, product flow (row product and finished product), and non-food materials (chemicals, packaging materials, refuse, etc.) throughout the entire facility. lf there are some risks of product cross-contamination due to incompatible operations (edible and inedible, raw and ready-to-eat products etc.), this must be indicated in the flow diagrams and the operational controls that are to be implemented to prevent product cross contamination risks must be provided in writing.

l. Existing layout: where the plans refer to modifications to an existing plant, sufficient description must be made of the surrounding rooms as well as those above and below. The principal areas of change shall be shown so as to give a comprehensive explanation of the nature, extent and impact of the proposed changes. This may be accomplished by attaching copies of plans of the existing layout and construction.

m. Construction Schedule: the estimated construction start date and proposed start-up dote of the abattoir. If the abattoir will be operating during the construction period, a detailed proposal must be submitted to ensure food safety.

The Ministry highly recommends that investors refrain from undertaking construction until they have been advised of the acceptability of their plans and specifications. For this reason, investors must provide written assurance that the location, construction, facilities and nature of operations are in accordance with this guideline. This may necessitate submission of a building permit, as well as written assurance from the appropriate authorities, indicating compliance with environmental and other requirements. Failure to follow this advice may result in unnecessary expense and inconvenience as a result of suspension or even rejection of construction works.

## Annex 4. Verification

1. Application for approval_____
2. Registration certification_____
3. Site layout and design_____
4. Structure conform to design drawing_____

Recommendation

Signature _____
Name_____
Status _____
Date _____

## References

**BC Center for Disease Control, 2006.** Abattoirs code of good practice. Canadian Food Inspection Agency (CFIA).

**BC Center for Disease Control, 2006.** Abattoirs. Plant Construction, Equipment and Operational Guidelines, Canadian Food Inspection Agency (CFIA).

**MoARD, 2006.** Major Construction Requirements for Export Abattoirs, APHRD (MoARD), Addis Ababa, Ethiopia.