Foreword

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled "Development of Technical Standards for Poultry Dressing Plant" which was funded by the Department of Agriculture – National Meat Inspection Service (DA-NMIS).

This standard has been technically prepared in accordance with PAES 010-2 – Rules for the Structure and Drafting of International Standards.

This standard cancels and replaces PAES 412: 2002 - Agricultural Structures – Poultry Dressing Plant.

The word "shall" is used to indicate mandatory requirements to conform to the standard.

The word "should" is used to indicate that among several possibilities one is recommended as particularly suitable without mentioning or excluding others.

In preparation of this standard, the following documents/publications were considered:

Chapter 2 – Establishment and Equipment Design and Construction New Establishment Approval Process. http://www.inspection.gc.ca/english/anima/meavia/mmopmmhv/chap2.shtml

PAES 010-1: 2005 General – Formulation of PAES – Part 1 : General Procedures

PAES 010-2: 2005 General – Formulation of PAES – Part 2 : Rules for the Structure and Drafting

PAES 020: 2005 General – Metrication Guidelines

PAES 411:2000 Agricultural Structures – Slaughterhouse for Swine, Small and Large Animals – General Requirements

PAES 412:2002 Agricultural Structures – Poultry Dressing Plant

Presidential Decree No. 1096 - Adopting A National Building Code Of The Philippines Thereby Revising Republic Act Numbered Sixty-Five Hundred Forty-One

Federal Register. 1997. USDA/NCDA & CS Facility Guidelines for Meat Processing Plants. Rules and Regulation. Vol 62. No. 164.

Food and Agriculture Organization. Standard Plans for a Small Abattoir and Meat Market. FAO Corporate Document Repository.

Thai Agricultural Standard (TAS) 9008-2006. Good Manufacturing Practices for Poultry Abattoir. National Bureau of Agricultural Commodity and Food Standards. Ministry of Agriculture and Cooperatives. ICS 65.040.20 ISBN 974-403-404-1

United States Department of Agriculture. 1982. Guidelines for Establishing and Operating Broiler Processing Plants. Agricultural Research Service. Agriculture Handbook No. 581

Caribbean Poultry Association. HACCP Manual for Poultry Processors and Further Processors.

1 Scope

This standard specifies the minimum requirements of a large-scale poultry dressing/slaughtering plant with a capacity of above 200 heads per hour. This covers from the unloading of live birds, dressing/slaughtering, further processing (cut ups, with and without marination), storage and dispatch of carcass.

2 References

The following normative documents contain provisions, which, through the reference in this text, constitute provisions of this National Standard:

CAC/RCP 1-1969. 2003. Codex Standard for General Principles of Food Hygiene. Adopted 1969. Amendment 1999. Revisions 1997 and 2003.

DA A.O. No. 21. 2004 Mandatory Application of Good Manufacturing Practices (GMP) in All NMIC Accredited "AA" Meat Establishments.

PAES 414-1:2002 Agricultural Structures – Waste Management Structures Part 1: Agricultural Liquid Waste

PAES 422-1:2012 Agricultural Structures – Poultry Dressing/Slaughtering Plant (Part 1 – small scale)

PAES 525:2012 Slaughterhouse Equipment – Overhead Rail System for Poultry Dressing/Slaughtering Plant - Specifications

PD No. 856 Code on Sanitation of the Philippines and its Implementing Rules and Regulations (1998)

Philippine Electrical Code. 2009

Republic Act 6541 National Building Code of the Philippines (1972)

Republic Act 9296 Meat Inspection Code of the Philippines and its Implementing Rules and Regulations

Revised National Plumbing Code. 1999

3 Definitions

For the purpose of this standard, the definitions in PAES 412, PAES 422-1, RA 9296 and following shall apply:

3.1
carcass
body of slaughtered poultry animal after defeathering, evisceration, and removal of head and feet

3.2
cove
concave molding that joins wall and ceiling or floor or another wall

3.3
defeathering
plucking
process of removing feathers from the skin of the poultry animal after scalding to prepare its meat for food

3.4
dressing
slaughtering
process composed of stunning, slitting and bleeding, defeathering, eviscerating from which head, shanks, crop, oil gland and other inedible parts are removed

3.5
evisceration
process of removing the internal organs on the abdominal and thoracic cavities

3.6
giblet
edible offals

3.7
kill floor
slaughtering area

3.8
offal
by-products, organs, glands and tissue other than the meat of the dressed poultry

3.9
poultry
group of poultry animals that are mostly domesticated for their eggs, meat and/or feathers (e.g. chicken, geese, turkeys, ducks and ostriches)

3.10
poultry dressing/slaughtering plant
any premises and building established for poultry dressing/slaughtering which include cut up processes to prepare poultry meat, parts, and products for human consumption

3.11
scalding
subjecting poultry into steam or hot water to loosen feathers from its skin prior to defeathering

3.12
trench drain
trough that collects waste from a larger area and directs the flow to a drain opening

3.13
vermin
animal species regarded as pests

4 Location

4.1 The selected location shall comply with the comprehensive land use plan (CLUP) of the municipality or city.

4.2 The poultry dressing/slaughtering plant shall be located in area with at least 200 m distance to dwellings, schools, churches and other public or commercial buildings due to possible nuisance from noise and smell congestion. Likely future commercial and residential developments should also be taken into account in site selection.

4.3 The poultry dressing/slaughtering plant shall be constructed in an area conforming to the requirements of the Code of Sanitation and its Implementing Rules and Regulations as well as the National Building Code of the Philippines.

4.4 The location shall have adequate water supply and other utilities (e.g. electricity and communication services) to suffice for the needs of poultry dressing/slaughtering plant.

4.5 The direction of prevailing winds should be considered in site determination to prevent contamination to and from the meat establishment.

5 Functional and Auxiliary Areas

The poultry dressing/slaughtering plant shall conform with the hygienic requirements stated in the Codex Standard for General Principles of Food Hygiene and DA A.O. No. 21. 2004 - Mandatory Application of Good Manufacturing Practices (GMP).

5.1 Functional areas

Functional areas shall be divided into the pre-clean area and clean area.

5.1.1 Pre-clean area

5.1.1.1 Unloading bay

Unloading bay shall accommodate poultry animals in crates or coops. It shall be easy to clean and shall have provision for easy unloading from delivery trucks or vans.

5.1.1.2 Shackling area

The shackling area shall have provisions to facilitate easy and continuous restraining of poultry animals.

5.1.1.3 Stunning area

The stunning area shall have provision for installation of poultry stunner. The area shall be kept dried to avoid accidents to personnel.

5.1.1.4 Slitting and bleeding area

The slitting and bleeding area shall have adequate water supply and shall have proper drainage system. The area shall have provision for collection of blood to separate it from liquid wastes.

5.1.1.5 Scalding area

The scalding area shall have provision for installation of poultry scalder. The area shall have proper ventilation to minimize condensates.

5.1.1.6 Defeathering area

The defeathering area shall have provisions for installation of poultry defeathering machine. It shall have adequate water supply. Floor drains in this area shall have strainers to avoid clogging.

5.1.1.7 Evisceration area

The evisceration area shall be equipped with proper drainage system and adequate water supply. It shall be easy to clean and shall have provision for collecting by-products from eviscerated carcasses.

5.1.2 Clean area

5.1.2.1 Head and feet cutting area

Channels shall be provided to separate the head and feet cutting area from the evisceration area. There shall be provision for collecting removed heads and feet. The area shall be equipped with proper drainage system and adequate water supply.

5.1.2.2 Spin washing area

The spin washing area shall be located adjacent the chilling area. It shall have provision for installation of spin washers and shall be in controlled temperature.

5.1.2.3 Chilling area

The chilling area shall be located adjacent to the spin washing area and ice room. It shall have provision for installation of chilling tanks and shall be in controlled temperature.

5.1.2.4 Weighing, sorting and packing area

The weighing, sorting and packing area shall be equipped with tables for proper segregation of poultry carcass. The area shall be kept dry and clean and shall be in controlled temperature.

5.1.2.5 Packaging area

The packaging area shall have provision for stocking of crates for carcasses. An anteroom shall be provided to separate the packaging area from the dispatch bay and cold rooms.

5.1.2.6 Cold rooms

Cold rooms shall be properly insulated to maintain the freshness of carcasses. An anteroom shall be provided to separate the cold rooms from the dispatch bay and packaging area.

5.1.2.7 Dispatch bay

The dispatch bay shall have provision for easy loading of carcass into delivery trucks or vans.

5.2 Auxiliary areas

5.2.1 View deck

A view deck shall be provided in all “AAA” Accredited dressing/slaughtering plant to prevent cross-contamination from visitors and other personnel not directly involved in the slaughtering procedures (Fig.3).

5.2.2 Crates cleaning area

A separate crates cleaning area may be constructed outside the main building or in an area where cross-contamination of products is inhibited. Proper drainage and adequate water supply shall be ensured for the cleaning operations.

5.2.3 By-products area

A by-products area shall be provided to contain the by-products of poultry slaughtering for further processing and utilization. It should be located where there is no cross-contamination of carcass.

5.2.4 Anteroom

Anteroom shall be provided adjacent to the cold room to minimize condensates and to facilitate dispatch of the carcass.

5.2.5 Ice room

Ice room shall be provided for storage of ice. The walls and ceiling shall be insulated to prevent frost penetration from the room. Ice rooms shall have provision for installation of ice makers if available.

5.2.6 Meat laboratory

Meat laboratory shall be provided in all "AAA" Accredited dressing/slaughtering plant for quality control and inspections. It shall be equipped with laboratory equipment and other tools for testing and analysis.

5.2.7 Changing room

Changing room shall be provided for the employees in the dressing/slaughtering plant. The room shall have provision for hanging of clothes and racks for boots. Changing rooms should be separate from rooms or compartments where product is prepared, stored or handled. It should be separated from toilet area.

5.2.8 Locker room

Locker room may be constructed outside the main building or it should be located where there is no possible cross-contamination of the product.

5.2.9 Washing/Shower room

Washing/shower room shall be equipped with restroom and hand washing facilities which include sanitizers and hand dryer. It may be constructed outside the building or in an area where there is no possible cross-contamination of product. Washing/shower room should be located near or adjacent the locker room.

5.2.10 Offices and Conference room

Separate offices and conference rooms shall be provided for administrative staffs and meat inspectors. Conference room shall have provision for conducting meetings. Such rooms may be constructed outside the dressing/slaughtering plant.

If the offices or conference rooms are to be constructed inside the main building, it should be ensured that the rooms have no direct access to the poultry dressing/slaughtering area.

5.2.11 Electrical room

Electrical room shall be provided in the dressing/slaughtering plant to contain the panel board as well as the electrical controls for the entire dressing/slaughtering plant. Warning signs and markings shall be posted on the door of the electrical room.

5.2.12 Boiler room

A separate boiler room should be provided to prevent dirt and objectionable odors entering from it into rooms where meat products are processed or handled.

6 Minimum Required Equipment List

The dressing/slaughtering plant shall conform with the minimum requirements for equipment as stated in the National Meat Inspection Service accreditation list.

7 Structural Requirements

The poultry dressing/slaughtering plant shall be in compliance with the requirements of the National Building Code.

7.1 Floor

7.1.1 Finish floor line shall be at least one (1) meter from the ground. It shall be designed such that it shall facilitate easy receiving of live birds and dispatch of carcass.

7.1.2 Floor elevation shall be sufficient for effective drainage. There shall be a minimum slope of two to four percent uniformly from the walls to the drain.

7.1.3 Floor shall be concrete and properly reinforced to prevent cracks. It shall be constructed from materials such as dense waterproof concrete mortar containing an approved latex or synthetic resin base or equivalent. It shall have a durable finish which is easy to clean and impervious to moisture.

7.1.4 Floors in operational areas shall have a non-slip finish to reduce hazards to workers.

7.1.5 Floors where wet operations are performed shall be well drained.

7.1.6 Floor-to-wall junction shall be coved with 50 mm to 60 mm radius for easy cleaning.

7.1.7 All floor surfaces shall slope uniformly to the drains without any low areas that would permit pooling of water.

7.1.8 Floors in cold room should be provided with adequate insulation to prevent frost penetration into the underlying soil.

7.2 Walls

7.2.1 Walls shall be designed to resist all perceived load.

7.2.2 Surfaces should be smooth to ensure proper cleaning. It shall be covered with impervious material such as prefabricated panel.

7.2.3 Wall surfaces should be preferably not painted. However, if painting is required, surfaces should be painted white or light-coloured for sanitary purposes.

7.2.4 Moisture-impervious materials such as glazed brick and tile or smooth surface portland cement plaster are typically used, but other nontoxic, non-absorbent materials applied to a suitable base can be equally satisfactory. Walls shall be hygienically smooth, level, hard and consist of impervious material.

7.2.5 All wall tops and ledges shall slope at 45 º. It shall be coved at wall-to-wall junctions with a radius of 50 mm to 60 mm (Fig. 1).

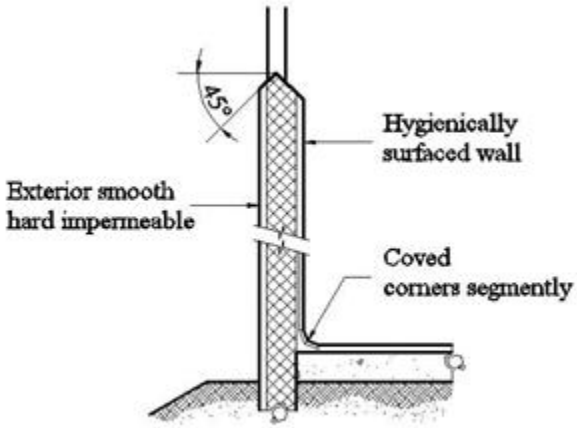


Figure 1. Coved wall-to-floor junction.

7.2.6 Walls should be provided with suitable sanitary-type bumpers or sloped curbs (Fig.2) to protect them from damage by hand trucks or lifters. Bases of the curbs shall be coved to facilitate easy cleaning.

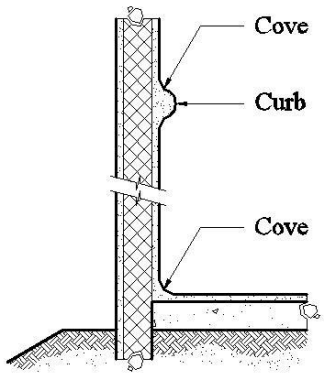


Figure 2. Sanitary-type bumper

7.2.7 Joints between walls and ceilings shall sealed.

7.2.8 Walls in cold room shall be insulated (e.g. prefabricated panel) to maintain desired temperature within the room and to avoid frost penetration. It shall maintain chilling temperature (4 to 0 °C), freezing temperature (-18 ºC and below) and blast freezing temperature (-20 to -40 °C).

7.3 Foundations and Columns

7.3.1 Foundations and columns of the poultry dressing/slaughtering plant shall conform to the National Building Code (see Annex A.12).

7.3.2 Factors which include soil type, location, wind speed and direction shall be taken into account during the design of the foundations and columns.

7.3.3 Design of foundations and columns system shall take into account the loads that will be contributed by the production live load. There shall be provision for future installations of poultry dressing/slaughtering equipment.

7.4 Roof

7.4.1 Roof shall be designed to conform with the National Building Code. It shall sustain all dead load plus unit live loads which are assumed to act vertically upon the area projected upon a horizontal plane.

7.4.2 Design of roofing system shall consider data on wind direction and wind speed for that specific location during the design phase (Annex A.10 and A.11).

7.4.3 Vents should be installed to enhance air flow in the poultry dressing/slaughtering plant. The vents shall be provided with screens properly mounted on the frames to protect the plant from infestation of vermin.

7.5 Ceiling

7.5.1 Ceiling should be at least 3 m in height from finish floor line inside operational areas except in cold room.

7.5.2 Ceiling shall be constructed from non-corrosive material (e.g. PVC sheet) or rust-resistant metal sheet fastened to the metal structure or joists by acceptable means.

7.5.3 Ceiling surfaces should be preferably not painted. However, if painting is required, surfaces should be painted white or light-coloured for sanitary purposes.

7.5.4 Ceiling shall be smoothly finished as to minimize possible mold development, flaking and accumulation of dirt.

7.5.5 Open joist construction of ceiling shall be permitted, provided joists are treated to prevent rusting, corrosion, dust accumulation and can be readily cleaned and sanitized.

7.5.6 Ceiling in cold storage room shall have proper insulations to maintain desired

temperature and to prevent frost penetration.

7.5.7 There shall be clearance for installation of overhead rail systems to conform with PAES 525.

7.6 Windows

7.6.1 Windowsills should be at least one (1) meter from the floor to avoid damage on impact from chill tanks, lifters and hand trucks. The ledges should be sloped 45 ° to promote sanitation.

7.6.2 Construction of windows must be minimized in operational areas.

7.6.3 View deck (Fig.3) may be provided along the dressing/slaughtering plant to allow contactless inspection. The view deck shall have a fixed glass window and shall be properly lighted for easy monitoring of operations. The glass window shall be shatter-proof.

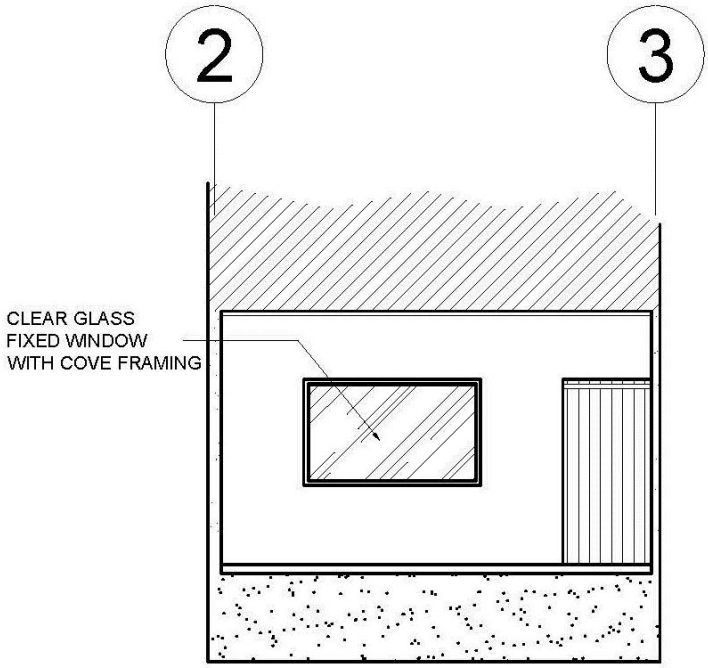


Figure 3. View deck

7.7 Doors, Doorways and Channels

7.7.1 Doorways should have a minimum width of one meter so that products transferred on rails, hand trucks or lifters do not come in contact with.

7.7.2 Doors, doorjambs and hinges shall be made of non-corrosive material (e.g. stainless steel 304). Doors shall have solid core and self-closing. The juncture between the wall and the doorjamb must be sealed with a flexible sealing compound.

7.7.3 Doorways that lead to different operational areas shall be provided with overlapping

strip curtains with 50 % overlaps. Curtains shall be made of non-corrosive material such as polycarbonate or polyvinyl chloride (PVC) which is smooth and easy to clean.

7.7.4 Doors in cold storage room shall have proper insulation to maintain desired temperature and prevent frost penetration. It shall be provided with rubber gaskets along its edges to maintain the condition inside the cold storage room.

7.7.5 Foot baths with drain shall be provided to separate operational rooms for sanitary purposes.

7.7.6 Channels for crates shall be provided to facilitate transfer of processed products for handling. Ledges of the channels shall be sloped at 45° to promote sanitation.

7.7.7 Channels shall have a smooth finish and shall not be painted. It shall be provided with overlapping strip curtains with 50% overlaps. Curtains shall be made of non-corrosive material such as polycarbonate or polyvinyl chloride.

7.7.8 An anteroom shall be provided to separate the cold storage area from the chilling and packing area. It shall have PVC curtains and/or self-closing door and shall be properly insulated to maintain temperature.

8 Lighting Requirements

8.1 To prevent glare and provide the maximum illumination, special attention shall be given to the amount and direction of lighting in inspection areas.

8.2 Light sources must not impart illumination that distorts the normal appearance of meat. Fixtures shall have protective covering to prevent contamination of carcass in case of breakage or shattering.

8.3 All rooms in which poultry is slaughtered, dressed, or otherwise processed shall have at least 323 lux of light intensity on all working surfaces.

8.4 There shall be a light intensity of 538 lux at inspection stations.

8.5 Lighting fixtures in cold room shall be water tight to prevent moisture penetration.

9 Ventilation

9.1 Ventilation system shall be designed to separate departments, control air movement and eliminate undesirable conditions such as steam, excess moisture, odors, dust, dirt or variations in temperature.

9.2 Airflow systems shall be designed to flow from clean to soiled areas (i.e., processing to kill floor).

9.3 Fresh air intakes should not be located in an area prone to contamination sources such

as odors, dust, or smoke. Air intakes shall be equipped with effective filters, which prevent the entry of insects or dust.

9.4 All refrigerated rooms shall be temperature controlled. These should be equipped with mechanical ventilation to keep walls and ceilings free of condensation.

10 Water Requirements

10.1 Potable water, under adequate pressure, and in sufficient quantities, shall be provided throughout the plant. Water potability certificates obtained by licensed establishments shall confirm potability of water and ice according to local and provincial standards.

10.2 If non-potable water is used for fire prevention or for condensers in refrigeration systems, it shall be kept completely separated from the potable water system, clearly identified, and never used where edible products are processed, handled, packaged, or stored to prevent cross-contamination of carcass.

10.3 Hand washing facilities shall have sufficient running water and hand-free operated to comply with the requirements in Codex Standard for General Principles of Food Hygiene.

10.4 Adequate and conveniently located facilities for hand washing and drying shall be provided wherever the process demands.

10.5 Management shall establish procedures to ensure quality control for water potability if automatic chlorinators are used. Fundamental controls shall include an automatic metering device for adding chlorine in the correct concentration and a warning device to indicate malfunction may at a specific point following thorough mixing in the water system.

11 Plumbing Requirements

11.1 Plumbing fixtures and layout shall conform to the Revised National Plumbing Code of the Philippines.

11.2 Plumbing fixtures, devices, and accessories shall be supplied with water in sufficient volume and at pressures adequate to enable them to function satisfactorily and without undue noise under all normal conditions of use.

11.3 The piping of the plumbing system shall be made of durable materials (e.g. G.I. pipe schedule 40), free from defective workmanship and so designed and constructed as to give satisfactory service for its reasonable expected life. PVC material shall not be used in hot water services.

11.4 Pipelines shall be color coded to distinguish potable water lines from other lines. Blue pipes shall be used for potable water lines.

12 Drainage Requirements

12.1 The drainage system shall be designed to provide an adequate circulation of air in pipes with no danger of siphonage, aspiration, or forcing of trap seals under condition of ordinary use.

12.2 Drainage pipe shall be made of ABS lined canal, PVC pipes, PE pipes or other approved materials having a smooth and uniform bore.

12.3 For trench drains (Fig. 4), the bottom of each shall have a slope of two to four percent. Open type canal shall have a minimum dimension of 20 cm x 20 cm and shall have a cover made of non-corrosive material (e.g. engineering plastic or polycarbonate).

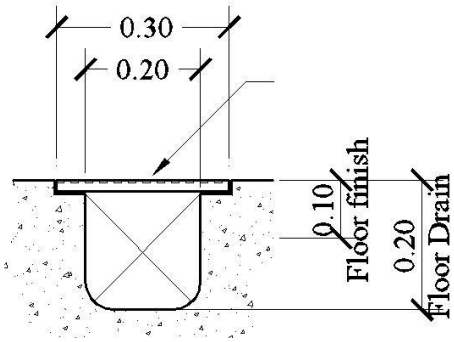


Figure 4. Drain cross-section

12.4 Sanitary sewage from buildings and neutralized or pre-treated industrial wastewater shall be discharged directly into a wastewater treatment facility in accordance with the criteria set by the Code on Sanitation of the Philippines.

12.5 Black or dark grey pipes shall be used for drainage system.

13 Electrical Requirements

13.1 During the design phase, the total load shall take into account the individual load of equipment in the plant.

13.2 Panel board equipped with main and branch circuit breakers shall be provided. A separate electrical room shall be provided to house the main switchboard and its accessory devices.

13.3 Wiring systems shall be protected by rigid PVC conduit or its equivalent. Where portions of the conduit are known to be subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the conduit shall be filled with an approved material to prevent the circulation of warm air to a colder section of the conduit. Orange pipes shall be used for electrical lines.

13.4 Receptacle outlets shall be installed at around 1 m to 1.5 m above the floor level. Such convenience outlets shall be waterproof type. The rating of an outlet shall be calculated based on the ampere rating of the appliance or load to be served.

13.5 Branch-circuit conductors or feeders shall have an ampere rating not less than the maximum load to be served. Branch circuit conductors or feeders and equipment shall be protected by overcurrent devices that have a rating not less than the non-continuous load plus 125 % of the continuous load except when the assembly, including the overcurrent devices protecting the branch circuit(s) or feeder(s), is listed for operation at 100 % of its rating. In such case, the ampere rating of the overcurrent device shall be permitted to be not less than the sum of the continuous load plus the non-continuous load.

13.6 Branch circuit conductors that supply a single motor used in a continuous duty application shall have an ampere rating of not less than 125 % of the motor's full-load current rating. Conductors supplying several motors, or a motor(s) and other load(s), shall have an ampacity not less than 125 % of the full-load current rating of the highest rated motor plus the sum of the full-load current ratings of all the other motors in the group, plus the ampere rating required for the other loads. Overload devices intended to protect motors, motor-control apparatus, and motor branch-circuit conductors against excessive heating due to motor overloads and failure to start shall be provided.

13.7 Branch circuits shall be rated in accordance with the maximum permitted ampere rating or setting of the overcurrent device. Where conductors of higher ampacity are used for any reason, the ampere rating or setting of the specified overcurrent device shall determine the circuit rating.

13.8 For lighting and other utilization equipment, the branch circuit shall have an ampere rating of 15 A to 20 A. For other non-lighting equipment and convenience outlets, the ampere rating of the branch circuit shall be at least 50 A in compliance with the requirements stated in the Philippine Electrical Code.

13.9 The minimum size of conductors to be used shall conform to the requirements of the branch circuits (Table 1).

Table 1. Minimum size of conductors (Philippine Electrical Code 2009)

Circuit Rating	15A	20A	30A	40A	50A
Circuit wires (copper conductors)	**2.0 mm^2** (14 AWG)	**3.5 mm^2** (12 AWG)	**5.5 mm^2** (10 AWG)	**8.0 mm^2** (8 AWG)	**14 mm^2** (6 AWG)
Taps	**2.0 mm^2** (14 AWG)	**2.0 mm^2** (14 AWG)	**2.0 mm^2** (14 AWG)	**3.5 mm^2** (12 AWG)	**3.5 mm^2** (12 AWG)
Fixture wires and conductors		**0.75 mm^2** (18 AWG), up to 15 m of run length **1.25 mm^2** (16 AWG), up to 30 m of run length **2.0 mm^2** (14 AWG) and larger	**2.0 mm^2** (14 AWG) and larger	**3.5 mm^2** (12 AWG) and larger	**3.5 mm^2** (12 AWG) and larger

13.10 Electronic temperature controls shall be installed for regulating temperature in cold storage area.

13.11 For spaces containing equipment requiring servicing, such as heating, air-conditioning, and refrigeration equipment, at least one lighting outlet containing a switch or controlled by a wall switch shall be installed in such spaces. At least one point of control shall be at the usual point of entry to these spaces. The lighting outlet shall be provided at or near the equipment requiring servicing.

13.12 Sufficient access and working space shall be provided and maintained for all electric equipment to permit ready and safe operation and maintenance of such equipment.

13.12.1 The depth of the working space in the direction of live parts shall not be less than that specified in Table 2 below:

Table 2. Working Spaces (Philippine Electrical Code 2009)

Nominal Voltage to Ground	Minimum Clear Distance (mm)		
	Condition 1	Condition 2	Condition 3
0-150	900	900	900
151-600	900	1000	1200

Note: Where the conditions are as follows:
Condition 1 — Exposed live parts on one side of the working space and no live or grounded parts on the other side of the working space, or exposed live parts on both sides of the working space that are effectively guarded by insulating materials.
Condition 2 — Exposed live parts on one side of the working space and grounded parts on the other side of the working space. Concrete, brick, or tile walls shall be considered as grounded.
Condition 3 — Exposed live parts on both sides of the working space.

13.12.2 The width of the working space in front of the electric equipment shall be the width of the equipment or 750 mm, whichever is greater. In all cases, the work space shall permit at least a 90 degree opening of equipment doors or hinged panels.

13.12.3 The minimum headroom of working spaces for service equipment, switchboards, panel boards, or motor control centers shall be 2000 mm. Where the electrical equipment exceeds 2000 mm in height, the minimum headroom shall not be less than the height of the equipment. Other equipment associated with the electrical installation and is located above or below the electrical equipment shall be permitted to extend not more than 150 mm beyond the front of the electrical equipment.

13.13 A 15A or 20A rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air-conditioning, and refrigeration equipment. The receptacle shall be located on the same level and within 7 600 mm of the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment disconnecting means.

13.14 Heaters and related equipment installed in damp or wet locations shall be constructed and installed so that water or other liquids cannot enter or accumulate in or on wired sections, electrical components, or ductwork.

14 Waste Disposal

Wastes from the poultry slaughtering plant shall be segregated to separate solid from liquid wastes. Liquid wastes shall be directed into the wastewater treatment facility which conforms to PAES 414-1, while solid wastes shall be collected and shall be forwarded to the municipal waste management facility.

14.1 Feathers and poultry viscera

To control insects and to prevent offensive odors, feathers and poultry viscera shall be promptly removed. Perforated barrels should be used for holding feathers until loaded on trucks and removed from the plant. Trucks should be used for feathers directly conveyed from poultry dressing/slaughtering rooms provided truck apron and/or dock areas are satisfactorily paved and sloped to drains and cleaned daily

14.2 Liquid wastes

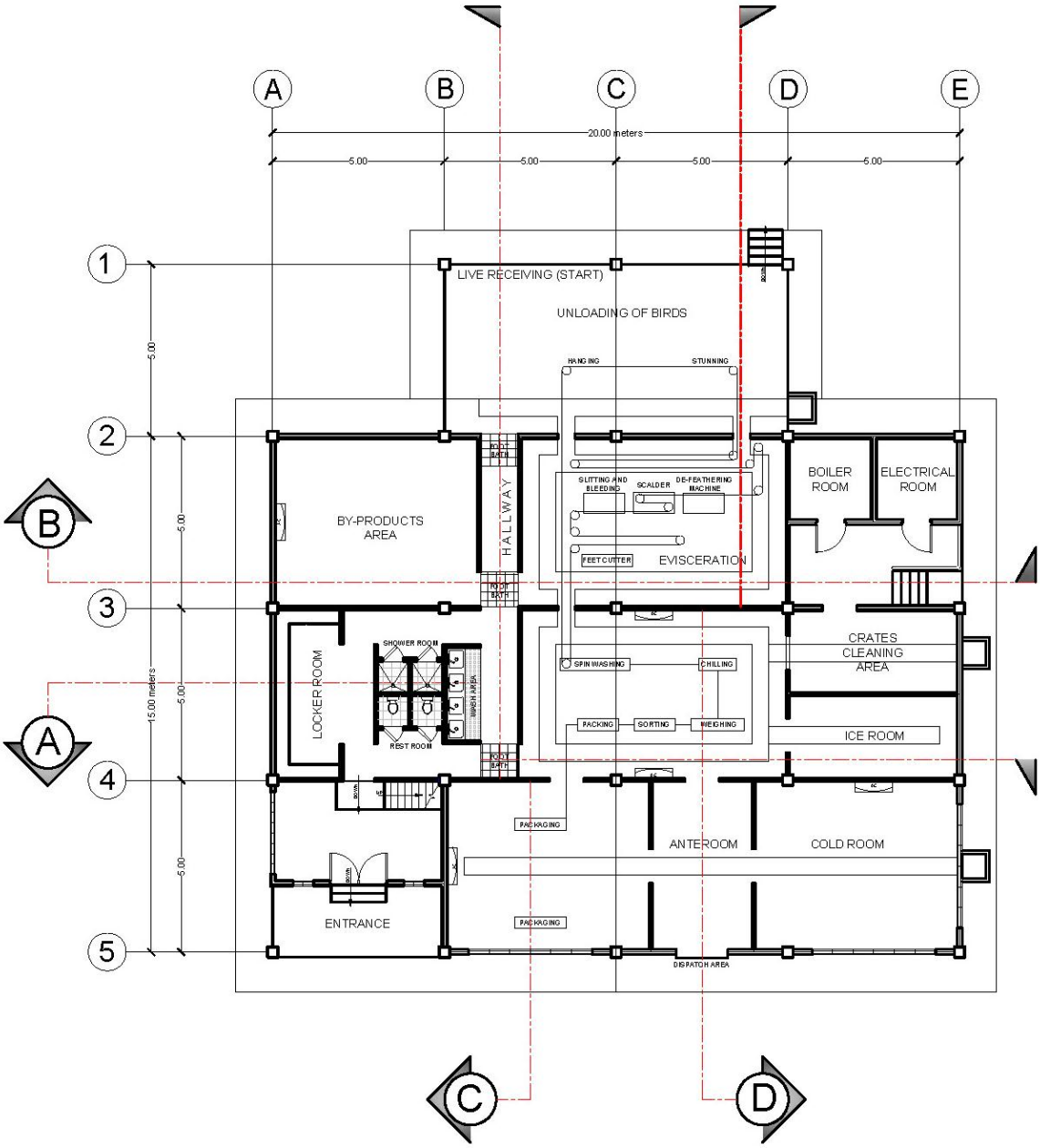
Liquid wastes shall be removed promptly. Wastes shall not accumulate in work areas, around premises, or on floors to prevent sanitation hazards. Blood shall be completely separated from waste water.

14.3 Manure

Properly drained concrete storage bins should be used for temporary storage provided manure is removed at least weekly. The bins shall be thoroughly cleaned before reuse and shall be protected from insect and rodent infestations.

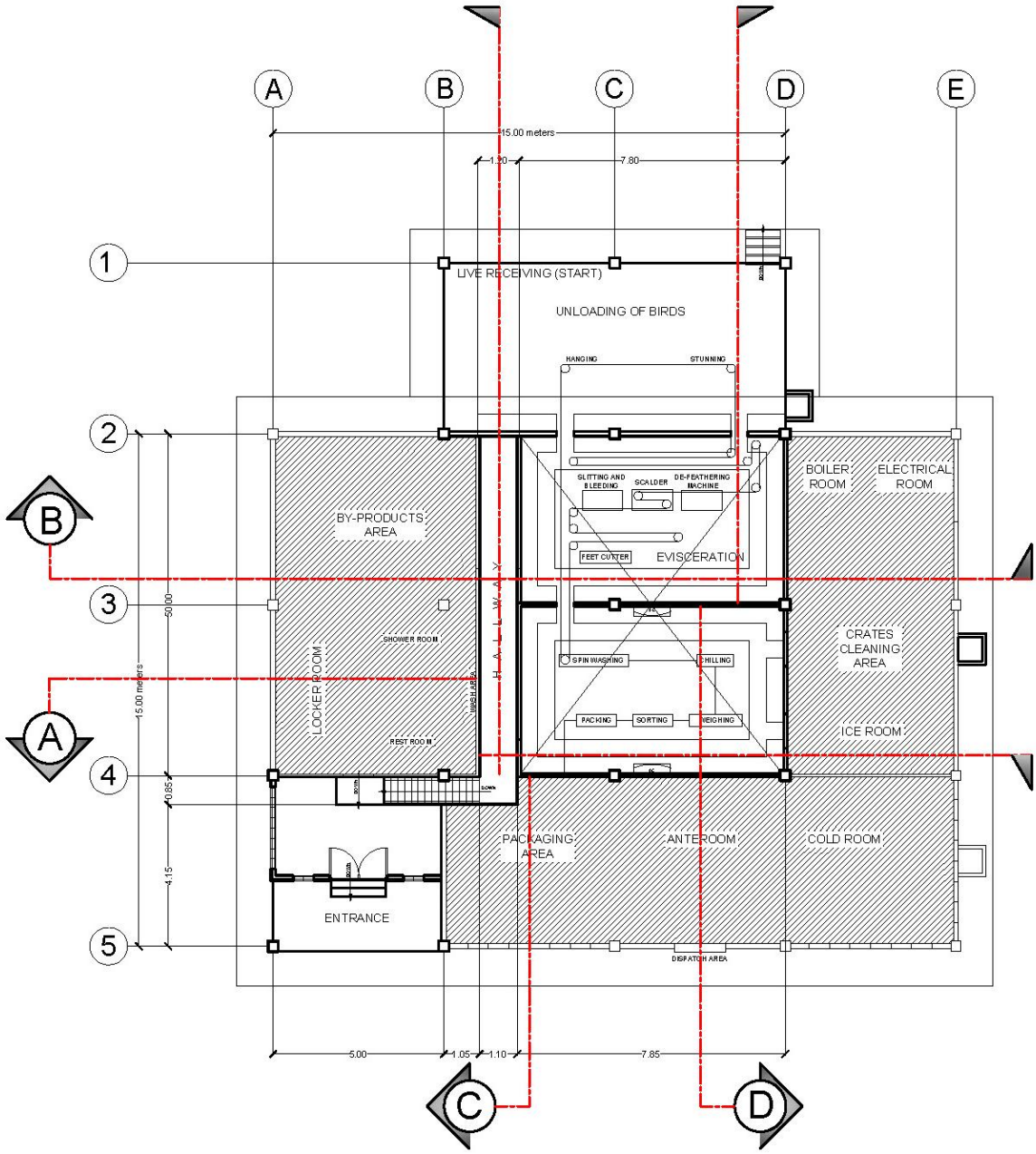
Annex A

A.1 Sample poultry dressing/slaughtering plant floor plan[1]



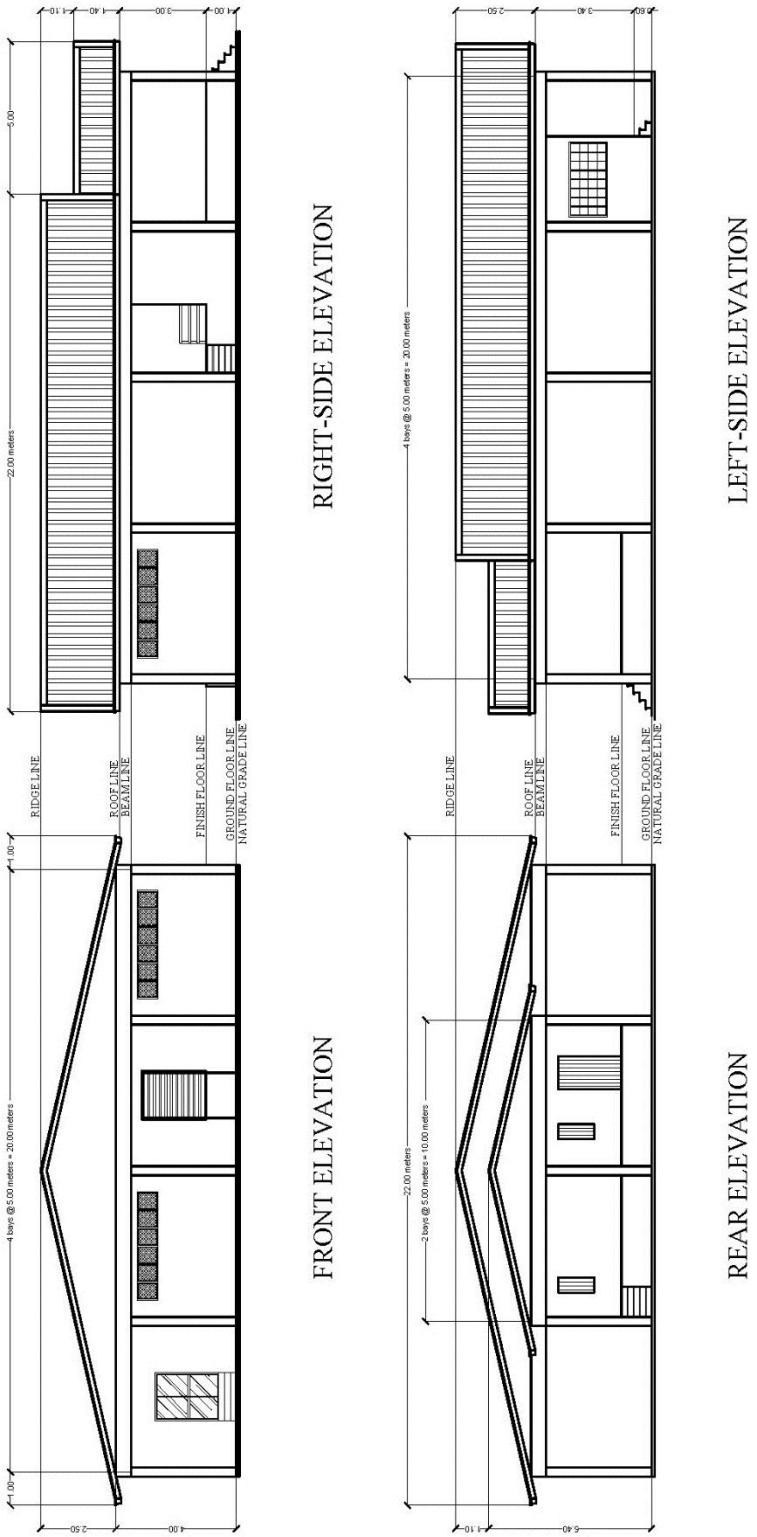
[1] **Scale 1:200 m. Not for construction purposes**

A.2 Sample view deck plan[2]



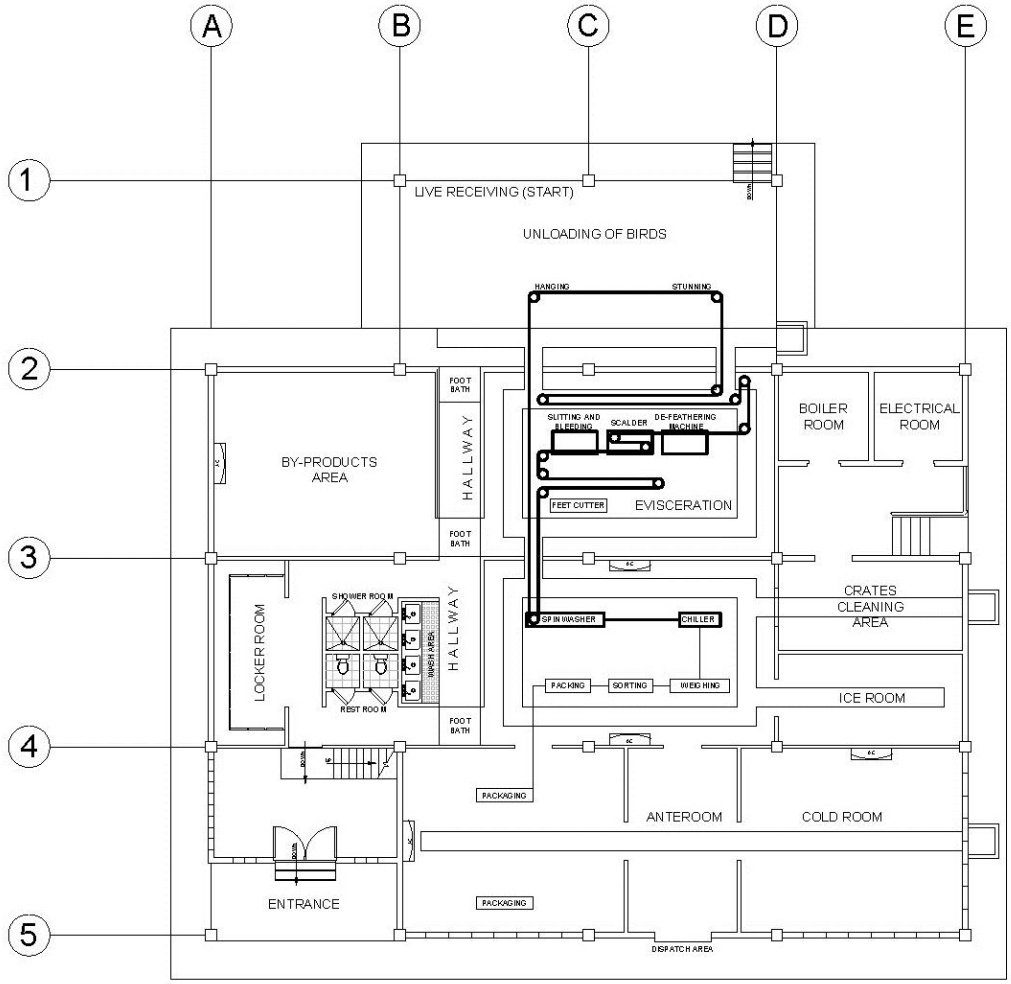
[2] **Scale 1:200 m. Not for construction purposes**

A.3 Sample poultry dressing/slaughtering plant elevation[3]



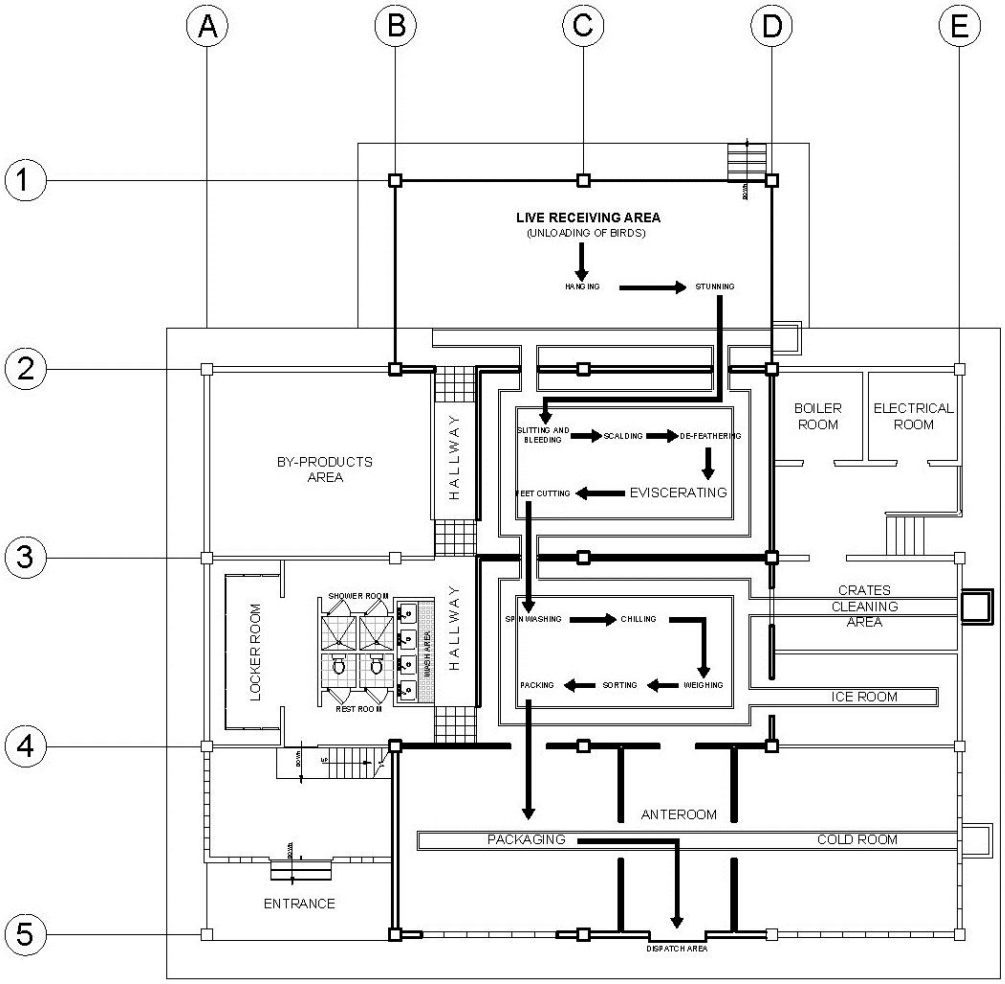
[3] **Not drawn to scale. Not for construction purposes**

A.4. Equipment layout[4]



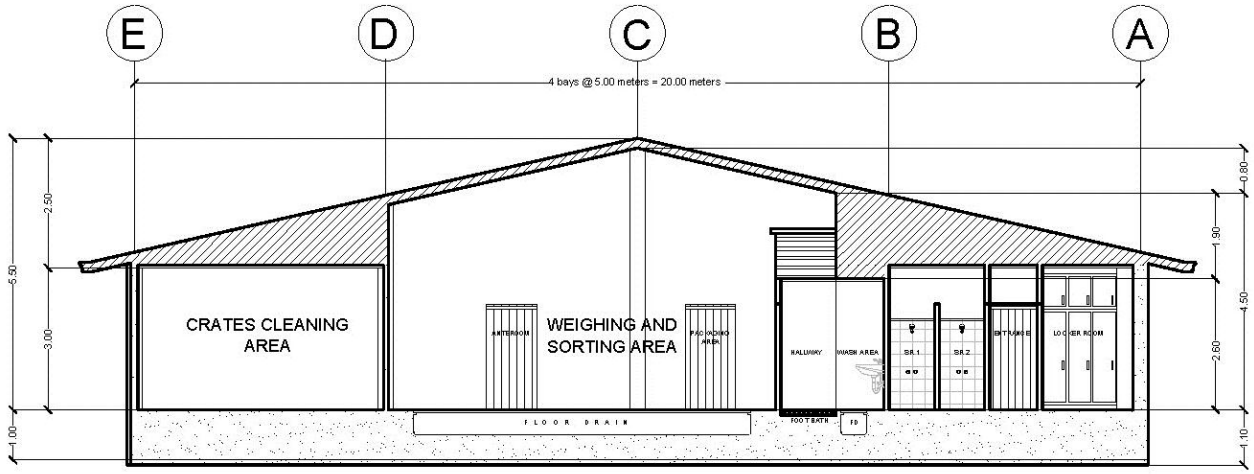
[4] **Scale 1:200 m. Not for construction purposes**

A.5. Process layout [5]

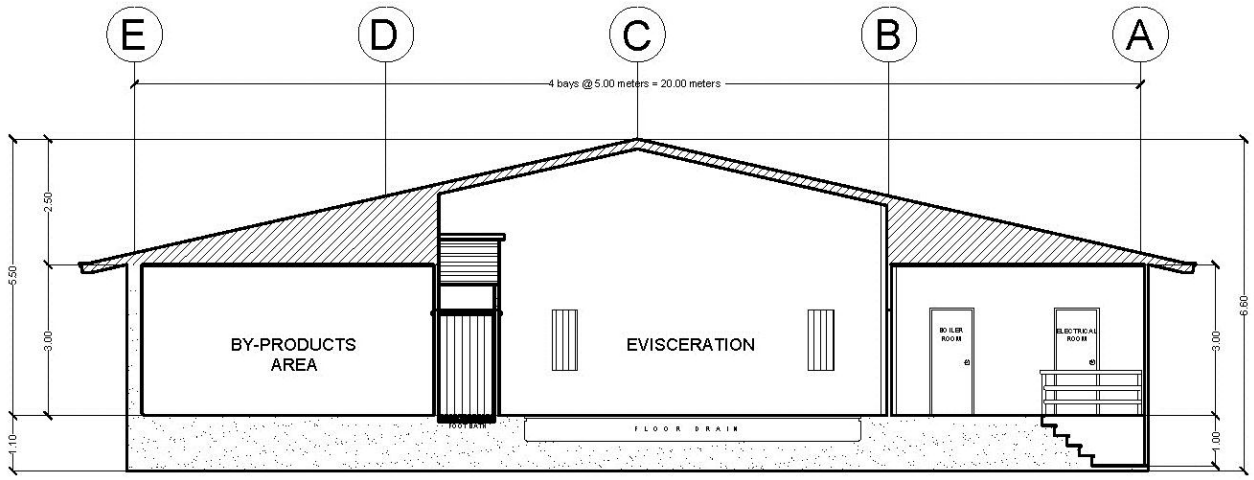


[5] **Scale 1:200 m. Not for construction purposes**

A.6. Cross-section view [6]



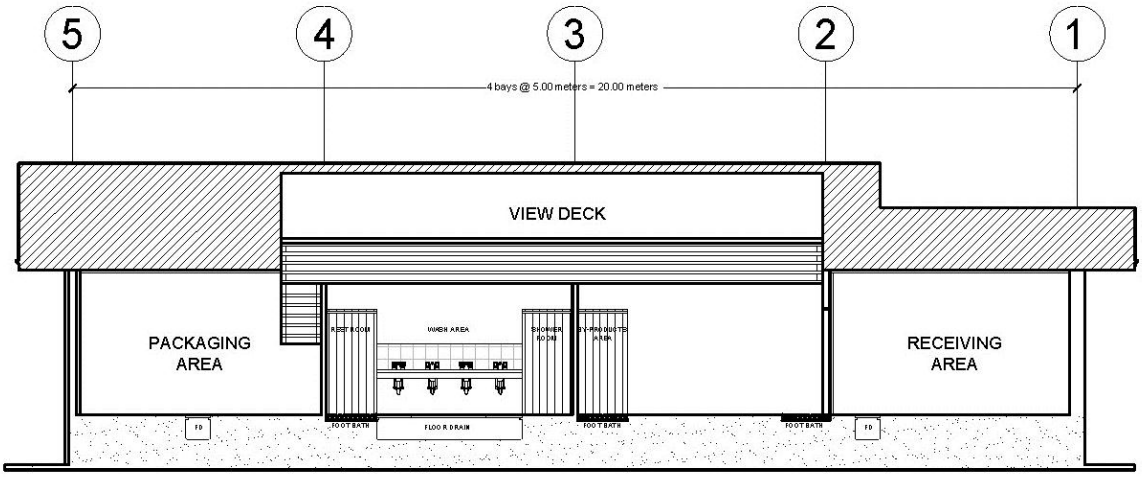
SECTION THRU "A-A"



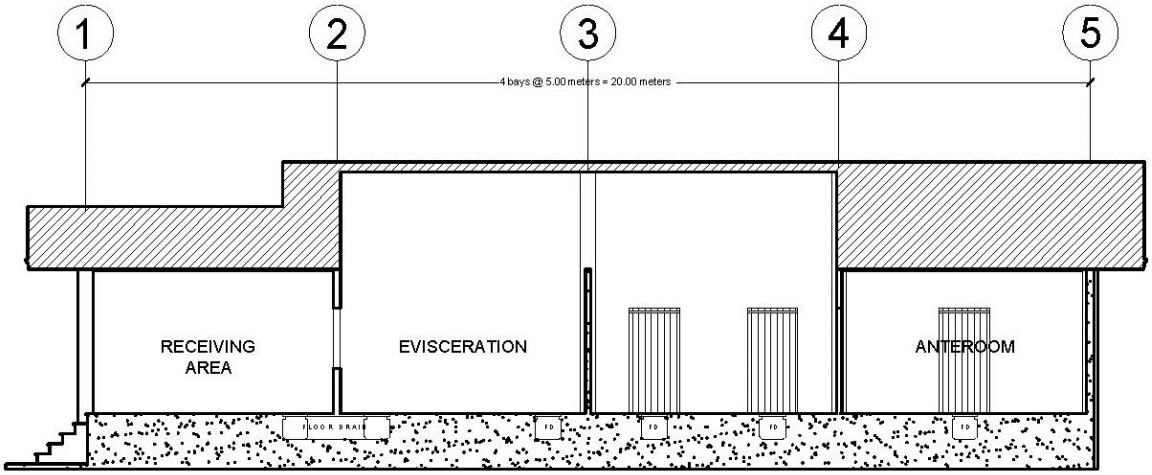
SECTION THRU "B-B"

[6] **Scale 1:150 m. Not for construction purposes**

A.7. Longitudinal -section view [7]



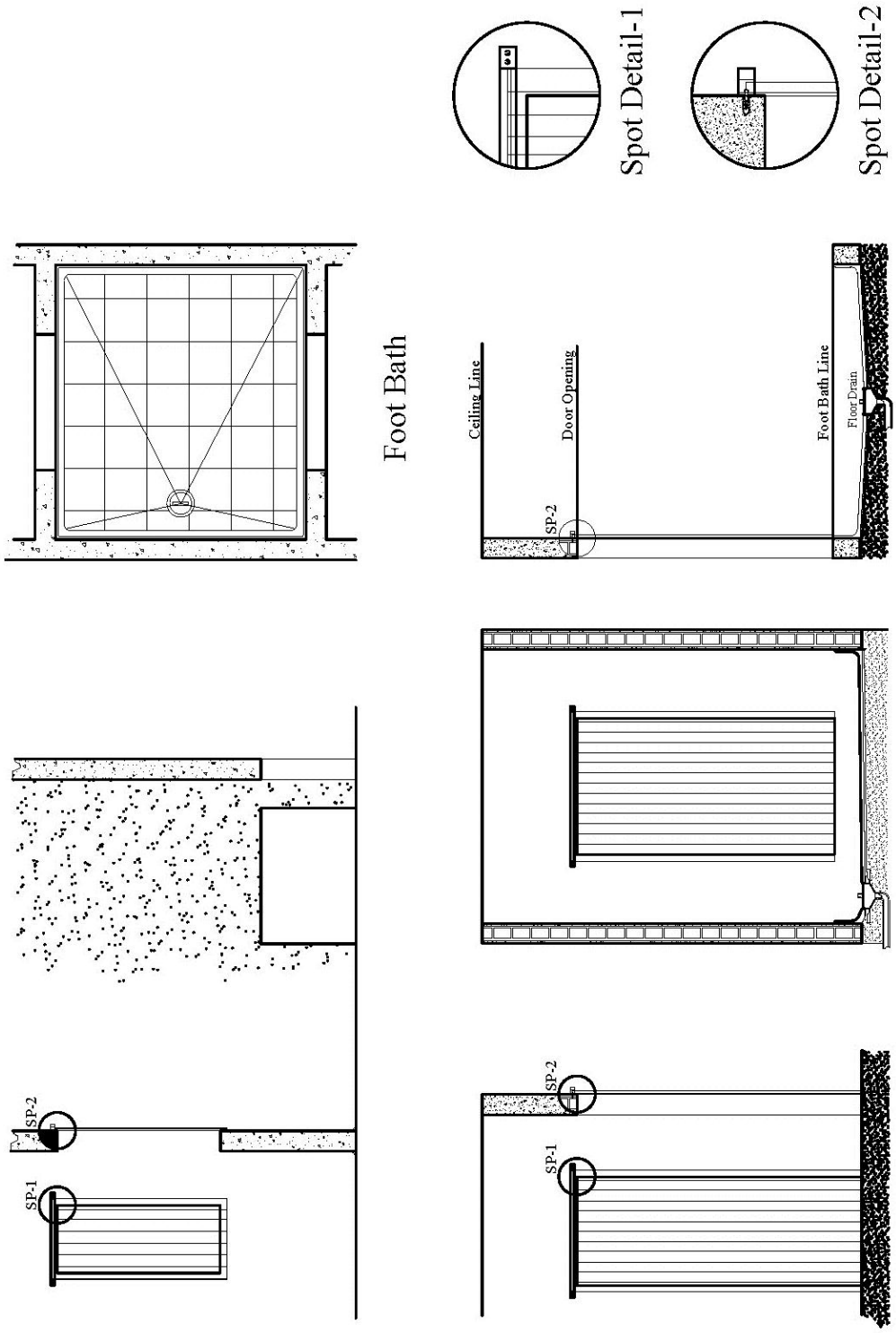
SECTION THRU "C-C"



SECTION THRU "D-D"

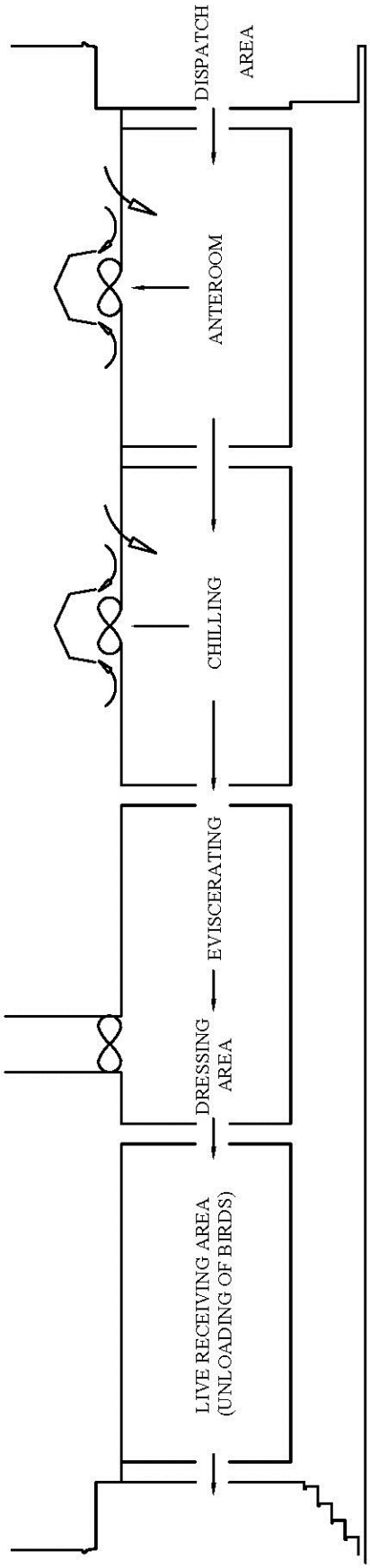
[7] **Scale 1:150 m. Not for construction purposes**

A.8. Doors, Doorways and Channels [8]



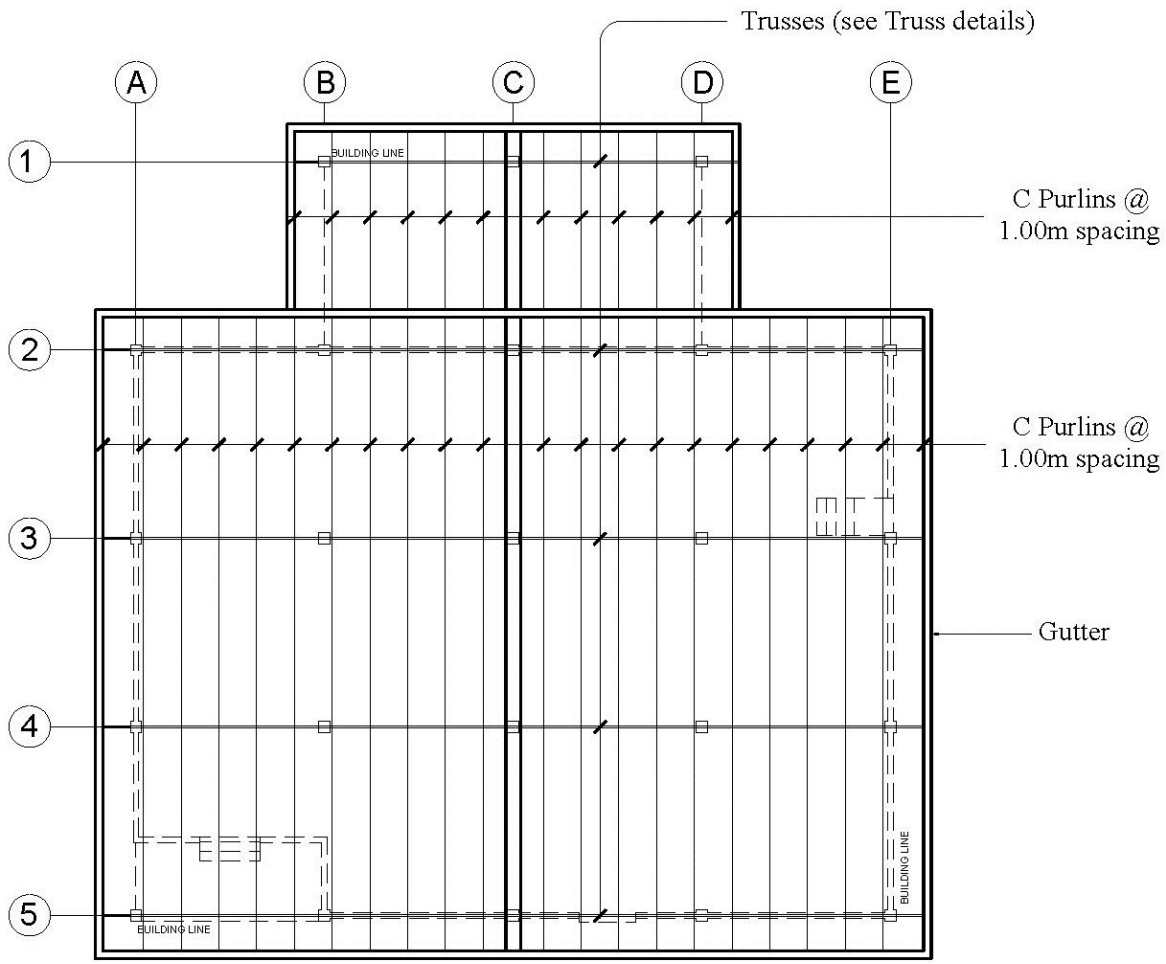
[8] **Scale 1:50 m. Not for construction purposes**

A.9. Airflow layout [9]



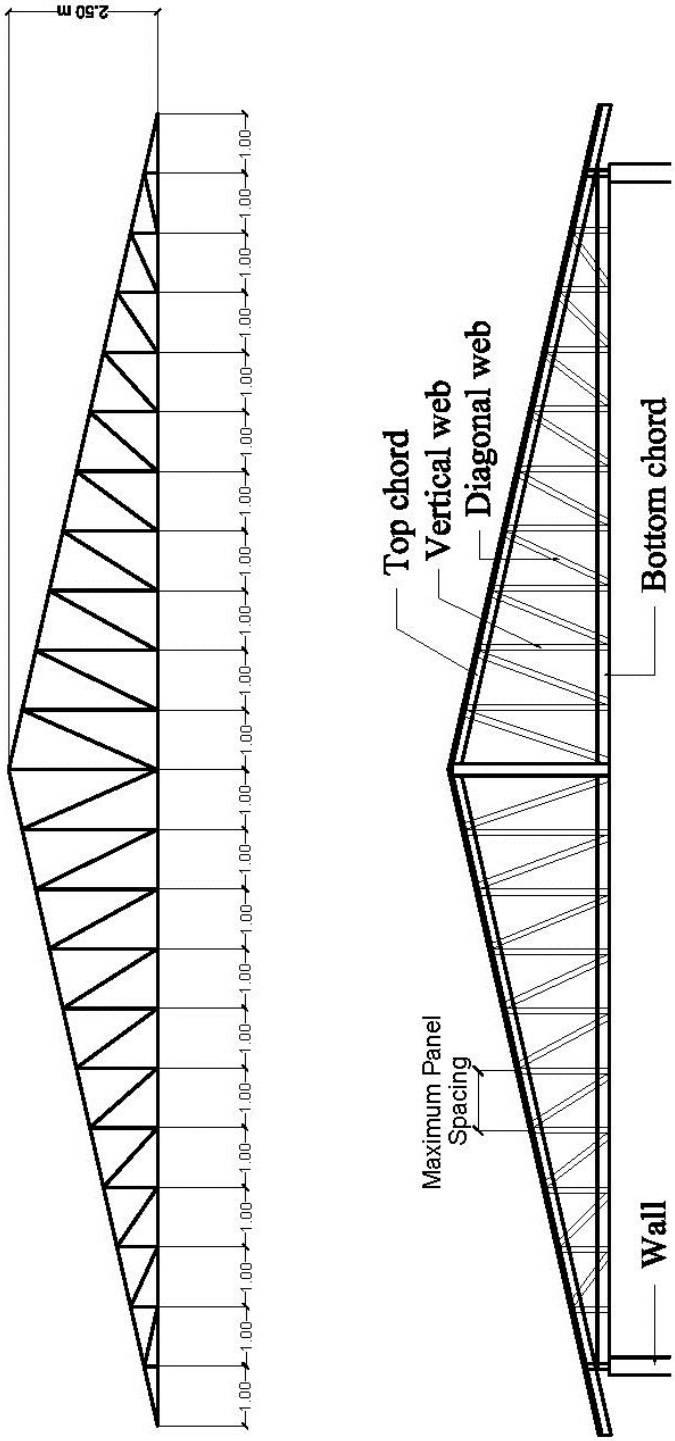
[9] **Scale 1:100 m. Not for construction purposes**

A.10. Roof framing plan [10]



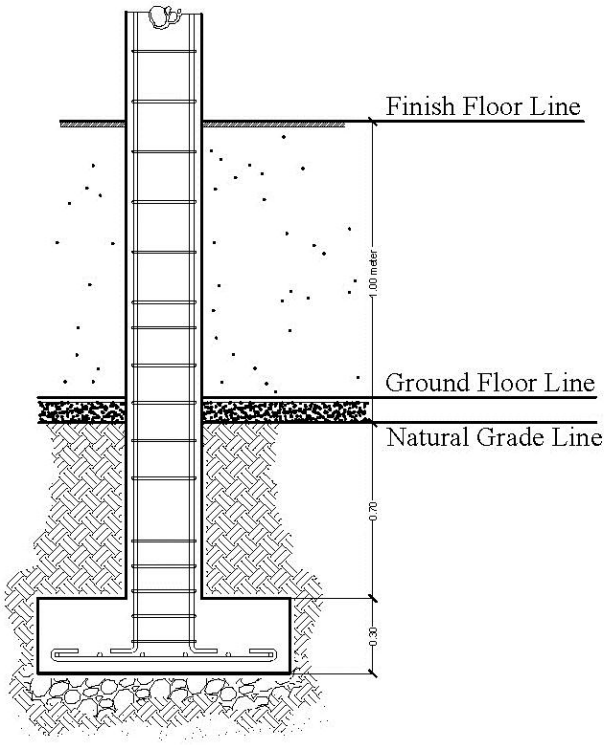
[10] **Scale 1:200 m. Not for construction purposes**

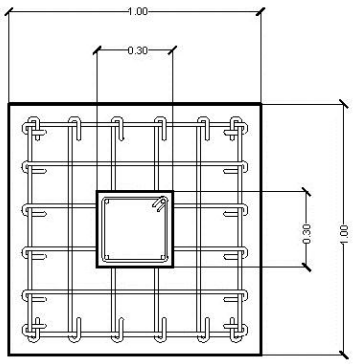
A.11. Roof truss details [11]



[11] **Not drawn to scale. Not for construction purposes. Design of trusses shall take into account all external factors such as wind speed and direction as well as other loads.**

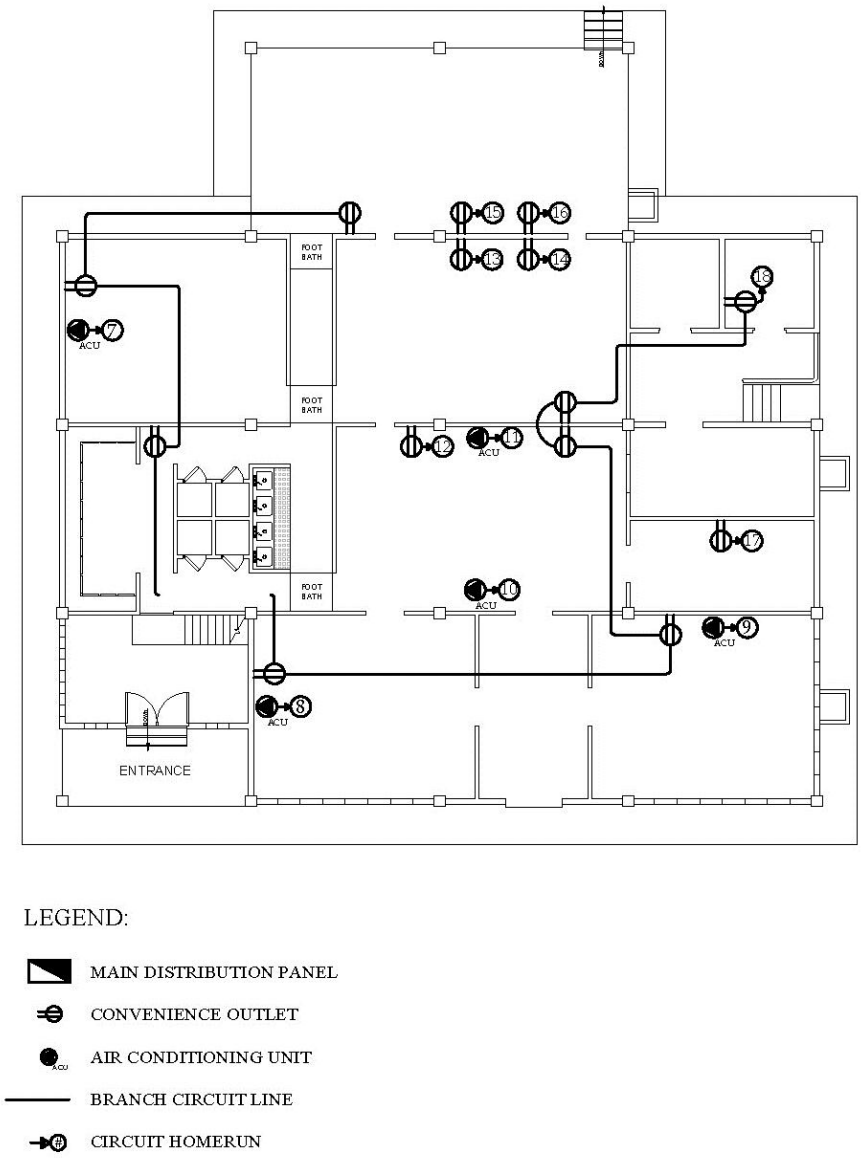
A.12. Sample column and footing details [12]





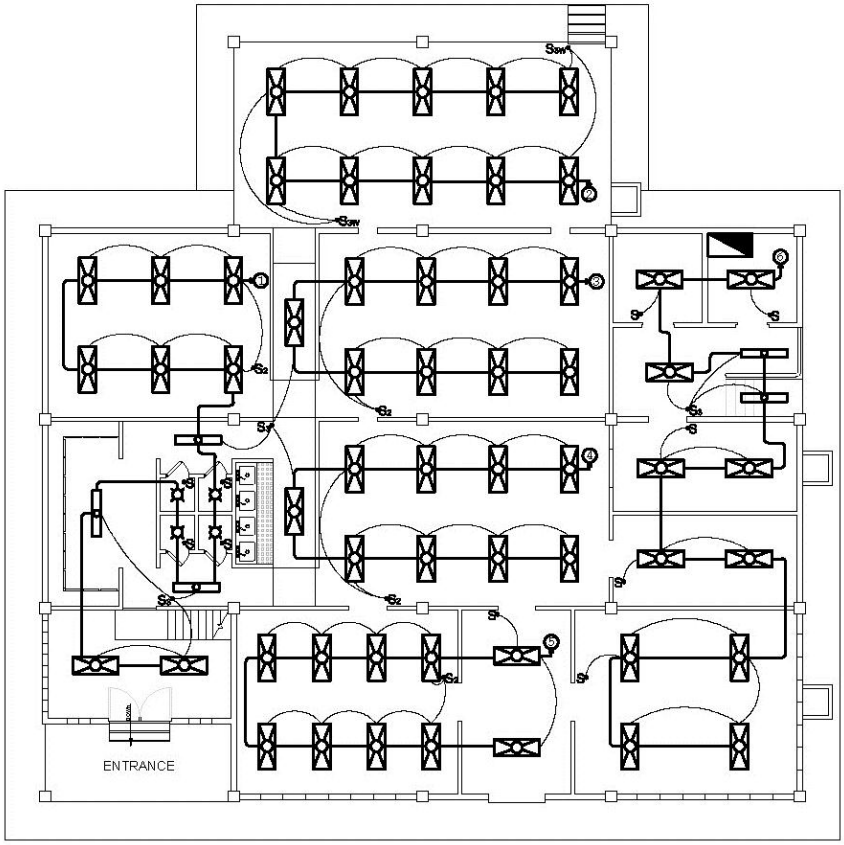
[12] **Not drawn to scale. Not for construction purposes. Design of column and footing shall take into account the type of soil.**

A.13. Sample power layout [13]



[13] **Scale 1:200 m. Not for construction purposes**

A.14. Sample lighting layout [14]

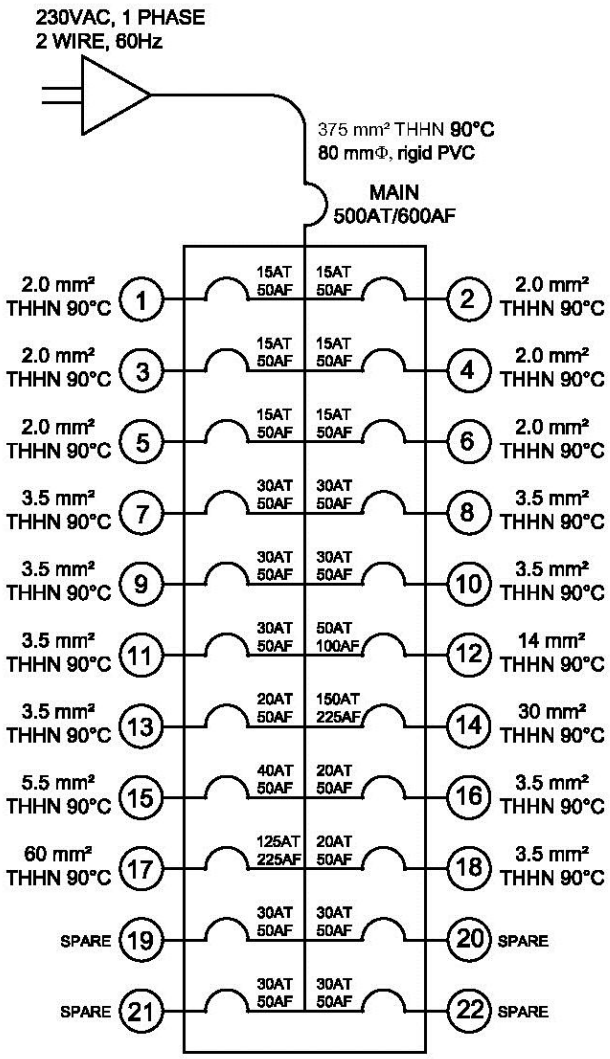


LEGEND:

	MAIN DISTRIBUTION PANEL		SWITCH LINE
	LIGHTING OUTLET (CFL)	S1	ONE-GANG SWITCH
	LED TUBE (2 lamps/luminaire)	S2	TWO-GANG SWITCH
	LED TUBE (1 lamp/luminaire)	S3W	THREE-WAY SWITCH
	BRANCH CIRCUIT LINE		CIRCUIT HOMERUN

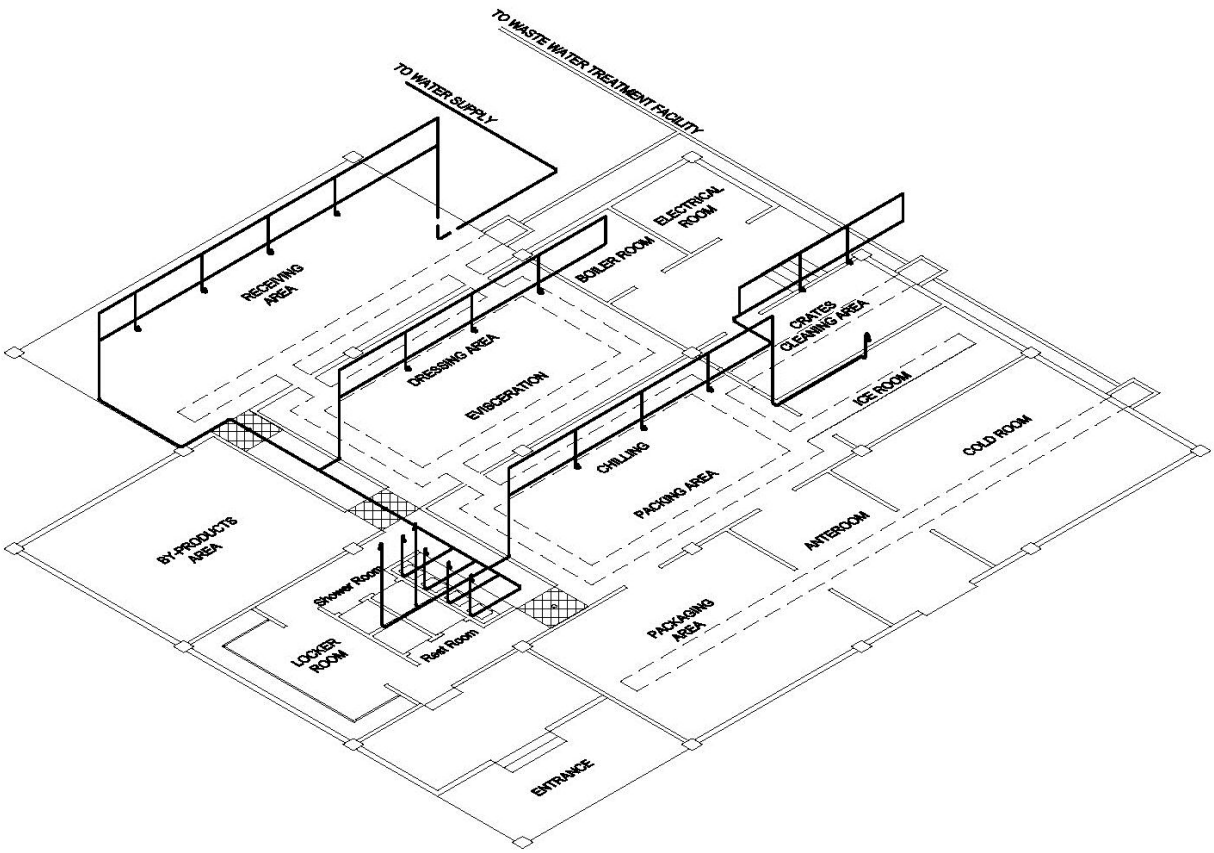
[14] **Scale 1:200 m. Not for construction purposes**

A.15. Sample riser diagram [15]



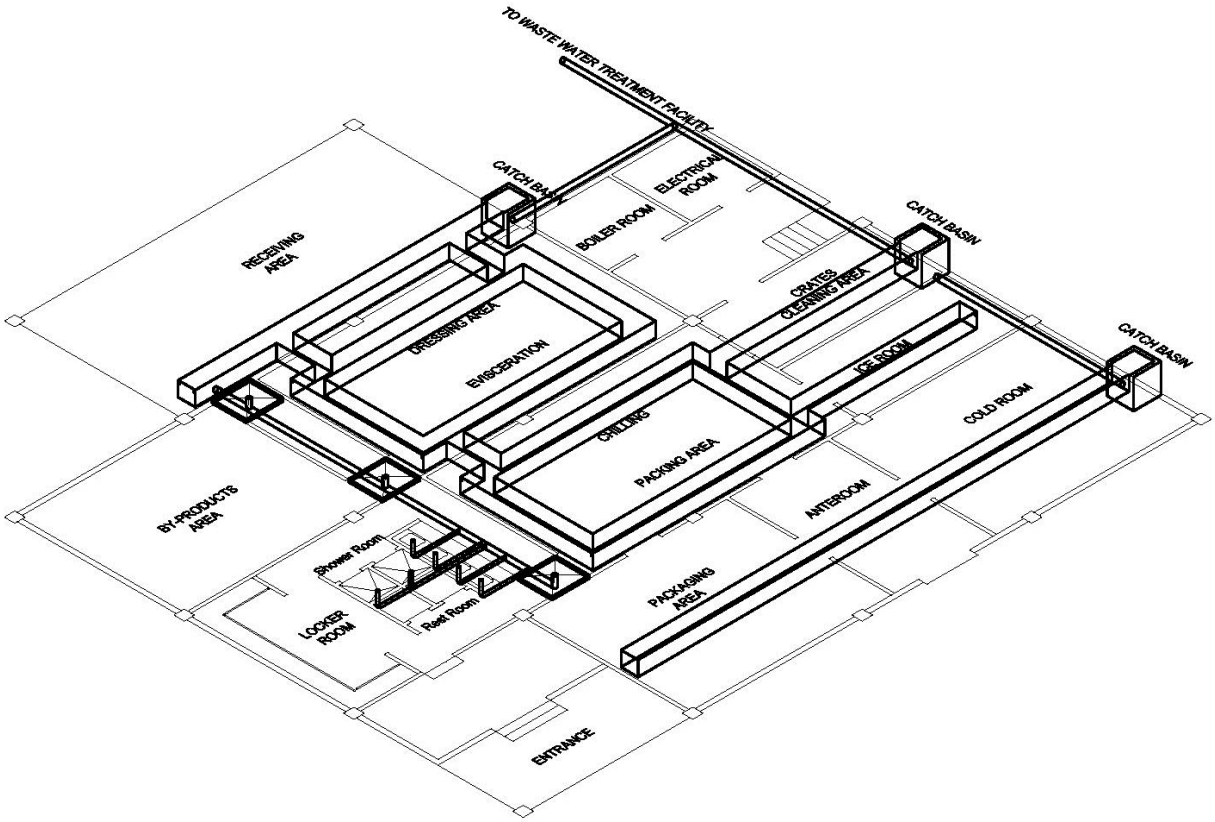
[15] **Not drawn to scale. Not for construction purposes**

A.16. Sample plumbing layout [16]



[16] **Not drawn to scale. Not for construction purposes**

A.17. Sample drainage layout [1]



[1] **Not drawn to scale. Not for construction purposes**

Annex B

B.1. Sample load schedule

Branch Circuit No.	Load Description	Qty.	Power (VA)	Voltage (V)	Current (A)	TDF	Conductor		Circuit Breaker			Conduit	
							Size	Type	AT	AF	No. of Poles	Size	Type
1	2 Lamps - 30W LED Tube Lamp	8	480	230	2.90	0.91	2.0mm²	THHN	15	50	2	15mmΦ	rigid PVC
	1 Lamp - 30W LED Tube Lamp	3	90	230									
	1 Lamp - 24 W Compact Fluorescent Lamp	4	96	230									
2	2 Lamps - 30W LED Tube Lamp	10	600	230	2.61	0.91	2.0mm²	THHN	15	50	2	15mmΦ	rigid PVC
3	2 Lamps - 30W LED Tube Lamp	9	540	230	2.35	0.91	2.0mm²	THHN	15	50	2	15mmΦ	rigid PVC
4	2 Lamps - 30W LED Tube Lamp	9	540	230	2.35	0.91	2.0mm²	THHN	15	50	2	15mmΦ	rigid PVC
5	2 Lamps - 30W LED Tube Lamp	10	600	230	2.61	0.91	2.0mm²	THHN	15	50	2	15mmΦ	rigid PVC
6	2 Lamps - 30W LED Tube Lamp	11	660	230	3.13	0.91	2.0mm²	THHN	15	50	2	15mmΦ	rigid PVC
	1 Lamp - 30W LED Tube Lamp	2	60	230									
7	2hp Air Conditioning Unit	1	2760	230	12.00	0.91	3.5mm²	THHN	30	50	2	15mmΦ	rigid PVC
8	2hp Air Conditioning Unit	1	2760	230	12.00	0.91	3.5mm²	THHN	30	50	2	15mmΦ	rigid PVC
9	2hp Air Conditioning Unit	1	2760	230	12.00	0.91	3.5mm²	THHN	30	50	2	15mmΦ	rigid PVC
10	1.5hp Air Conditioning Unit	1	2300	230	10.00	0.91	3.5mm²	THHN	30	50	2	15mmΦ	rigid PVC
11	1.5hp Air Conditioning Unit	1	2300	230	10.00	0.91	3.5mm²	THHN	30	50	2	15mmΦ	rigid PVC
12	9.5kW Spin Washer	1	9500	230	41.30	0.91	14mm²	THHN	50	100	2	20mmΦ	rigid PVC
13	2.2kW Scalder	1	2200	230	9.57	0.91	3.5mm²	THHN	20	50	2	15mmΦ	rigid PVC

14	13.2kW Defeathering Machine	1	13200	230	57.39	0.91	30mm²	THHN	150	225	2	25mmΦ	rigid PVC
15	2.2kW Overhead Rail System	1	3910	230	17.00	0.91	5.5mm²	THHN	40	50	2	15mmΦ	rigid PVC
16	1.49kW Stunner	1	1490	230	6.48	0.91	3.5mm²	THHN	20	50	2	15mmΦ	rigid PVC
17	25.3kW Ice Maker	1	25300	230	110.00	0.91	60mm²	THHN	125	225	2	40mmΦ	rigid PVC
18	Convenience Outlet	8	1440	230	6.26	0.91	3.5mm²	THHN	20	50	2	15mmΦ	rigid PVC
	Spare								20	50	2		
	Spare								20	50	2		
	Spare								20	50	2		

Main Distribution Panel:
Circuit Breaker: 500AT/600AF, 2 poles
Feeder: 375mm² THHN
Conduit: 80mmΦ, rigid PVC

B.2. Sample illumination calculation

Room Identification:	**BY PRODUCTS AREA**		
Area (sq.m):	30		
Perimeter (m):	22		
General Information		**Cavity Ratios**	
Average Maintained Illuminance (lux):	323	Ceiling Cavity Ratio (CCR):	0
Lamp Data		Room Cavity Ratio (RCR):	3.666667
Type and Color:	LED tube, standard color	Floor Cavity Ratio (FCR):	1.833333
Efficacy:	100 lumen/watt		
Lamp output:	30W	Effective Ceiling Cavity Reflectance (ρcc):	80
Luminaire Data		Effective Floor Cavity Reflectance (ρfc):	15
IES Catalog Number:	35	Initial Coefficient of Utilization (CU1):	0.53
Description:	lamp prismatic wraparound	Multiplying Factor (F):	0.955667
Luminaire Distribution:	semi-direct		
Lamps per luminaire:	2	**Final Coefficient of Utilization (CU):**	0.977833
Maintenance Information		**Light Loss Factor**	
Maintenance Category:	V	Lamp Lumen Depreciation (LLD):	0.86
Area Atmosphere:	clean	Lamp Burnout Factor (LBO):	0.9
Operating Characteristics:	12 hr/day	Luminaire Dirt Depreciation (LDD):	0.88
Cleaning Cycle:	12 months	Room Surface Dirt Depreciation (RSDD):	0.943333
Coefficient of Utilization		**Light Loss Factor (LLF):**	0.642523
Cavity Height			
Ceiling Height (hcc):	0		
Room Height (hrc):	2	**Number of Luminaires:**	4.850014 ≈ **6**
Floor Height (hfc):	1	**Actual Illuminance (lux):**	399.5865

Room Identification:	**PROCESSING 1**		
Area (sq.m):	40		
Perimeter (m):	26		
General Information		**Cavity Ratios**	
Average Maintained Illuminance (lux):	323	Ceiling Cavity Ratio (CCR):	0
Lamp Data		Room Cavity Ratio (RCR):	3.25
Type and Color:	LED tube, standard color	Floor Cavity Ratio (FCR):	1.625
Efficacy:	100 lumen/watt		
Lamp output:	30W	Effective Ceiling Cavity Reflectance (ρcc):	80
Luminaire Data		Effective Floor Cavity Reflectance (ρfc):	15.875
IES Catalog Number:	35	Initial Coefficient of Utilization (CU1):	0.555
Description:	lamp prismatic wraparound	Multiplying Factor (F):	0.95275
Luminaire Distribution:	semi-direct		
Lamps per luminaire:	2	**Final Coefficient of Utilization (CU):**	0.980509
Maintenance Information		**Light Loss Factor**	
Maintenance Category:	V	Lamp Lumen Depreciation (LLD):	0.86
Area Atmosphere:	medium	Lamp Burnout Factor (LBO):	0.9
Operating Characteristics:	12 hr/day	Luminaire Dirt Depreciation (LDD):	0.82
Cleaning Cycle:	12 months	Room Surface Dirt Depreciation (RSDD):	0.9175
Coefficient of Utilization		**Light Loss Factor (LLF):**	0.582319
Cavity Height			
Ceiling Height (hcc):	0		
Room Height (hrc):	2	**Number of Luminaires:**	6.795253 ≈ **8**
Floor Height (hfc):	1	**Actual Illuminance (lux):**	380.2654

Room Identification:	**PROCESSING 2**
Area (sq.m):	40
Perimeter (m):	26

General Information		**Cavity Ratios**	
Average Maintained Illuminance (lux):	323	Ceiling Cavity Ratio (CCR):	0
Lamp Data		Room Cavity Ratio (RCR):	3.25
Type and Color:	LED tube, standard color	Floor Cavity Ratio (FCR):	1.625
Efficacy:	100 lumen/watt		
Lamp output:	30W	Effective Ceiling Cavity Reflectance (ρcc):	80
Luminaire Data		Effective Floor Cavity Reflectance (ρfc):	15.875
IES Catalog Number:	35	Initial Coefficient of Utilization (CU1):	0.555
Description:	lamp prismatic wraparound	Multiplying Factor (F):	0.95275
Luminaire Distribution:	semi-direct		
Lamps per luminaire:	2	**Final Coefficient of Utilization (CU):**	0.980509

Maintenance Information		**Light Loss Factor**	
Maintenance Category:	V	Lamp Lumen Depreciation (LLD):	0.86
Area Atmosphere:	medium	Lamp Burnout Factor (LBO):	0.9
Operating Characteristics:	12 hr/day	Luminaire Dirt Depreciation (LDD):	0.82
Cleaning Cycle:	12 months	Room Surface Dirt Depreciation (RSDD):	0.9175
Coefficient of Utilization		**Light Loss Factor (LLF):**	0.582319
Cavity Height			
Ceiling Height (hcc):	0		
Room Height (hrc):	2	**Number of Luminaires:**	6.795253 ≈ **8**
Floor Height (hfc):	1	**Actual Illuminance (lux):**	380.2654

Room Identification:	**PACKAGING ROOM**		
Area (sq.m):	30		
Perimeter (m):	22		
General Information		**Cavity Ratios**	
Average Maintained Illuminance (lux):	538	Ceiling Cavity Ratio (CCR):	0
Lamp Data		Room Cavity Ratio (RCR):	3.666667
Type and Color:	LED tube, standard color	Floor Cavity Ratio (FCR):	1.833333
Efficacy:	100 lumen/watt		
Lamp output:	30W	Effective Ceiling Cavity Reflectance (ρcc):	80
Luminaire Data		Effective Floor Cavity Reflectance (ρfc):	15
IES Catalog Number:	35	Initial Coefficient of Utilization (CU1):	0.53
Description:	lamp prismatic wraparound	Multiplying Factor (F):	0.955667
Luminaire Distribution:	semi-direct		
Lamps per luminaire:	2	**Final Coefficient of Utilization (CU):**	0.977833
Maintenance Information		**Light Loss Factor**	
Maintenance Category:	V	Lamp Lumen Depreciation (LLD):	0.86
Area Atmosphere:	very clean	Lamp Burnout Factor (LBO):	0.9
Operating Characteristics:	12 hr/day	Luminaire Dirt Depreciation (LDD):	0.94
Cleaning Cycle:	12 months	Room Surface Dirt Depreciation (RSDD):	0.963333
Coefficient of Utilization		**Light Loss Factor (LLF):**	0.700883
Cavity Height			
Ceiling Height (hcc):	0		
Room Height (hrc):	2	**Number of Luminaires:**	7.405701 ≈ **8**
Floor Height (hfc):	1	**Actual Illuminance (lux):**	581.1739

Room Identification:	**COLD ROOM**
Area (sq.m):	30
Perimeter (m):	22

General Information		**Cavity Ratios**	
Average Maintained Illuminance (lux):	150	Ceiling Cavity Ratio (CCR):	0
Lamp Data		Room Cavity Ratio (RCR):	3.666667
Type and Color:	LED tube, standard color	Floor Cavity Ratio (FCR):	1.833333
Efficacy:	100 lumen/watt		
Lamp output:	30W	Effective Ceiling Cavity Reflectance (ρcc):	80
Luminaire Data		Effective Floor Cavity Reflectance (ρfc):	15
IES Catalog Number:	35	Initial Coefficient of Utilization (CU1):	0.53
Description:	lamp prismatic wraparound	Multiplying Factor (F):	0.955667
Luminaire Distribution:	semi-direct		
Lamps per luminaire:	2	**Final Coefficient of Utilization (CU):**	0.977833

Maintenance Information		**Light Loss Factor**	
Maintenance Category:	V	Lamp Lumen Depreciation (LLD):	0.86
Area Atmosphere:	clean	Lamp Burnout Factor (LBO):	0.9
Operating Characteristics:	12 hr/day	Luminaire Dirt Depreciation (LDD):	0.88
Cleaning Cycle:	12 months	Room Surface Dirt Depreciation (RSDD):	0.943333
Coefficient of Utilization		**Light Loss Factor (LLF):**	0.642523
Cavity Height			
Ceiling Height (hcc):	0		
Room Height (hrc):	2	**Number of Luminaires:**	2.252329 ≈ **4**
Floor Height (hfc):	1	**Actual Illuminance (lux):**	266.391

Room Identification:	**CRATES CLEANING AREA**		
Area (sq.m):	12.5		
Perimeter (m):	15		
General Information		**Cavity Ratios**	
Average Maintained Illuminance (lux):	150	Ceiling Cavity Ratio (CCR):	0
Lamp Data		Room Cavity Ratio (RCR):	6
Type and Color:	LED tube, standard color	Floor Cavity Ratio (FCR):	3
Efficacy:	100 lumen/watt		
Lamp output:	30W	Effective Ceiling Cavity Reflectance (ρcc):	80
Luminaire Data		Effective Floor Cavity Reflectance (ρfc):	13
IES Catalog Number:	35	Initial Coefficient of Utilization (CU1):	0.41
Description:	lamp prismatic wraparound	Multiplying Factor (F):	0.969
Luminaire Distribution:	semi-direct		
Lamps per luminaire:	2	**Final Coefficient of Utilization (CU):**	0.9783
Maintenance Information		**Light Loss Factor**	
Maintenance Category:	V	Lamp Lumen Depreciation (LLD):	0.86
Area Atmosphere:	medium	Lamp Burnout Factor (LBO):	0.9
Operating Characteristics:	12 hr/day	Luminaire Dirt Depreciation (LDD):	0.82
Cleaning Cycle:	12 months	Room Surface Dirt Depreciation (RSDD):	0.9
Coefficient of Utilization		**Light Loss Factor (LLF):**	0.571212
Cavity Height			
Ceiling Height (hcc):	0		
Room Height (hrc):	2	**Number of Luminaires:**	1.363945 ≈ **2**
Floor Height (hfc):	1	**Actual Illuminance (lux):**	219.9503

Room Identification:	**ICE ROOM**		
Area (sq.m):	12.5		
Perimeter (m):	15		
General Information		**Cavity Ratios**	
Average Maintained Illuminance (lux):	150	Ceiling Cavity Ratio (CCR):	0
Lamp Data		Room Cavity Ratio (RCR):	6
Type and Color:	LED tube, standard color	Floor Cavity Ratio (FCR):	3
Efficacy:	100 lumen/watt		
Lamp output:	30W	Effective Ceiling Cavity Reflectance (ρcc):	80
Luminaire Data		Effective Floor Cavity Reflectance (ρfc):	13
IES Catalog Number:	35	Initial Coefficient of Utilization (CU1):	0.41
Description:	lamp prismatic wraparound	Multiplying Factor (F):	0.969
Luminaire Distribution:	semi-direct		
Lamps per luminaire:	2	**Final Coefficient of Utilization (CU):**	0.9783
Maintenance Information		**Light Loss Factor**	
Maintenance Category:	V	Lamp Lumen Depreciation (LLD):	0.86
Area Atmosphere:	clean	Lamp Burnout Factor (LBO):	0.9
Operating Characteristics:	12 hr/day	Luminaire Dirt Depreciation (LDD):	0.88
Cleaning Cycle:	12 months	Room Surface Dirt Depreciation (RSDD):	0.93
Coefficient of Utilization		**Light Loss Factor (LLF):**	0.633442
Cavity Height			
Ceiling Height (hcc):	0		
Room Height (hrc):	2	**Number of Luminaires:**	1.22995 ≈ **2**
Floor Height (hfc):	1	**Actual Illuminance (lux):**	243.9123

Room Identification:	**LIVE RECEIVING**		
Area (sq.m):	50		
Perimeter (m):	30		
General Information		**Cavity Ratios**	
Average Maintained Illuminance (lux):	323	Ceiling Cavity Ratio (CCR):	0
Lamp Data		Room Cavity Ratio (RCR):	3
Type and Color:	LED tube, standard color	Floor Cavity Ratio (FCR):	1.5
Efficacy:	100 lumen/watt		
Lamp output:	30W	Effective Ceiling Cavity Reflectance (ρcc):	80
Luminaire Data		Effective Floor Cavity Reflectance (ρfc):	16
IES Catalog Number:	35	Initial Coefficient of Utilization (CU1):	0.57
Description:	lamp prismatic wraparound	Multiplying Factor (F):	0.951
Luminaire Distribution:	semi-direct		
Lamps per luminaire:	2	**Final Coefficient of Utilization (CU):**	0.9804
Maintenance Information		**Light Loss Factor**	
Maintenance Category:	V	Lamp Lumen Depreciation (LLD):	0.86
Area Atmosphere:	dirty	Lamp Burnout Factor (LBO):	0.9
Operating Characteristics:	12 hr/day	Luminaire Dirt Depreciation (LDD):	0.76
Cleaning Cycle:	12 months	Room Surface Dirt Depreciation (RSDD):	0.858
Coefficient of Utilization		**Light Loss Factor (LLF):**	0.50471
Cavity Height			
Ceiling Height (hcc):	0		
Room Height (hrc):	2	**Number of Luminaires:**	9.543359 ≈ **10**
Floor Height (hfc):	1	**Actual Illuminance (lux):**	338.4552

Room Identification:	**BOILER ROOM**		
Area (sq.m):	6.25		
Perimeter (m):	10		
General Information		**Cavity Ratios**	
Average Maintained Illuminance (lux):	150	Ceiling Cavity Ratio (CCR):	0
Lamp Data		Room Cavity Ratio (RCR):	8
Type and Color:	LED tube, standard color	Floor Cavity Ratio (FCR):	4
Efficacy:	100 lumen/watt		
Lamp output:	30W	Effective Ceiling Cavity Reflectance (ρcc):	80
Luminaire Data		Effective Floor Cavity Reflectance (ρfc):	11
IES Catalog Number:	35	Initial Coefficient of Utilization (CU1):	0.33
Description:	lamp prismatic wraparound	Multiplying Factor (F):	0.976
Luminaire Distribution:	semi-direct		
Lamps per luminaire:	2	**Final Coefficient of Utilization (CU):**	0.9784
Maintenance Information		**Light Loss Factor**	
Maintenance Category:	V	Lamp Lumen Depreciation (LLD):	0.86
Area Atmosphere:	medium	Lamp Burnout Factor (LBO):	0.9
Operating Characteristics:	12 hr/day	Luminaire Dirt Depreciation (LDD):	0.82
Cleaning Cycle:	12 months	Room Surface Dirt Depreciation (RSDD):	0.882
Coefficient of Utilization		**Light Loss Factor (LLF):**	0.559788
Cavity Height			
Ceiling Height (hcc):	0		
Room Height (hrc):	2	**Number of Luminaires:**	0.864502 ≈ **1**
Floor Height (hfc):	1	**Actual Illuminance (lux):**	173.5102

Room Identification:	**ELECTRICAL ROOM**		
Area (sq.m):	6.25		
Perimeter (m):	10		
General Information		**Cavity Ratios**	
Average Maintained Illuminance (lux):	150	Ceiling Cavity Ratio (CCR):	0
Lamp Data		Room Cavity Ratio (RCR):	8
Type and Color:	LED tube, standard color	Floor Cavity Ratio (FCR):	4
Efficacy:	100 lumen/watt		
Lamp output:	30W	Effective Ceiling Cavity Reflectance (ρcc):	80
Luminaire Data		Effective Floor Cavity Reflectance (ρfc):	11
IES Catalog Number:	35	Initial Coefficient of Utilization (CU1):	0.33
Description:	lamp prismatic wraparound	Multiplying Factor (F):	0.976
Luminaire Distribution:	semi-direct		
Lamps per luminaire:	2	**Final Coefficient of Utilization (CU):**	0.9784
Maintenance Information		**Light Loss Factor**	
Maintenance Category:	V	Lamp Lumen Depreciation (LLD):	0.86
Area Atmosphere:	medium	Lamp Burnout Factor (LBO):	0.9
Operating Characteristics:	12 hr/day	Luminaire Dirt Depreciation (LDD):	0.82
Cleaning Cycle:	12 months	Room Surface Dirt Depreciation (RSDD):	0.882
Coefficient of Utilization		**Light Loss Factor (LLF):**	0.559788
Cavity Height			
Ceiling Height (hcc):	0		
Room Height (hrc):	2	**Number of Luminaires:**	0.864502 ≈ **1**
Floor Height (hfc):	1	**Actual Illuminance (lux):**	173.5102

B.3. Comparison of some commercially-available T8 lamps

Power Consumption (W)	Light Output (lm)	
	T8 LED Tube	T8 FLUORESCENT Tube
13	905	565
15	1275	845
18	1530	1325
25	2125	1950
30	3000	2150
40	3700	3200