Republic of the Philippines
OFFICE OF THE SECRETARY
Elliptical Road, Diliman
1100 Quezon City

MEMORANDUM ORDER
No. 02
Series of 2023

SUBJECT : ADOPTION OF TECHNICAL BULLETIN NO. 3, SERIES OF 2022: GUIDELINES IN THE PREPARATION ON THE DESIGN OF BIOSECURE FINISHER SWINE HOUSING FACILITY

Pursuant to Section 24 of R.A. No. 10601, also known as the "Agricultural and Fisheries Mechanization (AFMech) Law", the Bureau of Agricultural and Fisheries Engineering (BAFE) is mandated to prepare, evaluate, validate, and recommend engineering plans, designs, and technical specifications of agri-fisheries mechanization and infrastructure projects.

The BAFE, in collaboration with the DA National Livestock Program and the DA- Regional Field Office Regional Agricultural Engineering Divisions (DA-RFO RAEDs), prepared this Technical Bulletin to provide supplemental guidelines in the preparation of the design of a biosecure finisher swine housing facility in line with the DA Memorandum Circular No. 25, Series of 2022 "Consolidated Guidelines on the Implementation of Community-based Swine Production Initiatives for Recovery and Expansion (INSPIRE) Program. Likewise, this will serve as a reference to all DA implementing offices in the preparation of engineering plans, designs, and technical specifications for the implementation of biosecure finisher swine housing facilities.

This Memorandum Order shall take effect immediately upon approval.

Done this 6th day of January 2023.

For compliance

DOMINGO F. PANGANIBAN
Senior Undersecretary

Attached: a/s

DA-CO-OSEC-MO20230106-00002

Republic of the Philippines
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This Memorandum Order shall take effect immediately upon approval.

Done this 4th day of January 2023.

For compliance

DOMINGO F. PANGANIBAN
Senior Undersecretary

Attached: a/s

DA-CO-OSEC-MO20230106-00002

Republic of the Philippines
Department of Agriculture
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EPDSD-TB-22-12-03

TECHNICAL BULLETIN
No. 3
Series of 2022

SUBJECT : GUIDELINES IN THE PREPARATION ON THE DESIGN OF BIOSECURE FINISHER SWINE HOUSING FACILITY

SECTION I. RATIONALE

The Department of Agriculture (DA) through the National Livestock Program launched the Integrated National Swine Production Initiatives for Recovery and Expansion (INSPIRE) Program which focuses on the recovery, rehabilitation, and repopulation program to mitigate the impacts of the African Swine Fever (ASF). One of the identified strategies to help solve the ASF problem and facilitate the recovery of the country's hog industry is the implementation of a biosecure finisher swine housing facility.

Pursuant to Section 24 of the R.A. 10601, also known as the *"Agricultural and Fisheries Mechanization (AFMech) Law"* the Bureau of Agricultural and Fisheries Engineering (BAFE) is mandated to prepare, evaluate, validate, and recommend engineering plans, designs, and technical specifications on agri-fisheries mechanization and infrastructure projects. Hence, this Technical Bulletin is prepared to provide supplemental guidelines in the preparation of the design of a biosecure swine housing facility in line with the DA Memorandum Circular No. 25, Series of 2022 *"Consolidated Guidelines on the Implementation of Community-based Swine Production, Repopulation, and Expansion under the Integrated National Swine Production Initiatives for Recovery and Expansion (INSPIRE) Program."* Likewise, this will serve as a guide to all DA Regional Field Offices (RFOs), and other DA implementing offices in the preparation of engineering plans, designs, and technical specifications for the implementation of biosecure swine housing facilities and adhering to the different levels of biosecurity to ensure a more comprehensive implementation of the livestock biosecurity program.

Furthermore, Figure 1 shows the logical relationship between biosafety and biosecurity and how they complement each other. The former focuses on the safe, secure, and reliable manner of performing the necessary operations while the latter ensures that these biological hazards are prevented from unauthorized release.

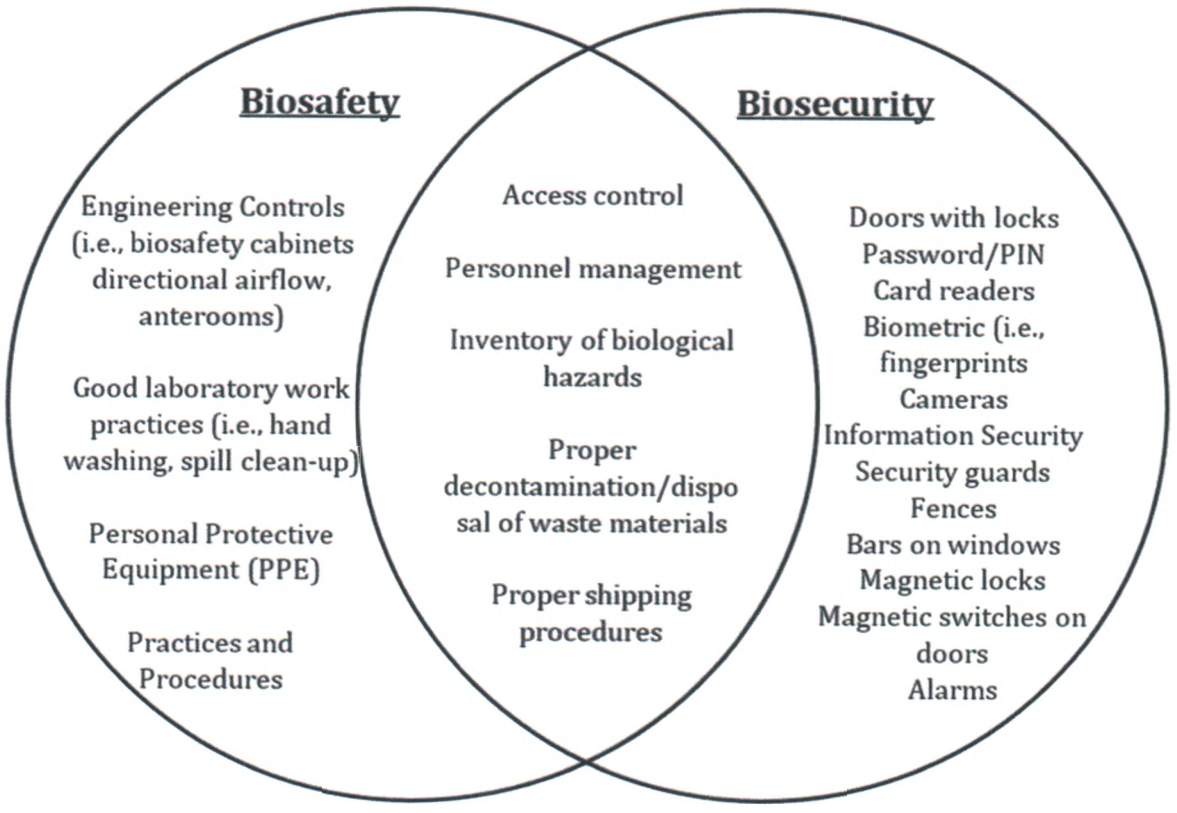

Figure 1. Biosafety and Biosecurity.

SECTION II. DEFINITION OF TERMS

The following terms shall apply to this Technical Bulletin:

Access road – a public road affording access to a particular area or to a through highway

Biosecurity – strategic and integrated approach to analyzing and managing relevant risks to human, animal, and plant life and health, as well as associated environmental risks.

Clean area – farm's interior areas that may necessitate a change of footwear, street clothes, and a full shower process.

Cluster – a group of farmers, with a minimum of 30 members residing in each locality with the business-type activity of swine production, or having the intention of doing a business-type activity of swine production; it also refers to a group of swine farmers as used in DA Administrative Order (AO) No. 7, Series 2021, Implementing Guidelines for the "Bantay ASF" Program.

Clustering – a strategic approach that involves organizing individual farmers from a specific locality into a group doing a similar business-type activity.

Conceptual Biosecurity – primary level of biosecurity which focuses on the selection of an appropriate project location such as farming density, proximity to other farms and roads, physical isolation (i.e., limited usage of common vehicles and facilities; limited access for authorized personnel, control spread of disease caused by pests.

Dirty area – farm's exterior areas where various pathogens exist.

Evaporative Cooling – a method of lowering temperature that employs evaporation of water.

Farm working clothes – recommended clothing attire before entering the farm's clean areas.

Farmers' Cooperatives and Associations – group of individuals who have undergone social preparation and duly registered by any recognized government agencies (i.e., SEC, DOLE, DAR, DA) with at least 50% of its members engaged in swine raising; FCAs also refer to duly-registered hog raisers' group, integrators, contract growers and agrarian reform beneficiaries' organization (ARBOs).

Finisher – swine weighing 66 kg or more.

Foot bath – a biosecurity measure that disinfects the soles of footwear that could unintentionally introduce pathogens to livestock while walking around the farm's clean area.

Grower – swine weighing 40 to 65 kg and up.

Hazard-prone areas – areas with high risk and frequency of natural disasters such as landslides, floods, and earthquakes that pose a threat to life, property, and structures.

Health hazard – chemical or biological factors that can have negative impacts on the health of the swine and farm workers

Implementing Office (IO) – DA RFOs, bureaus, attached agencies and corporations, and other DA implementing units.

Latent Heat of Vaporization – the amount of heat required to change one mole of liquid at its boiling point under normal atmospheric pressure.

Procedural Biosecurity – tertiary level of biosecurity which focuses on the routine procedures to prevent the introduction as well as the spread of infection inside the facility such as taking shower, changing footwear and personal clothes with farm working clothes before entry into the farm, washing hands, and disinfecting equipment at the point of entry.

Right-of-Way (ROW) – part or entirety of a property, site, or location, with defined physical boundaries, used or required by a government infrastructure project.

Sensible Heat – heat exchanged in an energy generation system that has no effect on the temperature of one or more substances.

Shower room – a designated area where those authorized to enter the farm's clean area can change out of their street clothes, undergarments, jewelry, and footwear and into recommended farm working clothes.

Site or Location – property or land on which the agri-fisheries infrastructure will be constructed.

Storage room – property used for storing and protecting feeds, biologics, and other vital farm supplies from contamination, pest infestation, and waste.

Street clothes – regular clothing worn in farm dirty areas that can potentially harbor microorganisms and adhering dirt that can compromise the farm's biosecurity measures.

Structural Biosecurity – secondary level of biosecurity which focuses on the physical factors and housing design considerations such as farm layout, perimeter fencing, drainage, air filtration systems, enclosed load-outs, traffic patterns, feed delivery and storage, on-site movement of vehicles, equipment, and animals.

Swine – hogs, pigs, native pigs, and shoats.

Thermal Conductivity – a measure of a substance's ability to conduct heat, calculated by dividing the rate of heat flow normally through an area in the substance by the area and subtracting the component of the temperature gradient in the direction of flow: measured in W/m-K.

Toilet – a fixture with a water-flushed bowl and seat for defecation and urination.

Tunnel Ventilation – natural or forced introduction of outdoor air into an enclosed space. It keeps health conditions like temperature and humidity stable brings in fresh and clean air from outside and removes air pollutants.

SECTION III. SCOPE AND COVERAGE

This Technical Bulletin shall serve as one of the references in the design of the biosecure finisher swine housing facility implemented by DA bureaus, RFOs, attached agencies and corporations, and other DA IOs.

SECTION IV. OBJECTIVES

This Technical Bulletin aims to provide the DA IOs with the standard selection criteria, design procedure, and other considerations. It will also serve as a guide for DA IOs in developing engineering plans, designs, and technical specifications for biosecure swine housing facilities.

SECTION V. SELECTION CRITERIA

Pursuant to PAES 401:2001 Re: "Agricultural Structures – Housing for Swine Production" and DA Memorandum Circular No. 25, series of 2022, the location of the biosecure swine housing facility shall be determined based on the following criteria while also considering conceptual biosecurity:

1. The minimum land area is 2,000 square meters.
2. The location shall adhere to the land use plan of the area.
3. The site shall have access to water and electricity (single or three-phase electrical supply).
4. The site shall be well-drained and allows for free air circulation.
5. The structure for marketable animals shall be located near the service road and built with an east-west orientation.
6. The site shall be in an area such that prevailing winds do not carry odors to the farmhouse.
7. The site shall be relatively flat (0-3%) or undulating slope classification (3%-8%) (see Annex C).
8. The distance between the proposed site from other farms and residential and/or commercial areas is recommended to be at least one (1) kilometer
9. The site shall be located 25 meters radius away from sources of ground and surface drinking water. Furthermore, it shall be at least 1,000 meters away from built-up areas (residential, commercial, institutional, and industrial) and at least 500 meters away from major roads and/or highways.[1]
10. The site shall have no issues with Right-of-Way acquisition.
11. The site shall not be constructed in hazard-prone areas.[2]

SECTION VI. MINIMUM COMPONENTS AND DESIGN CONSIDERATIONS

This section provides the minimum required components and design considerations for the preparation of a design of a biosecure finisher swine housing facility based on PNS/PAES/PABES/any acceptable standards and adheres to the structural and procedural level of biosecurity.

A. FINISHER BUILDING

A.1. BUILDING ORIENTATION

In the Philippine setting, the front side of the building should face east, and the back side should face west, to protect the animals from prolonged exposure to sunlight.

[1] Housing and Land Use Regulatory Board Resolution No. R-674, series of 2000.

[2] HazardHunterPH can be used as a reference for hazard-prone areas.

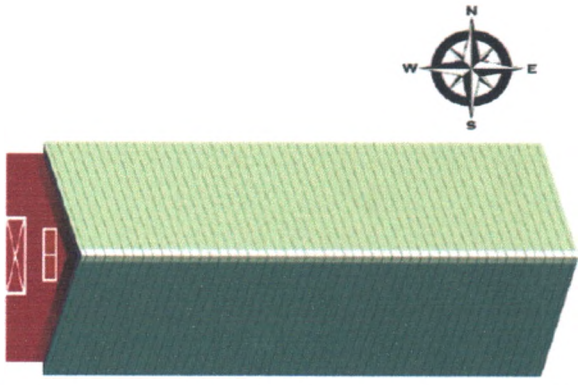

Figure 2. Proper Orientation of Finisher Building.

A.2. STRUCTURAL REQUIREMENTS

A.2.1. ROOF

The roofing material should be galvanized iron (GI) sheets or other durable roofing materials, preferably pre-painted. Furthermore, the roof overhang must be at least 1.0 m in length to provide adequate shade and rain protection for the pigs, and it must be equipped with gutters to allow rainwater to drain properly.

A.2.2. CEILING

The ceiling height from the finish floor line shall be at least 2.4 m.

A.2.3. WALLS

The building's sidewalls should be made of concrete hollow blocks with plastering (smooth finish) and optional paint finish. The walls may also be constructed with polyurethane (PU) sandwich panels.

A.2.4. FLOORS

A.2.4.1 SOLID FLOORS

Concrete solid floors should be laid on well-compacted gravel fill. The floor's roughness must be skid-resistant and avoid excessive roughness, which may cause swine foot and leg problems. Furthermore, the floor must have a slope of 2% to 4% towards the gutter, canal, pit, or drain.

A.2.4.2 SLATTED FLOORS

Slatted floors allow animal waste to fall or be forced through the slats, reducing manure disposal issues while also reducing total labor requirements. Slatted floors must be made of concrete, plastic, metals, or a combination of these

materials. Concrete slats should be used for swine weighing more than 30 kilograms.

Table 1. Minimum Recommended Specification for Concrete Slat.

SPAN(m)	SLAT DIMENSIONS		REINFORCING BAR
	TOP WIDTH (m)	DEPTH (mm)	
1.20	102	102	No. 3 (10 mm)
	152	102	No. 3
	204	102	No. 3
1.80	102	102	No. 4 (12 mm)
	152	102	No. 4
	204	102	No. 4
2.40	102	127	No. 4
	152	127	No. 4
	204	127	No. 4
3.00	102	152	No. 5 (14 mm)
	152	152	No. 5
	204	152	No. 5

The recommended spacing between concrete slats for finishers is 10 to 20 mm, with at least 10 mm top and bottom reinforcing bars provided in all lateral joints.

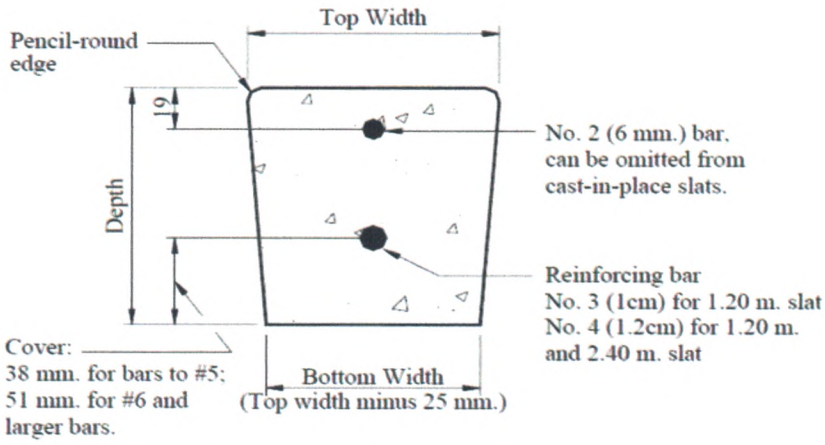

Figure 3. Recommended Spacing of Reinforced Steel Bars.

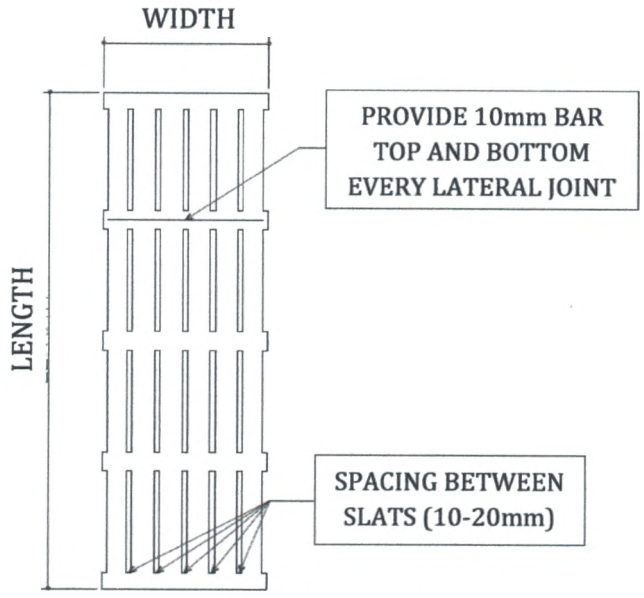

Figure 4. Details of Concrete Slat Design

A.2.4.3. SUMP PIT

The sump pit must have a minimum depth of 0.5 m from the finish floor. Furthermore, the pit's side slope must be 1:3 or less to allow the flow of solid and liquid waste from the sump pit's side.

Furthermore, the longitudinal slope of the sump pit should be 2% to 4% towards the drain, with at least a 3-inch water retention in the pit to ensure proper sludge flow along the drain. In addition, the drain must have a drain plug.

A.3. FUNCTIONAL REQUIREMENTS

A.3.1. FINISHING PEN

A.3.1.1. SPACE REQUIREMENT

To maximize the finisher growth rate, the minimum space requirement for the finisher pen shall be 0.85 m^2/animal. Furthermore, each pen must be designed to hold no more than 25 finishers.

A.3.1.2. MATERIAL REQUIREMENT

Finisher pens can be made from galvanized iron (GI) pipes, GI tubular, or deformed bars. To prevent rust, these materials must be hot-dipped or painted with a non-corrosive paint.

A.3.1.3. PEN HEIGHT, PARTITION, AND GATE

The pen's height must be at least 0.9 m, with a partition made of solid (e.g., concrete), slatted (e.g., GI pipes, tubular, or deformed bars), or a combination of the two.

The pen gate must be at least 0.6 m wide and made of pipes, tubulars, or deformed bars.

A.3.2. WALKWAYS

Walkways within the finisher building must be at least 600 mm wide.

A.3.3. FEEDING FACILITIES

A properly designed feeding trough is required. The minimum recommended length of feeding trough per swine is shown below:

Table 2. Minimum Recommended Length of Feeding Trough per Swine.

SWINE WEIGHT (kg)	LINEAR LENGTH OF FEED TROUGH (mm/animal)
50–75	250
75–100	300
100-130	350

The feeding trough can be made of concrete, fiberglass, steel, or plastic. It can be installed on the ground or elevated. The feeding trough shall be at least 300 mm wide and 250 mm deep.

A.3.4. DRINKING SYSTEM

A suitable drinking system with an adequate water supply for the finisher is required. The two most common types of drinking systems used in pig production are bite and push nipples.

For finishers, the bite nipple drinking system is recommended, with a minimum required water supply of 1.0 liter per minute. Furthermore, in order to accommodate swine growth, at least two (2) bite nipples should be installed per finisher pen. The table below shows the recommended height of the bite nipple drinking system from the floor line.

Table 3. Recommended Height of Bite Nipple Drinking System for Finisher.

TYPE OF SWINE	WEIGHT (kg)	45^0 (cm)	90^0 (cm)
Finisher	15–40	35	30

TYPE OF SWINE	WEIGHT (kg)	45° (cm)	90° (cm)
	40–60	50	45
	60–100	75	70

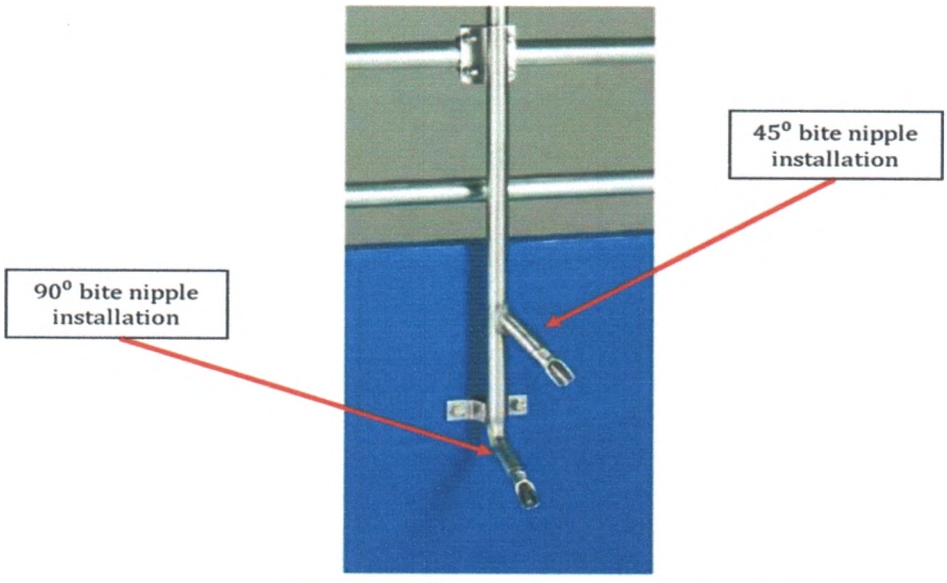

Figure 5. 45° and 90° bite nipple installation.

A.3.5. DRY-WET PIG FEEDER/SELF FEEDER (OPTIONAL USE)

This equipment has an automatic feeding and drinking mechanism and can handle both powder feedstuff and feed pellets. The feeds can be delivered evenly via valves equipped with an automatic regulation device. The built-in drinkers reduce swine running between feeder and waterer, which is beneficial to swine digestion. Furthermore, the self-feeder is mounted on the finish floor line for easier reach of the swine and cleaning purposes.

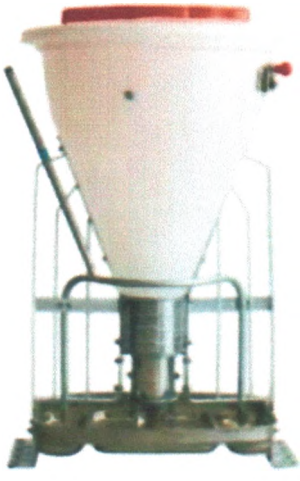

Figure 6. Dry-Wet Pig Feeder/Self-Feeder.[3]

[3] https://www.farming-machine.com/livestock-machinery/pig/pig-feeder/

A.3.6. LIGHTING

Lighting must be provided in the building. Table 4 shows the recommended lighting intensity for growing and finishing pigs. For lighting requirements, refer to Annex A-1 and A-2.

Table 4. Recommended Lighting Intensity for Growing and Finishing Swine Housing.

AREA	LIGHTING INTENSITY* lux (Lumen/m^2)
Growing and Finishing	50
Inspection Areas	200
Other Areas	110

A.3.7. VENTILATION

A.3.7.1. TEMPERATURE, HUMIDITY AND SENSIBLE HEAT PRODUCTION (Q_s)

Heat stress in swine can be attributed to both ambient temperature and humidity. Figure 7 depicts a heat stress index chart for growing-finishing swine that can be used as a reference for the optimal growing finisher environment inside a tunnel-ventilated building.

Temperature, °C	Relative Humidity, %																			
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
21	64	64	64	65	65	65	66	66	66	67	67	67	68	68	68	69	69	69	70	70
22	65	65	65	66	66	67	67	67	68	68	69	69	69	70	70	70	71	71	72	72
23	66	66	67	67	67	68	68	69	69	70	70	70	71	71	72	72	73	73	74	74
24	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75	76	76
26	68	68	69	69	70	70	71	71	72	73	73	74	74	75	75	76	76	77	77	78
27	69	69	70	70	71	72	72	73	73	74	75	75	76	76	77	78	78	79	79	80
28	69	70	71	71	72	73	73	74	75	75	76	77	77	78	79	79	80	81	81	82
29	70	71	72	73	73	74	75	75	76	77	78	78	79	80	80	81	82	83	83	84
30	71	72	73	74	74	75	76	77	78	78	79	80	81	81	82	83	84	84	85	86
31	72	73	74	75	76	76	77	78	79	80	81	81	82	83	84	85	86	86	87	88
32	73	74	75	76	77	78	79	79	80	81	82	83	84	85	86	86	87	88	89	90
33	74	75	76	77	78	79	80	81	82	83	84	85	85	86	87	88	89	90	91	92
34	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
36	76	77	78	79	80	81	82	83	85	86	87	88	89	90	91	92	93	94	95	96
37	77	78	79	80	82	83	84	85	86	87	88	89	90	91	93	94	95	96	97	98
38	78	79	80	82	83	84	85	86	87	88	90	91	92	93	94	95	97	98	99	100
39	79	80	81	83	84	85	86	87	89	90	91	92	94	95	96	97	98	100	101	102
40	80	81	82	84	85	86	88	89	90	91	93	94	95	96	98	99	100	101	103	104
41	81	82	84	85	86	88	89	90	91	93	94	95	97	98	99	101	102	103	105	106
42	82	83	85	86	87	89	90	92	93	94	96	97	98	100	101	103	104	105	107	108
43	83	84	86	87	89	90	91	93	94	96	97	99	100	101	103	104	106	107	109	110

Note: Normal: ≤ 74; Alert: 75-78; Danger: 79-83; Emergency: ≥84.

Figure 7. Temperature and Humidity Stress Index for Grower-Finisher Swine.

The table below shows the recommended temperature and sensible heat production level for the finisher per live weight.

Table 5. Recommended Temperature for Finisher per Liveweight with Corresponding Sensible Heat Production.

TEMPERATURE (°C)	LIVEWEIGHT (kg)	SENSIBLE HEAT PRODUCTION PER HEAD (Watts/head)
21	60	181.2
	70	200.2
	90	229.2
	100	236.5
	110	243.8
22	60	172.4
	70	190.4
	90	218.4
	100	225.9
	110	233.5
23	60	163.6
	70	180.6
	90	207.5
	100	215.4
	110	223.2
24	60	154.8
	70	170.8
	90	196.7
	100	204.8
	110	212.9
25	60	146.0
	70	161.0
	90	185.9
	100	194.2
	110	202.6
26	60	137.2
	70	151.2
	90	175.1
	100	183.7
	110	192.3
27	60	128.4
	70	141.4
	90	164.3
	100	173.1
	110	181.9
28	60	119.6
	70	131.6
	90	153.4

TEMPERATURE (°C)	LIVEWEIGHT (kg)	SENSIBLE HEAT PRODUCTION PER HEAD (Watts/head)
	100	162.5
	110	171.6
29	60	110.8
	70	121.8
	90	142.6
	100	152.0
	110	161.3
30	60	102.0
	70	112.0
	90	131.8
	100	141.4
	110	151.0

The formula below can be used to compute sensible heat production.

$$Q_S = \frac{q_s \cdot w}{1000}$$

wherein:
Q_S = sensible heat production, kW
q_s = sensible heat production per head specific desired inside temperature of the building, W/head
w = number of heads

A.3.7.2. MOISTURE HEAT PRODUCTION (Q_M)

This is the sensible heat gain from the moisture released by the swine during respiration. The recommended moisture production for finishers is between 0.0022 kg of water/kg–hr. Furthermore, the latent heat of vaporization for water is 2260 kJ/kg of water. The moisture heat production formula is given below.

$$Q_M = \frac{m_p \cdot m_w \cdot w \cdot l_v}{3600}$$

wherein:
Q_M = moisture heat production, kW
m_p = moisture production of grower and finisher, kg_{water}/kg–hr.
m_w = live weight of finisher/head, kg
w = number of heads
l_v = latent heat of vaporization for water, 2260 kJ/kg_{water}

A.3.7.3. TRANSMISSION HEAT PRODUCTION (Q_T)

The sensible heat gain through walls, ceilings, and floor areas caused by temperature differences between the interior and exterior of the building.

To calculate the building's transmission heat load, the thermal conductivity of the wall, ceiling, and flooring must be determined. Tables 6, 7, and 8 show the thermal conductivity of various wall, ceiling, and flooring materials.

Table 6. Thermal Conductivity of Different Types of Material for Wall.

INSULATION	THERMAL CONDUCTIVITY, *k* (W/m-K)
Concrete	2.25
Polyurethane sandwich panel	0.023 to 0.026
Polyisocyanurate, cellular	0.027
Polystyrene, extruded	0.035
Polystyrene, expanded	0.037

Table 7. Thermal Conductivity of Different Types of Material for Ceiling.

INSULATION	THERMAL CONDUCTIVITY, *k* (W/m-K)
Plywood	0.13
Gypsum Board	0.17
Fiber cement board	0.20
Polyurethane sandwich panel	0.023 to 0.026

Table 8. Thermal Conductivity of Different Types of Material for Flooring

INSULATION	THERMAL CONDUCTIVITY, *k* (W/m-K)
Concrete	2.25
Plastic	0.52
Steel	45.0

The formula for calculating transmission heat production between the outside and inside of a building is provided below. [11]

$$Q_T = \frac{UA(t_o - t_i)}{1000}$$

wherein:
Q_T = transmission heat production, kW
U = overall heat transfer coefficient, W/m^2–K
A = surface area of a floor, ceiling or wall, m^2
t_o = outside surrounding temperature, ^{0}C

t_i = desired inside temperature of the building, ^0C

$$U = \frac{1}{\frac{x_1}{k_1} + \frac{x_2}{k_2} + \cdots + \frac{x_n}{k_n}}$$

k_1k_2 = thermal conductivities of the wall, ceiling, or floor materials, W/m–K
x_1x_2 = thickness of the wall, ceiling, or floor material, m

Figure 8 shows the heat transfer profile across the wall is influence by the temperature difference between each side, thermal conductivity, as well as wall thickness and surface area.

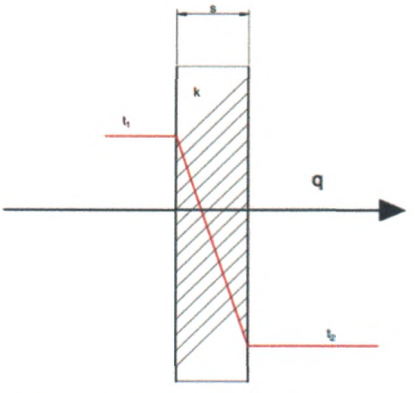

Figure 8. Heat transfer movement across the wall.[4]

A.3.7.4. LIGHTING HEAT PRODUCTION (Q_L)

Using the lighting requirements in Table 4, refer to Annex A-1 and A-2 for the wattage of the desired type of bulb and the number of bulbs per square meter.

A.3.7.5. EQUIPMENT AND MISCELLANEOUS HEAT PRODUCTION (Q_{EM})

This refers to the heat produced by an electric motor from equipment and noxious gases such as ammonia and carbon dioxide present inside the building. It is approximately equivalent to 1% of the sum of sensible, moisture, transmission, and lighting heat production.

$$Q_{EM} = 0.01\ (Q_S + Q_M + Q_T + Q_L)$$

wherein:
Q_{EM} = equipment and miscellaneous heat production, kW

[4] https://www.engineeringtoolbox.com/conductive-heat-transfer-d_428.html

A.3.7.6. TOTAL HEAT PRODUCTION (Q_{total})

Total heat production is calculated as the sum of sensible, moisture, transmission, equipment, and miscellaneous heat production plus a 10% safety factor.

$$Q_{total} = 1.10\ (Q_S + Q_M + Q_T + Q_L + Q_{EM})$$

wherein:
Q_{total} = total heat production, kW

A.3.7.7. MAXIMUM VENTILATION RATE (V_{max})

The volumetric flow rate of air required to remove the total heat production is given by the formula below to determine the maximum ventilation rate of a given population of finishers inside a tunnel-ventilated building.

$$m_{max} = \frac{Q_{total}}{c_p(t_o - t_i)}$$

$$V_{max} = \frac{m_{max}}{\rho_{air}}\ x\ 2119$$

wherein:
m_{max} = mass flow rate of air, kg/s
Q_{total} = total heat production, kW
c_p = specific heat of air, 1.006 kJ/kg-K
t_o = outside surrounding temperature, ^{0}C
t_i = desired inside temperature of the building, ^{0}C
V_{max} = maximum ventilation rate, ft^3/min.
ρ_{air} = density of air, 1.20 kg/m^3

A.3.7.8. EVAPORATIVE COOLING PAD SIZING

The maximum ventilation rate and air velocity required to achieve the desired temperature inside the tunnel-ventilated building determine the size of the evaporative cooling pads. Furthermore, for grower and finisher swine, the recommended air velocity is 200–300 ft/min. The formula for calculating the evaporative cooling pad area is given below.

$$A_{ECP} = \frac{V_{max}}{v_{air} \cdot 10.7639}$$

wherein:
A_{ECP} = total evaporative cooling pad area, m^2
V_{max} = maximum ventilation rate, ft^3/min
v_{air} = recommended air velocity, ft/min

The table below lists the various materials for evaporative cooling pads.

Table 9. Different Types of Evaporative Cooling Pads and its Thickness.

PAD TYPE	THICKNESS
Aspen fiber	50 to 100 mm (2 to 4 in.)
Aspen fiber, desert conditions	50 to 100 mm (2 to 4 in.)
Corrugated cellulose	100 to 150 mm (4 to 6in.)

Corrugated cellulose is the most commonly used type of evaporative cooling pad because it is more durable than aspen fiber.

Figure 9. Aspen Fiber Evaporative Cooling Pad.[5]

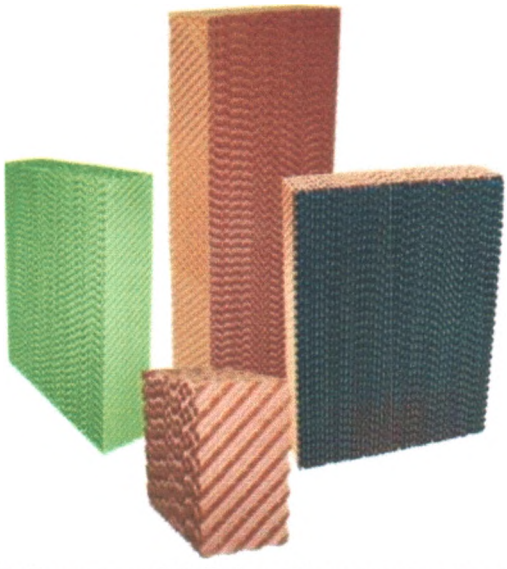

Figure 10. Corrugated Cellulose Evaporative Cooling Pad.[6]

[5] https://www.coolingmedia.com/aspenpad/

[6] https://www.coowor.com/p/201706091755290NZK/Evaporative-Cooling-Cellulose-Pad.htm

A.3.7.9. SUMP AND PUMP SIZING

The table below shows the recommended minimum sump capacity per unit pad area and minimum water flow rate per unit width of the pad for specific type and thickness of the cooling pad.

Table 10. Recommended Minimum Sump Capacity per Unit Area and Water Flow Rate per Unit Width of Pad.

PAD TYPE	THICKNESS	MIN. WATER FLOW RATE PER UNIT WIDTH OF PAD (L/min-m)	MIN. SUMP CAPACITY PER UNIT PAD AREA (L/m^2)
Aspen fiber	50 to 100 mm (2 to 4 in.)	3.7	20
Aspen fiber, desert conditions	50 to 100 mm (2 to 4 in.)	5.0	20
Corrugated cellulose	100 mm (4 in.)	6.2	33
Corrugated cellulose	150 mm (6 in.)	9.9	40

The formula for calculating the minimum sump capacity is given below.

$$S_{cap} = s_{min} \cdot A_C$$

wherein:
S_{cap} = minimum sump capacity, L
s_{min} = minimum sump capacity per unit pad area, L/m^2
A_C = evaporative cooling pad area, m^2

To determine the pump's capacity, compute the discharge and total dynamic head loss using the formula below.

1) MINIMUM DISCHARGE, Q_D

$$Q_D = \frac{q_d \cdot W}{60000}$$

wherein:
Q_D = minimum discharge, m^3/s
q_d = water flowrate per unit length of pad, L/min-m
W = width of evaporative cooling pad, m

2) FRICTIONAL HEAD LOSS THROUGH THE PIPELINE, h_L

This can be calculated using the Hazen-Williams equation.

$$h_L = 10.68 \cdot \frac{Q_D^{1.85}}{C^{1.85}} \cdot \frac{L}{d^{4.87}}$$

wherein:
h_L = frictional head loss thru pipeline, m
Q_D = minimum discharge, m^3/s
C = Hazen-Williams coefficient*
L = length of pipe, m
d = diameter of the pipe, m

3) FRICTIONAL HEAD LOSS THROUGH THE PIPE FITTINGS, h_m

$$v = \frac{Q_D}{\frac{\pi}{4} \cdot d^2}$$

$$h_m = \left(\sum \mathrm{K}\right) \cdot \frac{v^2}{2g}$$

wherein:
h_m = frictional head loss thru pipe fittings, m
Q_D = minimum discharge, m^3/s
d = diameter of pipe, m
v = velocity of water, m/s
ΣK = summation of coefficient of pipe fittings*
g = gravitational acceleration, 9.81 m/s^2
**Refer to Annex B for the Hazen-Williams coefficient and coefficient of pipe fittings.*

4) TOTAL STATIC HEAD LOSS, H_S

This refers to the elevation difference between the water surface at the intake point (i.e., the water surface of the sump) and the perforated pipe above the evaporative cooling pads.

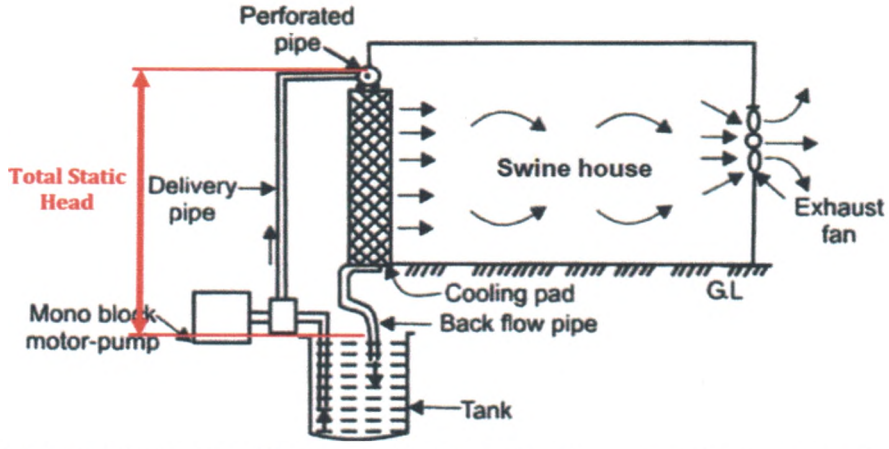

Figure 11. Total Static Head from Sump's Water Surface to Perforated Pipe Above the Evaporative Cooling Pads.[7]

5) TOTAL DYNAMIC HEAD LOSS, H_D

$$H_D = h_L + h_m + H_S$$

wherein:
H_D = total dynamic head loss, m or ft
h_L = frictional head loss thru pipeline, m or ft
h_m = diameter of the pipe, m
H_S = frictional head loss thru pipe fittings, m or ft

Using the computed minimum discharge and total dynamic head loss, the pump capacity can be calculated using the formula below.

$$P_{pump} = \frac{Q_D \cdot H_D \cdot sg}{n} \cdot 9.81$$

wherein:
P_{pump} = pump capacity, kW
Q_D = minimum discharge, m^3/s
H_D = total dynamic head loss, m
sg = specific gravity of water, 1.0
n = pump efficiency

A.3.7.10. PAD STATIC PRESSURE

The pad static pressure is the amount of work required to pull air through the evaporative cooling pads at the desired air velocity. When the pressure is higher, the fans must work harder to pull air through the pads. Furthermore, the pad

[7] Darwish, 2015.

pressure is only one component of the total static pressure, which also includes door pressure and transition pressure. Inside the tunnel-ventilated building, the recommended total static pressure is 0.10 to 0.20 inch of water, or 25 to 50 Pascal.

A.3.7.11. VENTILATION FANS

The maximum ventilation rate must be divided by the fan capacity available on the market to determine the number of fans in the building. The fan capacity should be chosen based on the recommended total static pressure inside the building.

Figure 12. Ventilation Exhaust Fans.[8]

The formula for the number of ventilation fans is given below.

$$N_{fan} = \frac{V_{max}}{v_{fan}}$$

wherein:
V_{max} = maximum ventilation rate, ft^3/min.
v_{fan} = fan capacity at recommended total static pressure, ft^3/min.
N_{fan} = Number of ventilation fans

A.3.8. Sensors and Climate Controller

Temperature and humidity sensors are the most important component of any ventilation control system because they measure the actual temperature experienced by the pigs as well as the relative humidity inside the building. Furthermore, these sensors must not be placed in areas of the incoming air from the air inlets (i.e., air inlets from the cooling pad) and must be placed above the pen height sufficient to prevent the swine from reaching it.

[8] https://bestpoultryfan.com/the-most-popular-poultry-house-fans/

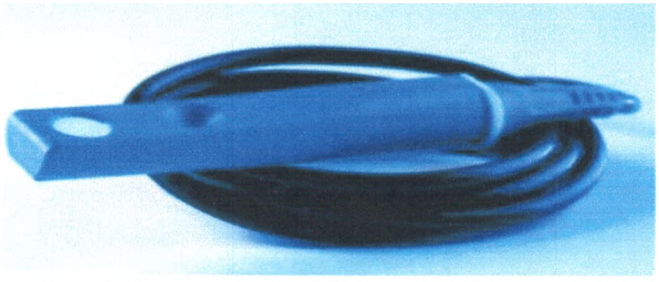

Figure 13. Temperature-humidity sensor.[9]

The climate controller regulates the swine environment inside the tunnel-ventilated building regardless of the outside atmospheric conditions. The following are the control parameters:[10]

- Minimum and maximum ventilation rates are adjustable.
- Reduces the inside temperature as the pigs grow based on preset temperature values.

Figure 14. Climate-controller.[10]

A.3.9. CONTROL ROOM

The computer controller and electrical panels are housed in this facility, which is part of the tunnel ventilated building.

A.3.10 ALARMS AND BACK-UP VENTILATION

An alarm system that will operate even if the power goes out must be provided to warn of any system failure. If the system fails, backup ventilation must be provided to maintain the swine's health and well-being.

[9] https://www.stockyardindustries.com/pigs/ventilation/sensors/

[10] https://www.agriexpo.online/prod/cnbaichen/product-187859-119727.html

For example, a manual drop-down side curtain system is a low-cost backup ventilation system used in tunnel ventilated buildings that operate on the principle that heat is removed by a pressure difference created by a wind gradient. The cool air moves from one side of the wall and across the building, creating a vacuum on the other side of the wall that pulls the heated air out.

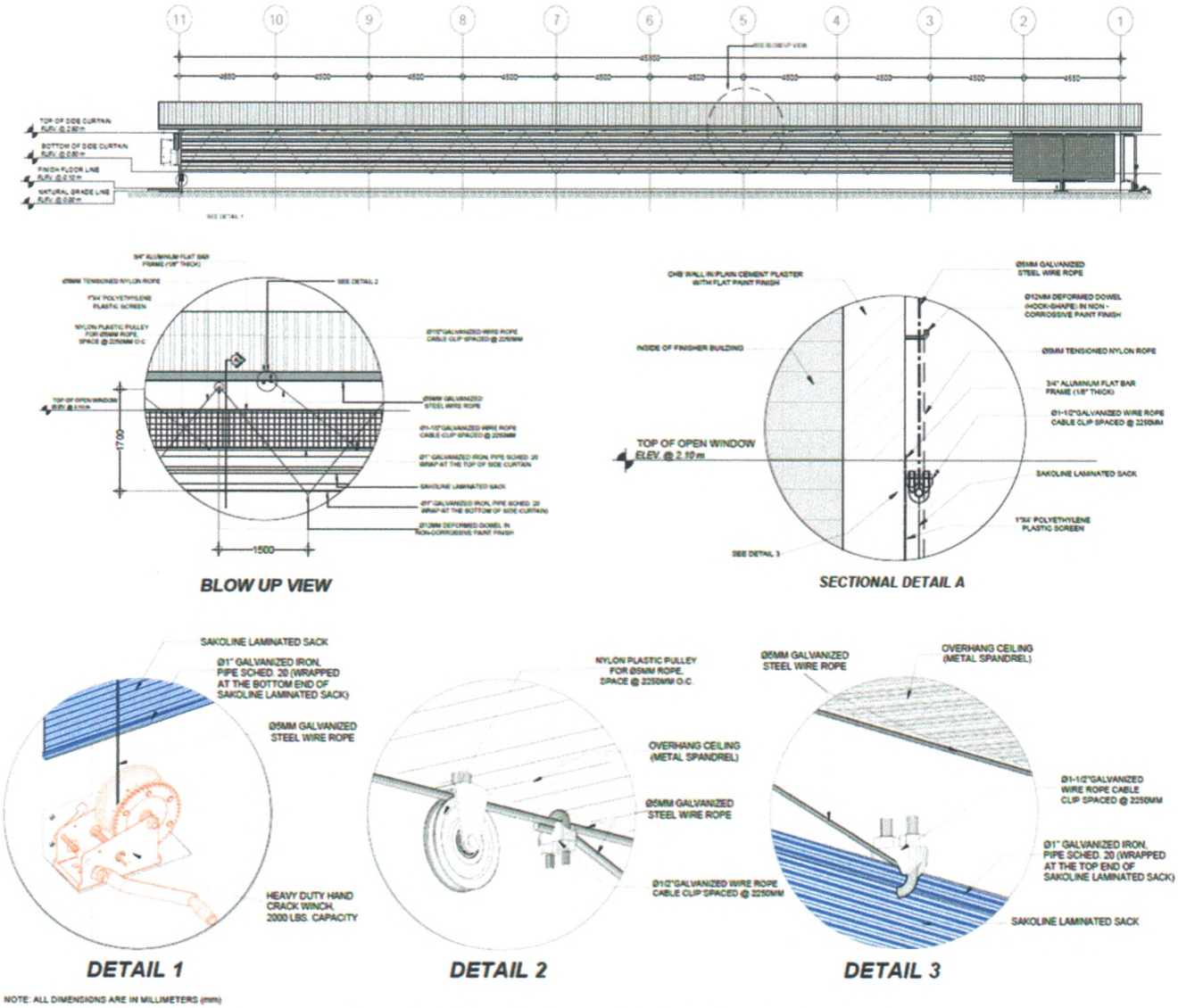

Figure 15. Drop-down Side Curtain System Set-up.

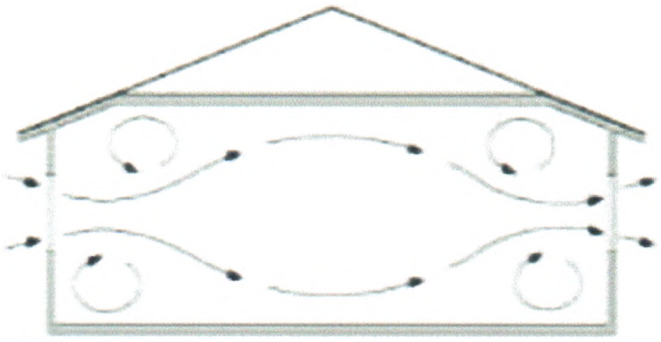

Figure 16. Air Movement Across the Tunnel Ventilated Building During the Onset of Drop-down Side Curtain System.[11]

B. SHOWER AREA

The shower area is where authorized personnel change out of their street clothes, footwear, and jewelry and into their farm working clothes. A shower area is deemed necessary to minimize the entry and spread of adhering dirt and pathogens.

C. OFFICE

The farm office is the designated area where all administrative work and operations are planned and centralized. It also serves as the personnel headquarters and storage for important farm inputs, tools, and equipment. Furthermore, it can be found in either a clean or dirty area.

D. FEED STORAGE ROOM

The feed storage room, also known as the "bodega", is designed to store and protect feeds, biologics, and other vital farm supplies from contamination and waste. However, keep in mind that only the feeds will be permitted to enter the finisher building, and the sacks should be left in the dirty area. This practice follows the intended biosecurity measures to prevent the spread of undesirable dirt and pathogens within the clean area.

E. WASTE MANAGEMENT FACILITY

The waste management facility should be built in accordance with the minimum design considerations and technical specifications indicated in PAES 413:2001 and PAES 414-1:2002. Furthermore, the facility should be designed to facilitate the proper collection, management, and disposal of animal manure and other farm by-products in a manner that promotes the quality of air, water, and soil in the interior and exterior farm areas, as well as the use of renewable energy sources (e.g., biogas production).

[11] https://www.canr.msu.edu/news/basic-types-of-ventilation-in-swine-barns

F. PERIMETER FENCE

The perimeter fence separates the biosecure swine farm's interior and exterior areas, preventing unauthorized personnel, animals, and equipment from entering and exiting the farm. It can be built with concrete posts, GI posts, barbed wire, steel matting, cyclone wire, or any other material that will serve its purpose.

SECTION VIII. OPTIONAL COMPONENTS

A. OVERHEAD/ELEVATED WATER TANK

The water consumption must be considered when designing an elevated water tank to determine the tank's capacity. The recommended total daily water requirement for swine is three times the weight of feed consumed per day plus 15% for waste and 30% for cleaning. Likewise, one kilogram of feed intake equals one liter of water consumption. Moreover, the table below can be used as a reference in computing the water requirement for the daily feed intake.

Table 11. Feeding rates by age and expected body weight gain.

BODY WEIGHT, kg	FEED, kg/day
40-50	2.5
50-84	3.0
84-105	3.5

B. CONCRETE WALKWAY

A paved walkway may be provided for the laborers and animals. It should be bird-proof and relatively straight to avoid blind spots that keep animals from moving around freely.

C. GENERATOR SET ROOM

This is the designated area that should be designed with enough space to allow the generator set to operate and be maintained without causing unnecessary damage. The provision of a generator set can help improve farm operations, particularly during times of power outages. However, it is optional because it is dependent on the availability of funds.

D. MARKET AREA

Farm transactions such as loading, weighing, and unloading of farm animals take place in the market area. Furthermore, the market area should be in the dirty area.

SECTION IX. STRUCTURAL DESIGN

The design of structural components shall be based on the National Building Code of the Philippines, the National Structural Code of the Philippines, and other applicable standards.

SECTION X. PLUMBING DESIGN

The design of the plumbing requirements shall be based on the Revised Plumbing Code of the Philippines and other applicable standards.

SECTION XI. ELECTRICAL DESIGN

The design of the electrical requirements shall be based on the Philippine Electrical Code and other applicable standards.

SECTION XII. REFERENCES

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For information and guidance.

ENGR. ARIODEAR C. RICO
Director IV

Attached: a/s

ANNEX A-1

Lighting intensity and its corresponding number of bulbs per square meter for incandescent and fluorescent lamp.

Lighting Intensity lux	No. of Bulbs Required per m^2							
	Incandescent lamp						Fluorescent lamp	
	25W	40W	60W	100W	150W	200W	20W	40W
500	3.935	1.989	1.052	0.520	0.314	0.226	0.682	0.266
400	3.148	1.591	0.842	0.416	0.251	0.181	0.546	0.213
300	2.361	1.193	0.631	0.312	0.189	0.136	0.409	0.160
200	1.574	0.796	0.421	0.208	0.126	0.090	0.273	0.107
150	1.180	0.597	0.316	0.156	0.094	0.068	0.205	0.080
100	0.787	0.398	0.210	0.104	0.063	0.045	0.136	0.053
50	0.393	0.199	0.105	0.052	0.031	0.023	0.068	0.027
10	0.079	0.040	0.021	0.010	0.006	0.005	0.014	0.005

ANNEX A-2

Lighting intensity and its corresponding number of bulbs per square meter for light-emitting diode (LED) lamps.

Lighting Intensity lux	No. of Bulbs Required per m^2					
	2W-3W	4W-6W	7W-10W	11W-15W	16W-20W	21W-30W
500	2.00	0.893	0.625	0.455	0.313	0.192
400	1.60	0.714	0.500	0.364	0.250	0.154
300	1.20	0.536	0.375	0.273	0.188	0.115
200	0.80	0.357	0.250	0.182	0.125	0.077
150	0.60	0.268	0.188	0.136	0.094	0.058
100	0.40	0.179	0.125	0.091	0.063	0.038
50	0.20	0.089	0.063	0.045	0.031	0.019
10	0.04	0.018	0.013	0.009	0.006	0.004

Note: *Sample computations were based on lumens and wattage from https://www.takethreelighting.com/lumen-watt-comparison.html.*

ANNEX B

Hazen-Williams coefficient for selected materials.

MATERIAL	HAZEN-WILLIAMS COEFFICIENT (C)
Galvanized Iron	120
Polyethylene (i.e., PE, PEH)	140
Polyvinyl chloride (i.e., PVC, CPVC)	150
Wrought Iron, plain	100
Copper	130 – 140

Source: *The Engineering Toolbox.* *https://www.engineeringtoolbox.com/hazen-williams-coefficients-d_798.html*

ANNEX C

Slope classification and classes.

Data Analysis 2009 based on USDA classification.

DESCRIPTION	SLOPE GRADIENT CLASSES
Flat	0 to 3%
Undulating	3% to 8%
Moderately sloping	8% to 15%
Hilly	15% to 30%
Moderately steep	30% to 45%
Steep	45% to 65%
Very steep	>65%

Source: *The selective causative factors on landslide susceptibility assessment: Case study Takengon, Aceh, Indonesia (Wahono, 2010). Retrieved from https://webapps.itc.utwente.nl/librarywww/papers_2010/msc/aes/wahono.pdf*

ANNEX D

Loss Coefficients for Pipe Components

COMPONENT	K_L
a. Elbows	
Regular 90°, flanged	0.3
Regular 90°, threaded	1.5
Long radius 90°, flanged	0.2
Long radius 90°, threaded	0.7
Long radius 45°, flanged	0.2
Regular 45°, threaded	0.4
b. 180° return bends	
180° return bend, flanged	0.2
180° return bend, threaded	1.5
c. Tees	
Line flow, flanged	0.2
Line flow, threaded	0.9
Branch flow, flanged	1.0
Branch flow, threaded	2.0
d. Union, threaded	0.08
e. Valves	
Globe, fully open	10
Angle, fully open	2
Gate, fully open	0.15
Gate, ¼ closed	0.26
Gate, ½ closed	2.1
Gate, ¾ closed	17
Swing check, forward flow	2
Ball valve, full open	0.05
Ball valve, ⅓ closed	5.5
Ball valve, ⅔ closed	210

Source: *Hydraulic losses in pipes.*

ANNEX E

Sample design computation for the 300-level finisher building

Assumptions:

Space Requirement = 0.9 m^2/animal
Number of heads/pen = 15 heads
No. of pen per room = 10 pens
Number of rooms = 2 rooms
Ceiling height = 2.4 m
Width of walkways = 1.0 m (i.e., solid concrete floor)
Ceiling = Fiber cement board, 6 mm thick
Wall = Concrete, 150 mm thick
Flooring = Concrete slats, 100 mm thick
Type of Cooling Pads = Corrugated Cellulose 150mm thick
Design inlet air speed = 250 ft/min.
Feeding and Drinking System = Dry-wet pig feeder/Self feeder
Outside temperature = 31^{0}C
Outside relative humidity = 50%
Desired inside temperature = 21 ^{0}C,
Desired inside relative humidity = 70%
Temperature-humidity stress index = 68 < 74 (Normal THS index)
Moisture production = 0.00285 kg of water/kg–hr.
Finisher live weight (for harvest) = 110 kg

I. Finisher Pen Dimension

$$Pen\ Area = Space\ Requirement\ x\ No.of\ heads/pen$$

$$Pen\ Area = 0.90\ m^2\ x\ 15\ heads/pen$$

$$Pen\ Area = 13.5\ m^2$$

Assume Pen Width = 3.15 m

$$Pen\ Length = \frac{Pen\ Area}{Pen\ Width}$$

$$Pen\ Length = \frac{13.5\ m^2}{3.15\ m}$$

$$Pen\ Length = 4.3\ m$$

II. Finisher Building Dimension

$$Building\ Length = (Pen\ Length\ x\ No.of\ pen\ along\ length\ axis) + (Walkway\ width\ x\ No.of\ walkway\ along\ length\ axis) + (Wall\ thickness\ x\ No.of\ wall\ along\ length\ axis)$$

$$Building\ Length = (4.3\ m/pen\ \ x\ 10\ pens) + (2\ x\ 1.0\ m) + (2\ x\ 0.15\ m)$$

$$Building\ Length = 45.3\ m$$

$$Building\ Width = (Pen\ Width\ x\ No.of\ pen\ along\ width\ axis) + (Walkway\ width\ x\ No.of\ walkway\ along\ width\ axis) + (Wall\ thickness\ x\ No.of\ wall\ along\ width\ axis)$$

$$Building\ Width = (3.15\ m/pen\ \ x\ 2\ pens) + (2\ x\ 1.0\ m) + (3\ x\ 0.15\ m)$$

$$Building\ Width = 8.75\ m$$

III. Ventilation

1. Sensible Heat Production (Q_S)

At 21^{0}C and 110 kg/head, the q_s = 243.8 W/head

$$Q_S = \frac{q_s \cdot w}{1000}$$

$$Q_S = \frac{243.8\ W/head \cdot 300\ heads}{1000}$$

$$Q_S = 73.14\ kW$$

2. Moisture Heat Production (Q_M)

Moisture production = 0.0022 kg of water/kg–hr.
Water's latent heat of vaporization = 2260 kJ/kg of water

$$Q_M = \frac{m_p \cdot m_w \cdot w \cdot l_v}{3600}$$

$$Q_M = \frac{0.0022\ \frac{kg_{water}}{kg \cdot hr} \cdot 110 \frac{kg}{head} \cdot 300\ heads\ \cdot 2260 \frac{kJ}{kg_{water}}}{3600}$$

$$Q_M = 45.58\ kW$$

3. Transmission Heat Production (Q_T)

STRUCTURAL COMPONENT	MATERIAL	AREA (m^2)	QTY.	K-VALUE (W/m-K)	THICKNESS (m)	t_i (°C)	t_o (°C)	SUBTOTAL (kW)
Side wall	Concrete	108.72	2	2.25	0.15	21	31	32.62
End wall	Concrete	21.0	2	2.25	0.15			6.3
Ceiling	Fiber cement board	396.38	1	0.20	0.006			132.13
Flooring	Concrete	396.38	1	2.25	0.10			89.18
							TOTAL (Q_T)	**260.23**

4. Lighting Heat Production (Q_L)

Using 40W of fluorescent lamp with lighting intensity of 50 lux

$$Area\ per\ room = \frac{Building\ Length\ x\ Building\ Width}{2}$$

$$Area\ per\ room = \frac{45.3\ m\ x\ 8.75\ m}{2}$$

$$Area\ per\ room = 198.19\ m^2$$

$$No.of\ bulbs\ per\ room\ = Area\ per\ room\ x\ No.of\ bulbs\ per\ m^2$$

$$No.of\ bulbs\ per\ room\ = 198.19\ m^2\ x\ 0.027/m^2$$

$$No.of\ bulbs\ per\ room\ = 5.35$$
$$No.of\ bulbs\ per\ room\ \approx 6\ pieces$$

$$Total\ bulbs = No.of\ bulbs\ per\ room\ x\ No.of\ room$$

$$Total\ bulbs = 6\ pieces\ x\ 2$$

$$Total\ bulbs = 12\ pieces$$

$$Q_L = \frac{Total\ bulbs\ x\ Wattage/bulb}{1000}$$

$$Q_L = \frac{12\ x\ 40\ W}{1000}$$

$$Q_L = 0.48\ kW$$

5. **Equipment and Miscellaneous Heat Production (Q_{EM})**

Q_S = 73.14 kW
Q_M = 45.58 kW
Q_T = 260.23 kW
Q_L = 0.48 kW

$$Q_{EM} = 0.01\ (Q_S + Q_M + Q_T + Q_L)$$

$$Q_{EM} = 0.01\ (73.14\ kW + 45.58\ kW + 260.23\ kW + 0.48\ kW)$$

$$Q_{EM} = 3.80\ kW$$

6. **Total Heat Production (Q_{total})**

$$Q_{total} = 1.10\ (Q_S + Q_M + Q_T + Q_L + Q_{EM})$$

$$Q_{total} = 1.10\ (73.14\ kW + 45.58\ kW + 260.23\ kW + 0.48\ kW + 3.80\ kW)$$

$$Q_{total} = 421.55\ kW$$

7. **Maximum Ventilation Rate (V_{max})**

$$m_{max} = \frac{Q_{total}}{c_p(t_o - t_i)}$$

$$m_{max} = \frac{421.55\ kW}{1.006\frac{kJ}{kg \cdot K}(31^0C - 21^0C)}$$

$$m_{max} = 41.91\frac{kg}{s}$$

$$V_{max} = \frac{m_{max}}{\rho_{air}}\ x\ 2119$$

$$V_{max} = \frac{41.91\frac{kg}{s}}{1.2\frac{kg}{m^3}}\ x\ 2119$$

$$V_{max} = 74{,}006.10\ ft^3/min$$

8. Evaporative Cooling Pad Sizing

Using a 150 mm corrugated cellulose cooling pad material, the required total area is:

$$A_{ECP} = \frac{V_{max}}{v_{air} \cdot 10.7639}$$

$$A_{ECP} = \frac{74006.10\ ft^3/min}{250\ ft/min \cdot 10.7639}$$

$$A_{ECP} = 27.50\ m^2$$

The market offers standard pad height of 1.5 m, 1.8 m, and 2.0 m. The pad height for this sample calculation is 1.8 m. As a result, the formula for calculating the total width of the cooling pad is shown below:

$$pad\ width = \frac{A_{ECP}}{pad\ height}$$

$$pad\ width = \frac{27.50\ m^2}{1.8\ m}$$

$$pad\ width = 15.30\ m$$

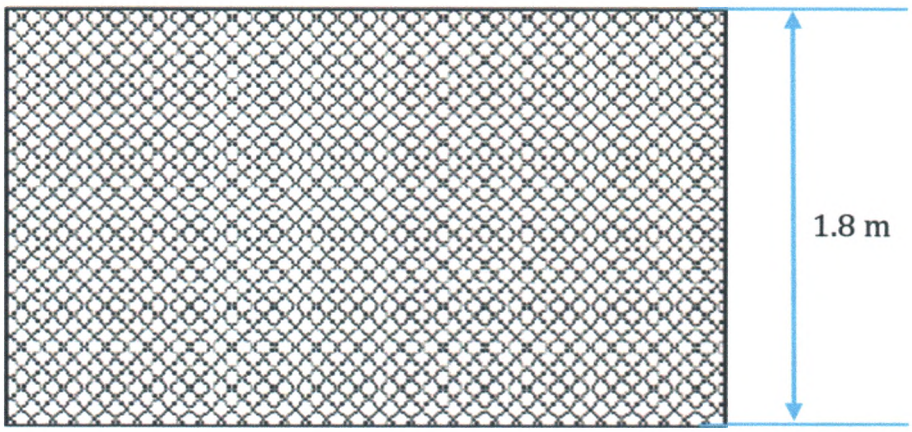


Figure 17. Elevation view of wall showing the height of evaporative cooling pad.

Dividing the total pad width into two to determine the width of the cooling pad per room.

$$pad\ width\ per\ room = \frac{15.30\ m}{2}$$

$$pad\ width\ per\ room = 7.65\ m$$

$$pad\ width\ per\ room \approx 7.7\ m$$

9. Sump Sizing

For a 150 mm corrugated cellulose pad material, the minimum sump capacity per unit pad area is 40 L/m². Two (2) sumps per room will be designed for this sample calculation, with one on the side wall and the other on the end wall.

The sump capacities for a single room are computed below:

Pad height = 1.8 m
Pad width 1 = 3.3 m
Pad width 2 = 4.4 m

$$S_{cap\,1} = s_{min} \cdot A_C$$

$$S_{cap1} = s_{min} \cdot (Pad\ height\ \cdot\ Pad\ width\ 1)$$

$$S_{cap1} = 40\frac{L}{m^2} \cdot (\,1.8\,m \cdot\ 3.3\,m)$$

$$S_{cap1} = 237.6\,L$$
$$\approx 240\,L$$

$$S_{cap\,2} = s_{min} \cdot A_C$$

$$S_{cap2} = s_{min} \cdot (Pad\ height\ \cdot\ Pad\ width\ 2)$$

$$S_{cap2} = 40\frac{L}{m^2} \cdot (\,1.8\,m \cdot\ 4.4\,m)$$

$$S_{cap1} = 316.8\,L$$
$$\approx 320\,L$$

As a result, each room has sump capacities of 240 and 320 Liters for the evaporative cooling pads, with widths of 3.3 and 4.4 meters, respectively, and a standard pad length of 1.8 meters.

10. Pump Sizing

For a 150 mm corrugated cellulose pad material, the minimum water flow rate per unit width of the pad is 9.9 L/min*m. For this sample calculation, two (2) pumps per room will be designed, one on the side wall and the other on the end wall.

The pump capacities for a single room are computed below:

Pad width 1 (W_1) = 3.3 m
Pad width 2 (W_2) = 4.4 m

10.1. Minimum Discharge (Q_D)

$$Q_{D1} = \frac{q_d \cdot W_1}{60000}$$

$$Q_{D1} = \frac{9.9 \frac{L}{min * m} \cdot 3.3\ m}{60000}$$

$$Q_{D1} = 0.000545\ m^3/s$$

$$Q_{D2} = \frac{q_d \cdot W_2}{60000}$$

$$Q_{D2} = \frac{9.9 \frac{L}{min * m} \cdot 4.4\ m}{60000}$$

$$Q_{D2} = 0.000726\ m^3/s$$

10.2. Frictional Head Loss thru Pipeline, h_L

Assumptions:
Pipe material: PVC pipe
Pipe diameter: 50 mm
Hazen-Williams coefficient for PVC: 150
Pipeline length (L_1): 5.5 meters
Pipeline length (L_2): 6.0 meters

$$h_{L1} = 10.68 \cdot \frac{Q_{D1}^{1.85}}{C^{1.85}} \cdot \frac{L_1}{d^{4.87}}$$

$$h_{L1} = 10.68 \cdot \frac{(0.000545\ m^3/s)^{1.85}}{(150)^{1.85}} \cdot \frac{5.5\ m}{(0.05\ m)^{4.87}}$$

$$h_{L1} = 0.011\ m$$

$$h_{L2} = 10.68 \cdot \frac{Q_{D2}^{1.85}}{C^{1.85}} \cdot \frac{L_2}{d^{4.87}}$$

$$h_{L2} = 10.68 \cdot \frac{(0.000726\, m^3/s)^{1.85}}{(150)^{1.85}} \cdot \frac{6.0\, m}{(0.05\, m)^{4.87}}$$

$$h_{L2} = 0.0204\, m$$

10.3. Frictional Head Loss thru Pipe Fittings, h_m

Assumptions:
Pipe fittings material: PVC pipe
Pipe fittings diameter: 50 mm
Coefficient of pipe fittings for;
90^0 elbow: 1.5 (2 pieces)
Ball valve: 0.05 (2 pieces)
Check valve: 2 (1 piece)

$$v_1 = \frac{Q_{D1}}{\frac{\pi}{4} \cdot d^2}$$

$$v_1 = \frac{0.000545\, m^3/s}{\frac{\pi}{4} \cdot (0.05\, m)^2}$$

$$v_1 = 0.2776\, m/s$$

$$h_{m1} = \left(\sum K_1\right) \cdot \frac{v_1^2}{2g}$$

$$h_{m1} = [(1.5 \cdot 2) + (0.05 \cdot 2) + (2)] \cdot \frac{\left(0.2776 \frac{m}{s}\right)^2}{\left(2 \cdot 9.81 \frac{m}{s^2}\right)}$$

$$h_{m1} = 0.02\, m$$

$$v_2 = \frac{Q_{D2}}{\frac{\pi}{4} \cdot d^2}$$

$$v_2 = \frac{0.000726\, m^3/s}{\frac{\pi}{4} \cdot (0.05\, m)^2}$$

$$v_2 = 0.3697\, m/s$$

$$h_{m2} = \left(\sum K_2\right) \cdot \frac{v_2^2}{2g}$$

$$h_{m2} = [(1.5 \cdot 2) + (0.05 \cdot 2) + (2)] \cdot \frac{\left(0.3697 \frac{m}{s}\right)^2}{\left(2 \cdot 9.81 \frac{m}{s^2}\right)}$$

$$h_{m2} = 0.0355\ m$$

10.4. Total Static Head Loss, H_S

Assumptions:

The total static head loss (H_S) for both 3.3 m (W1) and 4.4 m (W2) evaporative cooling pads is **2.5 m** based on the modular design.

10.5. Total Dynamic Head Loss, H_D

$$H_{D1} = h_{L1} + h_{m1} + H_{S1}$$

$$H_{D1} = 0.011\ m + 0.020\ m + 2.5\ m$$

$$H_{D1} = 2.531\ m$$
$$\approx 2.53\ m$$

$$H_{D2} = h_{L2} + h_{m2} + H_{S2}$$

$$H_{D2} = 0.0204\ m + 0.0355\ m + 2.5\ m$$

$$H_{D2} = 2.556\ m$$
$$\approx 2.56\ m$$

10.6. Pump Power, P_{pump}

Assumption:

Pump efficiency, n = 70%

$$P_{pump1} = \frac{Q_{D1} \cdot H_{D1} \cdot sg}{n} \cdot 9.81$$

$$P_{pump1} = \frac{\left(0.000545 \frac{m^3}{s}\right) \cdot (2.53\ m) \cdot (1.0)}{0.70} \cdot 9.81$$

$$P_{pump1} = \frac{0.0193\ kW}{0.746}$$

$$P_{pump1} = 0.026\ hp$$

$$\approx 0.50\ hp \quad \text{(Available in the market)}$$

$$P_{pump2} = \frac{Q_{D2} \cdot H_{D2} \cdot sg}{n} \cdot 9.81$$

$$P_{pump2} = \frac{\left(0.000726 \frac{m^3}{s}\right) \cdot (2.56\ m) \cdot (1.0)}{0.70} \cdot 9.81$$

$$P_{pump2} = \frac{0.0260\ kW}{0.746}$$

$$P_{pump2} = 0.035\ hp$$
$$\approx 0.50\ hp \quad \text{(Available in the market)}$$

As a result, each room has a 0.50 hp pump capacity for both evaporative cooling pads with widths of 3.3 and 4.4 meters, respectively, and a standard pad length of 1.8 meters.

11. Number of Ventilation Fans

Assumption:
Total static pressure = 30 Pascal
Maximum ventilation rate = 74,006.10 ft³/min

Since the finisher building has two rooms, the maximum ventilation rate (Vmax) of 74,006.10 ft³/min will be divided by two to determine the number of ventilation fans per room. Furthermore, the selection of fan capacity is shown in the sample technical specification table for ventilation fans below.

Technical data single-phase

Article **	ø (cm)	Power supply			(n) RPM	P_m (W)	I_{nom} (A)	Q_v (m³/h)					SFP @0Pa (W/1000m³/h)	Control options *
		~	V	Hz				0 Pa	30 Pa	50 Pa	80 Pa	100 Pa		
C4E45K1M10241	45	1	240	60	1.700	290	1,4	7.150	6.650	6.250	5.400	-	40,2	E / T
C6E63K2M10241	63	1	230	60	1.135	390	1,8	12.700	11.300	10.400	-	-	31	E / T
C8E92K1M10241	92	1	230	60	845	900	4,6	23.300	20.600	18.300	-	-	38,7	-
C4E13K1M10241	130	1	230	60	620	1.800	8,3	52.700	48.000	44.300	37.700	-	34,2	-
C4E14K1M10241	140	1	230	60	510	1.050	4,8	50.500	44.100	37.900	-	-	20,8	-
C4E14K3M10241	140	1	230	60	555	1.600	7,2	58.600	52.700	48.000	-	-	27,4	-
C4E14K4M10241	140	1	230	60	580	1.750	8,2	53.700	50.200	47.900	43.800	40.200	32,9	-
Vplus technology														
C4E13P3M10241	130	1	230	50 / 60	640	1.650	11,5	56.100	51.700	48.200	41.700	-	29,6	F
Performance at 80% RPM					490	800	6,1	43.300	37.300	31.100	-	-	18,4	
C4E14P3M10241	140	1	230	50 / 60	600	1.550	10,5	63.900	58.200	54.000	46.900	-	23,9	F
Performance at 80% RPM					490	900	6,7	52.700	45.900	39.000	-	-	17	

Figure 18. Sample technical specifications for ventilated fans

Source: Fiberglass Cone Fans: Efficient ventilation with high air yields (Vostermans, 2020).

$$N_{fan} = \frac{74{,}006.10\frac{ft^3}{min}\cdot\frac{1}{2}}{v_{fan}}$$

$$N_{fan} = \frac{37{,}0003.05\frac{ft^3}{min}}{v_{fan}}$$

First selection of ventilation fan is 130 cm (≈ 50 in.) diameter with a fan capacity of 51,700 m³/hr. (30,429.50 ft³/min).

$$N_{fan} = \frac{37{,}0003.05\frac{ft^3}{min}}{30{,}429.50\frac{ft^3}{min}}$$

$$N_{fan} = \frac{37{,}0003.05\frac{ft^3}{min}}{30{,}429.50\frac{ft^3}{min}}$$

$$N_{fan} = 1.22$$
$$\approx 2\ fans$$

The remaining fan capacity is calculated by subtracting the first fan size (130 cm diameter; 30,429.50 ft³/min) from the total maximum ventilation rate (V_{max}).

$$= 37{,}003.05\ \frac{ft^3}{min} - 30{,}429.50\frac{ft^3}{min}$$

$$= 6573.55\ \frac{ft^3}{min}$$

$$\approx 11{,}168.53\ \frac{m^3}{hr}$$

Technical data single-phase

Article **	ø (cm)	Power supply			(n) RPM	P_{in} (W)	I_{nom} (A)	Q_v (m³/h)					SFP @0Pa (W/1000m³/h)	Control options *
		~	V	Hz				0 Pa	30 Pa	50 Pa	80 Pa	100 Pa		
C4E45K1M10241	45	1	240	60	1.700	290	1,4	7.150	6.450	6.250	5.400	-	40,2	E / T
C6E63K2M10241	63	1	230	60	1.135	390	1,8	12.700	11.300	10.400	-	-	31	E / T
C8E92K1M10241	92	1	230	60	845	900	4,6	23.300	20.600	18.300	-	-	38,7	-
C4E13K1M10241	130	1	230	60	620	1.800	8,3	52.700	48.000	44.300	37.700	-	34,2	-
C4E14K1M10241	140	1	230	60	510	1.050	4,8	50.500	44.100	37.900	-	-	20,8	-
C4E14K3M10241	140	1	230	60	555	1.600	7,2	58.600	52.700	48.000	-	-	27,4	-
C4E14K4M10241	140	1	230	60	580	1.750	8,2	53.700	50.200	47.900	43.800	40.200	32,9	-
Vplus technology														
C4E13P3M10241	130	1	230	50 / 60	640	1.650	11,5	56.100	51.700	48.200	41.700	-	29,6	F
Performance at 80% RPM					490	800	6,1	43.300	37.300	31.100	-	-	18,4	
C4E14P3M10241	140	1	230	50 / 60	600	1.550	10,5	63.900	58.200	54.000	46.900	-	23,9	F
Performance at 80% RPM					490	900	6,7	52.700	45.900	39.000	-	-	17	

Source: Fiberglass Cone Fans: Efficient ventilation with high air yields (Vostermans, 2020).

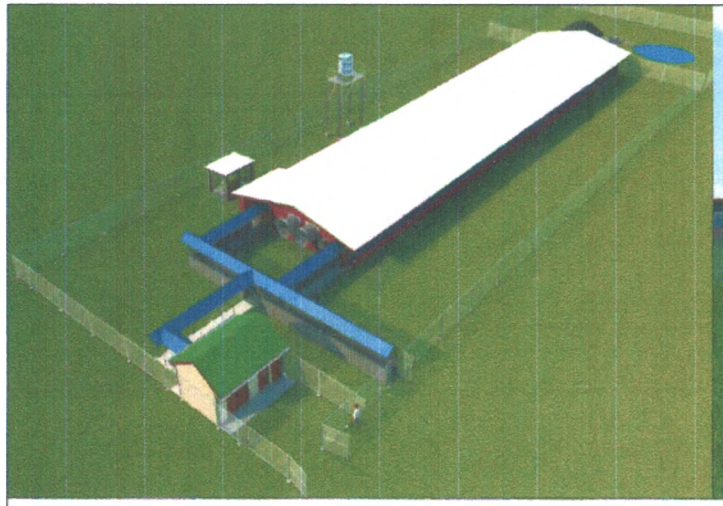
Based on the computed remaining fan capacity, the second fan shall be 63 cm (24 in.) in diameter with a fan capacity of 11,300 m3/hr. As a result, the total ventilation fan specifications are shown in tabular form below.

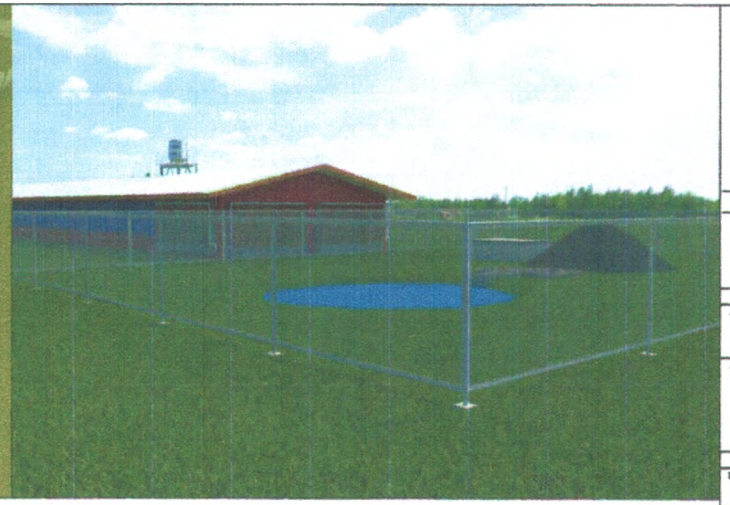
FAN SIZE cm [in.]	FAN CAPACITY m³/hr. [ft³/min]	TOTAL PRESSURE Pa [in. of water]	QUANTITY
63 (24)	51,700 [30,429.50]	30 [0.12]	2
130 (50)	11,300 [6,650.93]	30 [0.12]	2

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING
SUGAR CENTER, ANNEX II BUILDING EXTENSION, NORTH AVENUE, DILIMAN, QUEZON CITY

ANNEX F

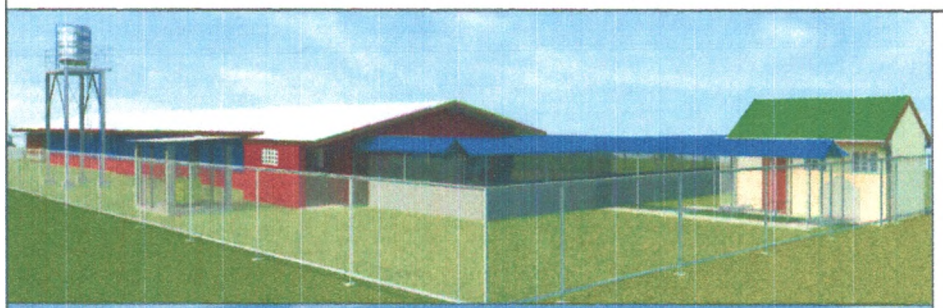
PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM

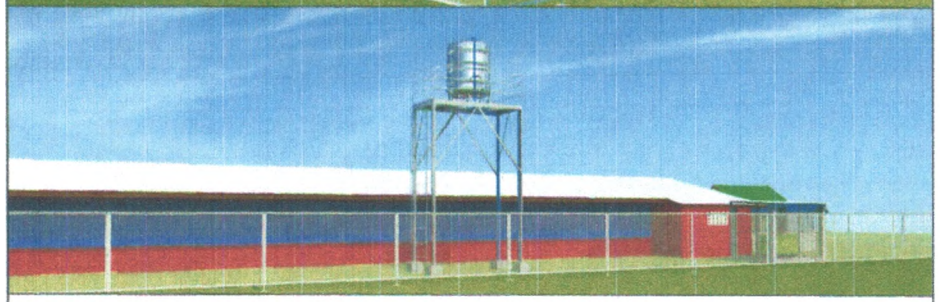




PERSPECTIVE

SCALE NTS





PERSPECTIVE

SCALE NTS

VICINITY MAP

SCALE NTS

OFFICE OF THE BUILDING OFFICIALS

CITY DISTRICT MUNICIPALITY

LAND USE & ZONING

LINE & GRADE

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REPUBLIC OF THE PHILIPPINES

DEPARTMENT OF AGRICULTURE

BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING

PROJECT TITLE: PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM

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31/02

SHEET CONTENT	SHEET NO.
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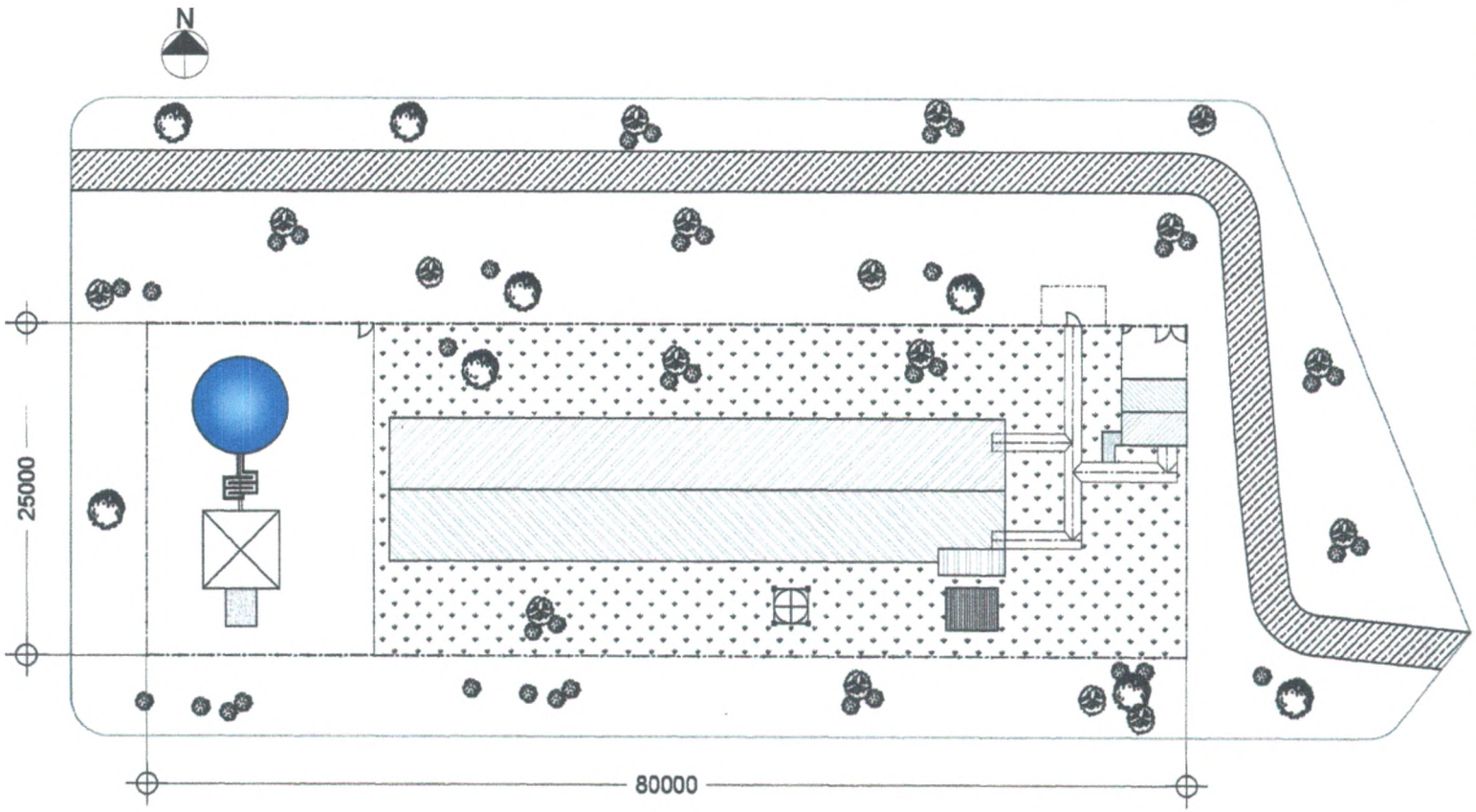


LEGENDS

REPRESENTATION	DESCRIPTION
N	NORTH
	DIRTY AREA
	CLEAN AREA
	EXISTING ROAD
	CONCRETE PATHWAY
	TREES
	FEED STORAGE ROOM AND SHOWER ROOM
	FINISHER BUILDING
	COVERED PATH WALK
	ELEVATED WATER TANK
	GENERATOR SET ROOM
	BIOGAS FACILITY
	LAGOON
	PERIMETER FENCE
	GATE
	MARKET AREA
	PROPERTY LINE

A 1-2

FARMSTEAD PLAN

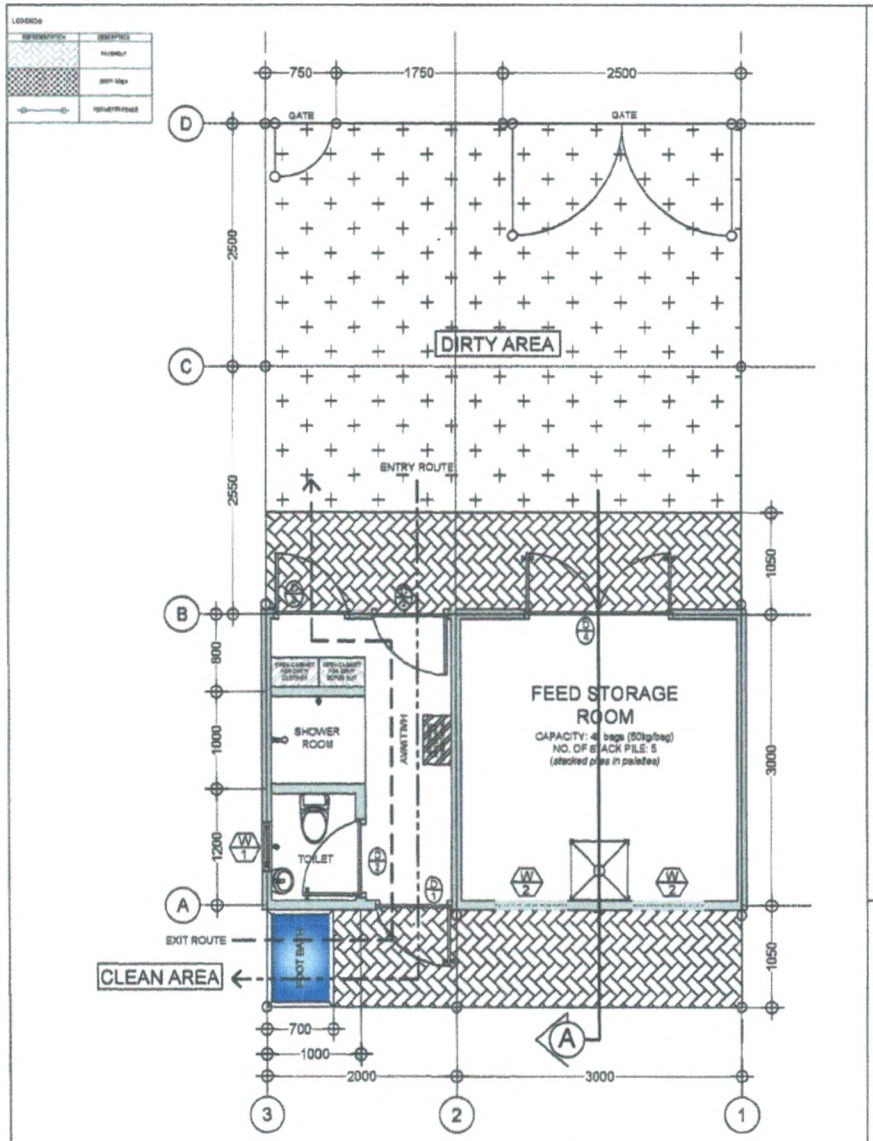
SCALE: 1:350

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

GENERAL NOTES:

- BASED ON THE DA MEMORANDUM CIRCULAR NO. 1 SERIES OF 2022 SECTION 6.1, THE MINIMUM LAND AREA FOR THE IDENTIFIED SITE IS 2,000 SQUARE METERS.
- THE IDENTIFIED SITE MUST HAVE AVAILABLE ELECTRICITY AND WATER SUPPLY.
- THE SITE SHOULD BE RELATIVELY FLAT TERRAIN OR WITH MINIMAL SLOPING TERRAIN TO MINIMIZE THE EMBANKMENT THAT CAUSE INCREASE IN THE TOTAL PROJECT COST AND UNDERMINES THE TOTAL ALLOCATED BUDGET FOR THE PROJECT.
- THE IDENTIFIED SITE SHOULD NOT BE SITUATED IN A FLOOD PRONE AREA.
- THE DESIGNER MUST TAKE ADVANTAGE THE TOPOGRAPHY OF IDENTIFIED SITE RELATIVE TO THE POSITIONING OF STRUCTURES/BUILDINGS WITHIN THE PROPERTY LINE.
- THE ORIENTATION OF LONGER DIMENSION FOR THE FINISHER BUILDING MUST BE PARALLEL TO EAST-WEST DIRECTION.
- OPTIONAL PROVISION FOR GENERATOR SET AS BACK UP POWER FOR THE WHOLE OPERATION.
- THE MATERIAL COSTING AND LABOR RATES OF PROGRAM OF WORKS (POW) FOR THIS MODULAR DESIGN IS BASED ON THE DPWH - NCR CONSTRUCTION MATERIALS PRICE DATA (CMPD) 4TH QUARTER F.Y. 2021.

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY: ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, DESIGNS AND SPECIFICATIONS DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMIL C. CARPIO ENGINEER IV ENGINEERING PLANS, DESIGNS AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTHIE DISHAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - SWINE INDUSTRY DEVELOPMENT PROGRAM	SHEET CONTENT FARMSTEAD PLAN DATE	SHEET NO. A-1 2 of 2

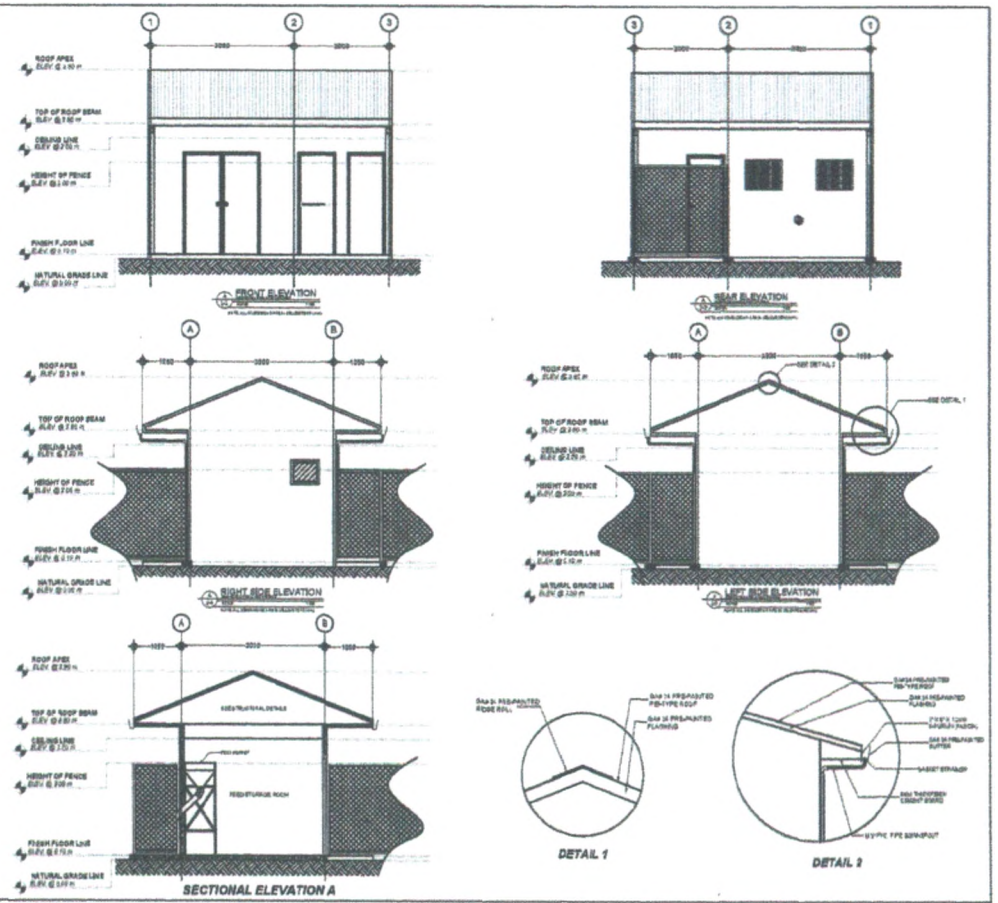


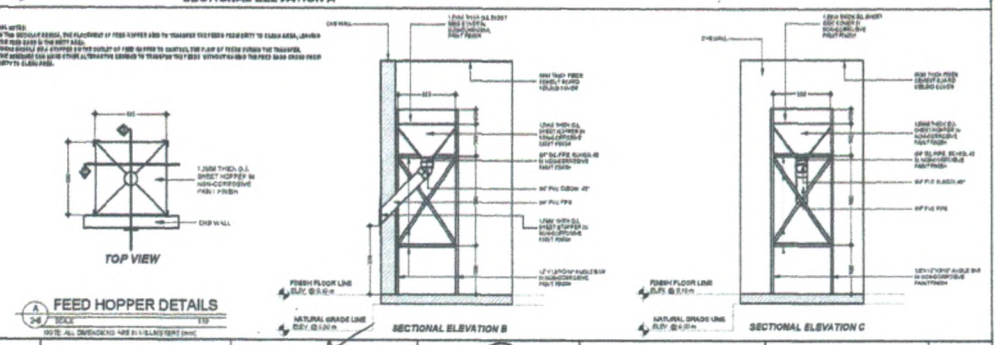
FLOOR PLAN

A 2-1 DISINFECTION AREA & FEED STORAGE

SCALE: 1:50

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)



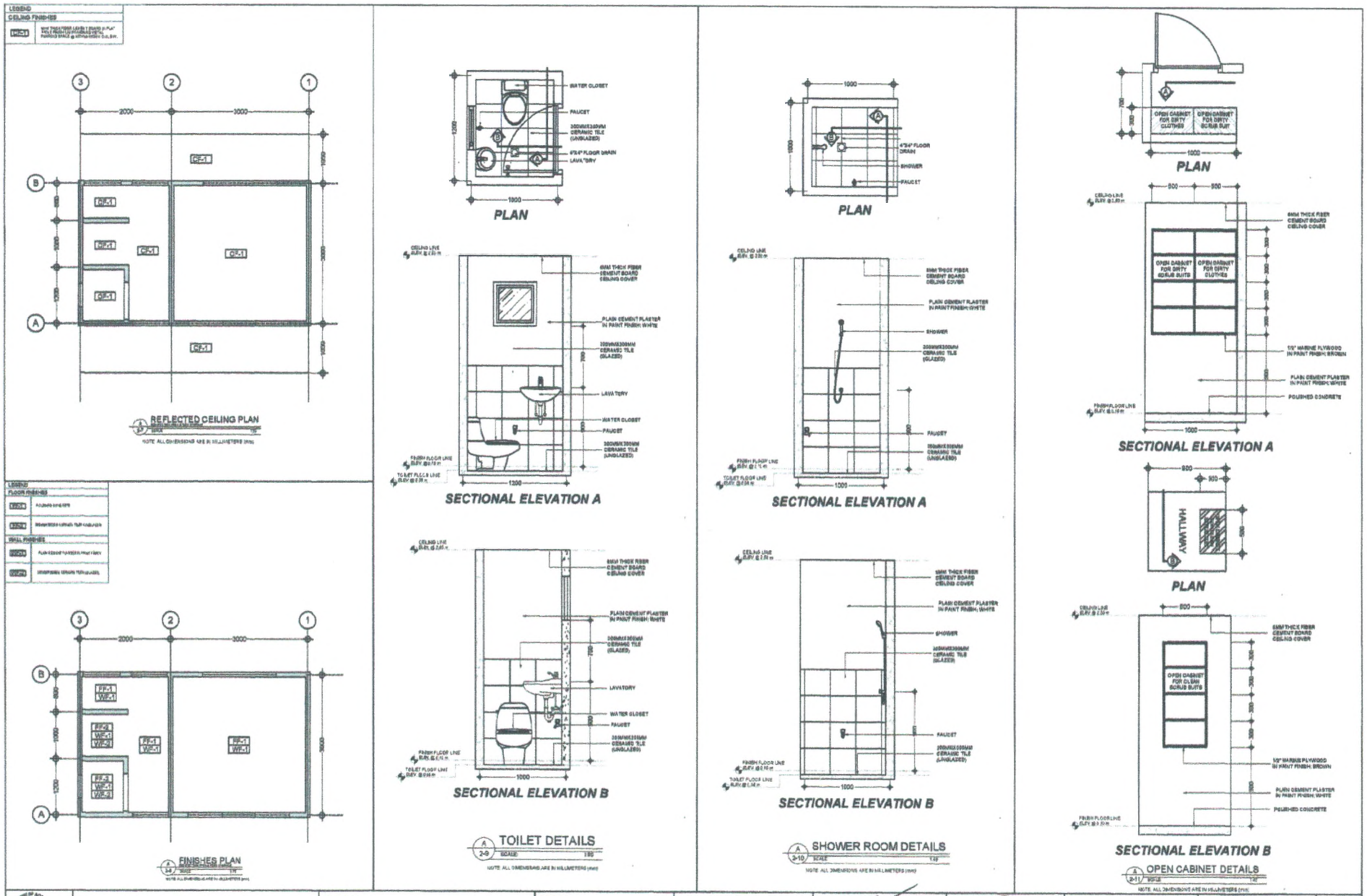


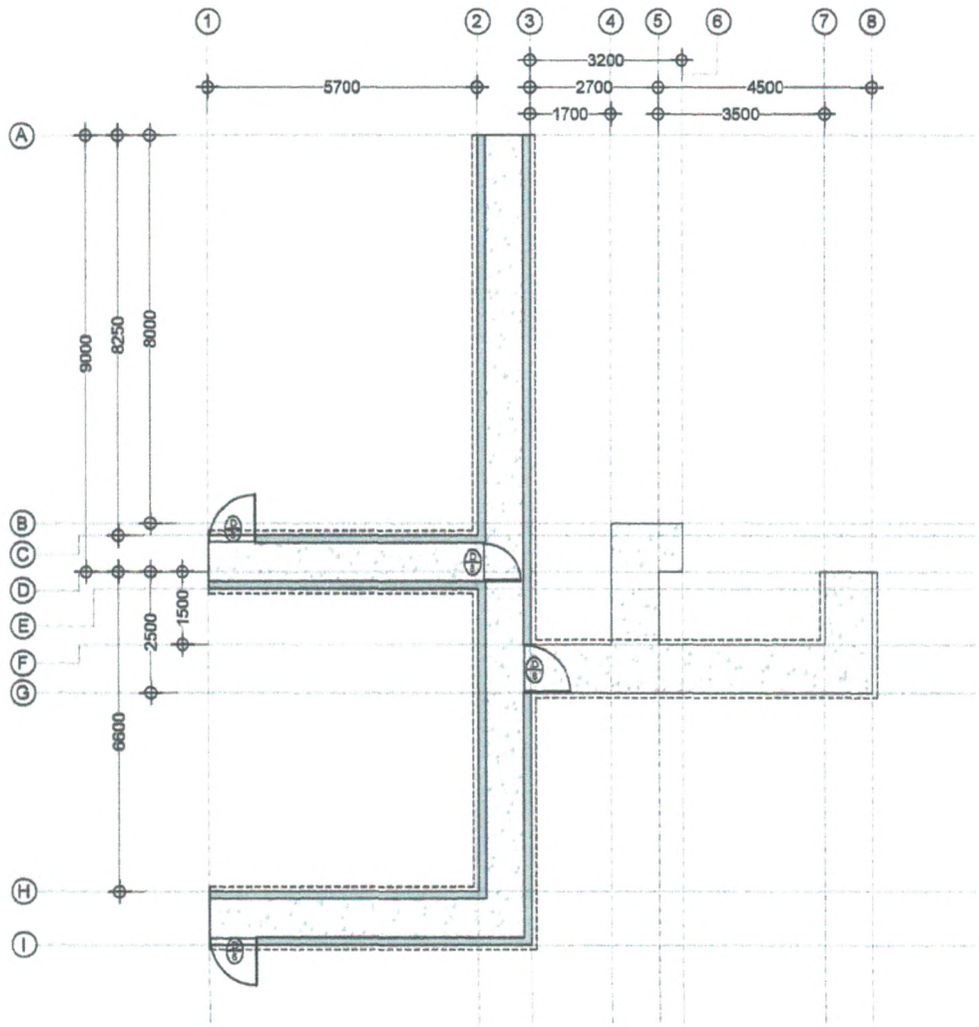
FEED HOPPER DETAILS

A 2-6 SCALE: 1:50

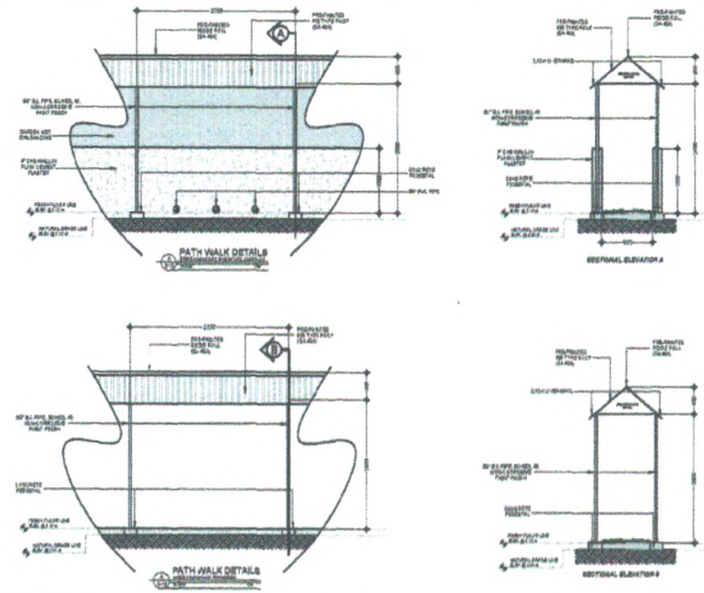
NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

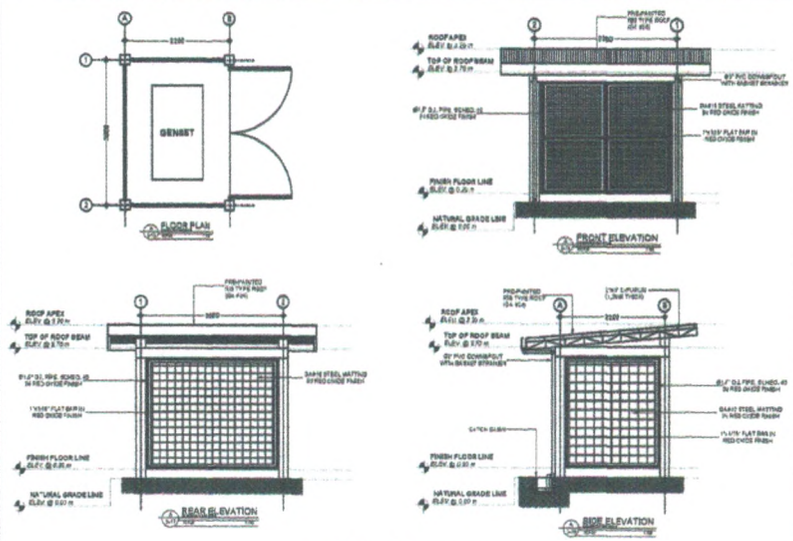
REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. BABALLERO ENGINEER I ENGINEERING PLANS, DESIGNS, AND SPECIFICATION STUDIES	REVIEWED & EVALUATED BY: ENGR. NOEMIL CARPIO ENGINEER V ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. [illegible]-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT FLOOR PLAN FRONT ELEVATION REAR ELEVATION LEFT SIDE ELEVATION RIGHT SIDE ELEVATION SECTIONAL ELEVATION DATE	SHEET NO. A-2 1 of 11


REFLECTED CEILING PLAN
FINISHES PLAN
PLAN
SECTIONAL ELEVATION A
SECTIONAL ELEVATION B
TOILET DETAILS
SHOWER ROOM DETAILS
OPEN CABINET DETAILS
NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)
REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING
PROJECT TITLE
PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM
PREPARED BY
ENGR. ROMEL A. CABALLERO
ENGINEER I
REVIEWED & EVALUATED BY:
ENGR. NOEMI L. CARPIO
ENGINEER III
RECOMMENDING APPROVAL
ENGR. JUANA T. TAPEL, Ph.D
DIRECTOR III
APPROVED BY:
ENGR. ARIODEAR C. RICO
DIRECTOR IV
CONCURRED BY:
DR. RUTH S. MIRLAT-SONACO
DIRECTOR
SHEET CONTENT
SHEET NO.
A-2
DATE
2 of 11



A 2-12 PATH WALK PLAN
SCALE: 1:100





GENERATOR SET ROOM

NOTE: THE COST ESTIMATE FOR GENSET FACILITY IS NOT INCLUDED IN THIS MODULAR DESIGN.

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

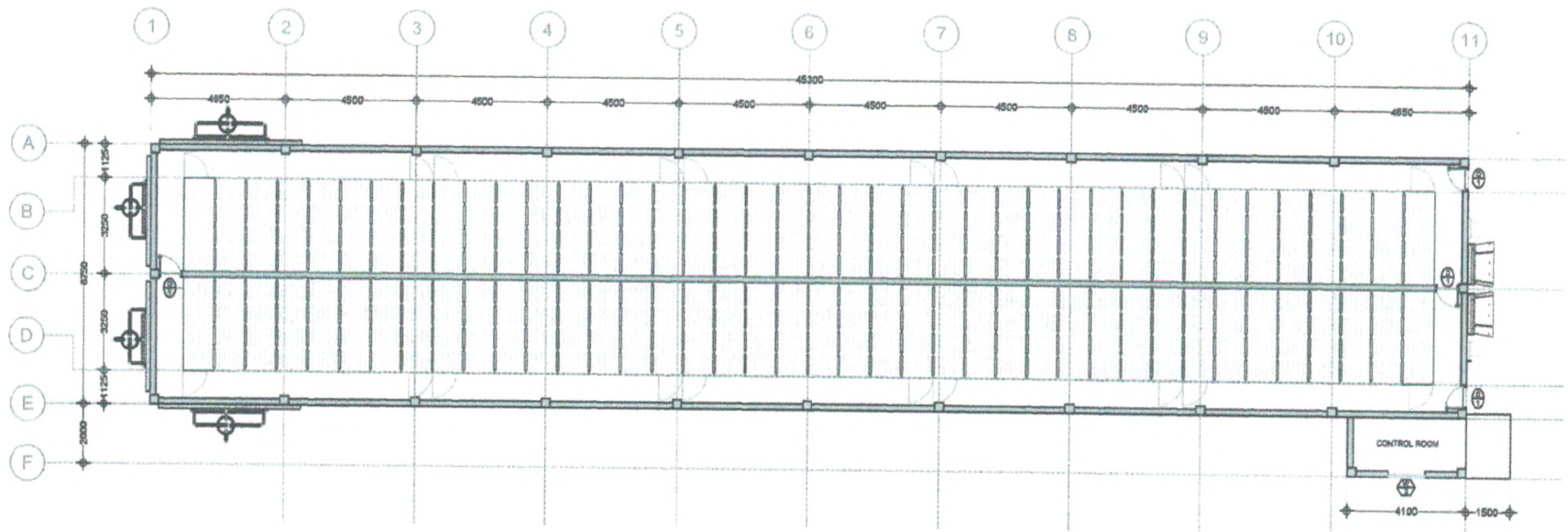
REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI L. CARPIO ENGINEER IV ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAFEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR II OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTHS. MALAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE – NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT PATH WALK PLAN PATH WALK DETAILS GENERATOR SET ROOM DEPARTMENT OF AGRICULTURE DATE	SHEET NO. A-2 3 of 11

LEGENDS

REPRESENTATION	DESCRIPTION
	EVAPORATIVE COOLING SYSTEM
	GALVANIZED CONE EXHAUST FAN
	REINFORCED CONCRETE SLATS (3.15m X 1.075m)
	FINISHER PEN

GENERAL NOTES:

- THE SPACE REQUIREMENT USED FOR THE FINISHER BUILDING IS 0.9 SQUARE METER PER HEAD. IN ADDITION, THE EACH PEN IS CONSIST OF 15 HEADS FINISHER.
- THE FINISHER BUILDING IS COMPOSED OF 2 ROWS OF PENS WHEREIN THE DIMENSION OF EACH PEN IS 4.30 METERS BY 3.15 METERS. THIS DIMENSION IS DERIVED FROM THE SPACE REQUIREMENT USED MULTIPLIED BY THE NUMBER OF HEADS PER PEN.
- IN THIS MODULAR DESIGN, THE TYPE OF FLOORING USED FOR THE FINISHER PEN IS REINFORCED CONCRETE SLAT TO CREATE A WASTE DISPOSAL SYSTEM AND PROVIDE LESS LABOR INTENSIVE SYSTEM IN THE REMOVAL OF WASTE. HOWEVER, OTHER TYPES OF FLOORING FOR THE PEN CAN BE USED AS ALTERNATIVE FOR REINFORCED CONCRETE SLAT AS PER THE DESIGN CONSIDERATIONS OF THE DESIGNER.
- THERE MUST BE A PROVISION FOR A CLOSE CABINET INTENDED FOR THE STORAGE OF BIOLOGIC PRODUCTS AT THE CONTROL ROOM. IN ADDITION, THE CONTROL ROOM CAN BE USED AS QUARTER/OFFICE FOR THE FARM WORKERS AND STORAGE OF NECESSARY DOCUMENTS.



A
2-19

FLOOR PLAN

300 HEADS FINISHER BUILDING

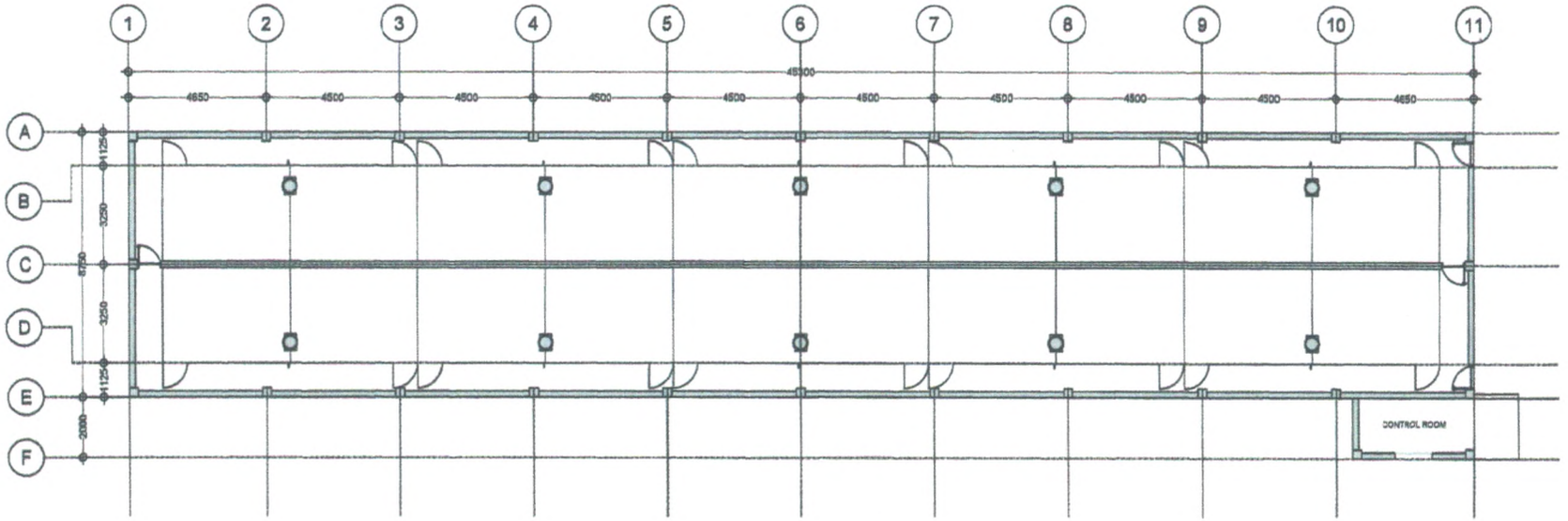
SCALE: 1:150

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMIL C. CARPIO ENGINEER V ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH B. ANCLAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT FLOOR PLAN DATE	SHEET NO. A-2 4 of 11

LEGENDS

REPRESENTATION	DESCRIPTION
	SELF FEEDER
	FINISHER PEN
	FAUCET (FOR CLEANING)



A 2-20

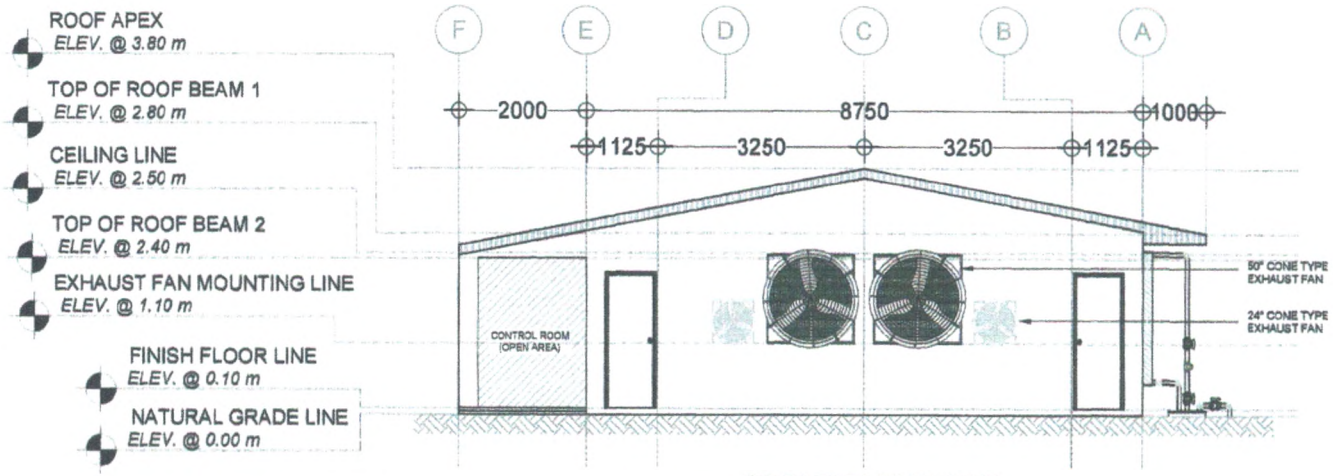
EQUIPMENT LAYOUT

300 HEADS FINISHER BUILDING

SCALE: 1:100

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, DESIGNS, AND SPECIFICATION DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI U. CARPIO ENGINEER ENGINEERING PLANS, DESIGNS AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEARIC. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. [illegible]-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT EQUIPMENT LAYOUT DATE	SHEET NO. A-2 5 of 11

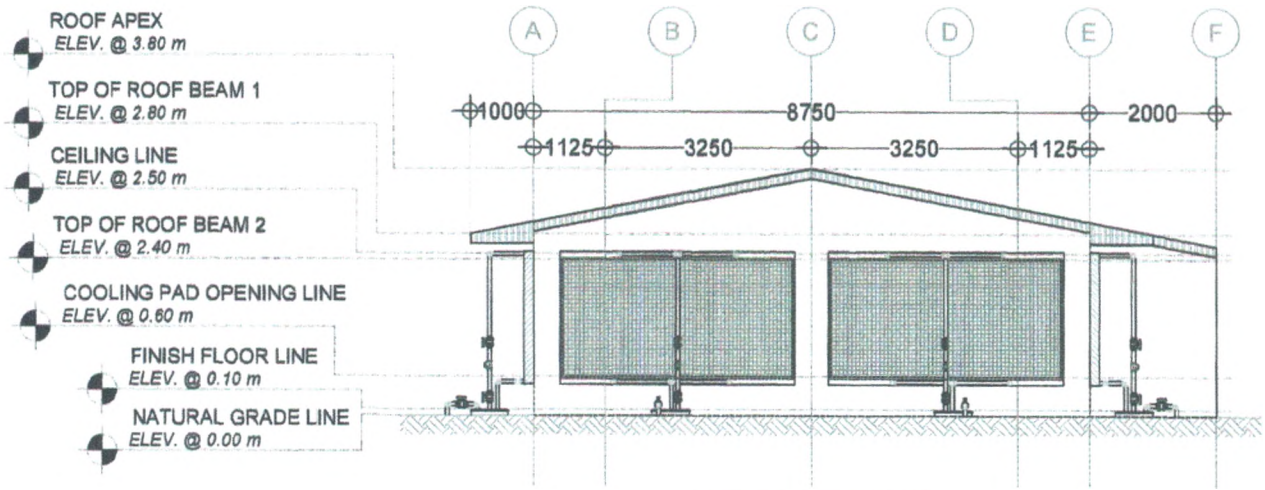


A
2-21

FRONT ELEVATION

300 HEADS FINISHER BUILDING

SCALE: 1:75



A
2-22

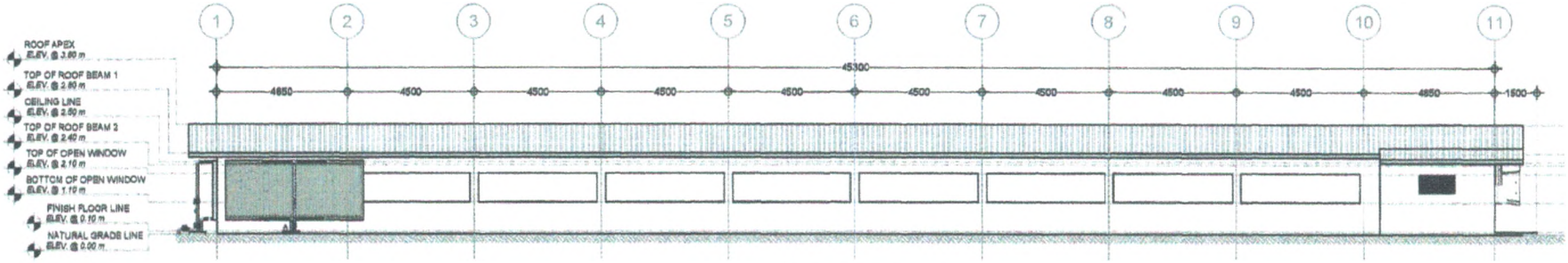
REAR ELEVATION

300 HEADS FINISHER BUILDING

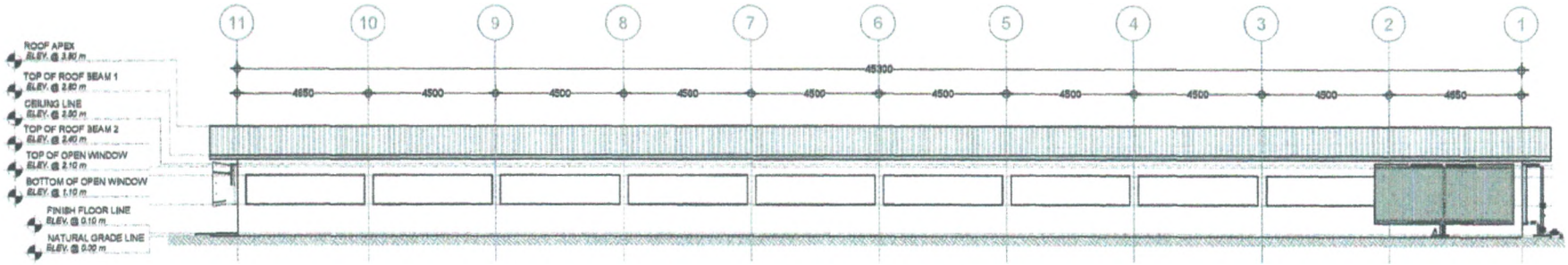
SCALE: 1:75

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, DRAWING, AND SPECIFICATION DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI U. CARPIO ENGINEER V ENGINEERING PLANS, DRAWING AND SPECIFICATION DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH B. [illegible]-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT FRONT ELEVATION REAR ELEVATION DATE	SHEET NO. A-2 6 of 11



A 2-23 LEFT SIDE ELEVATION
300 HEADS FINISHER BUILDING
SCALE 1:150

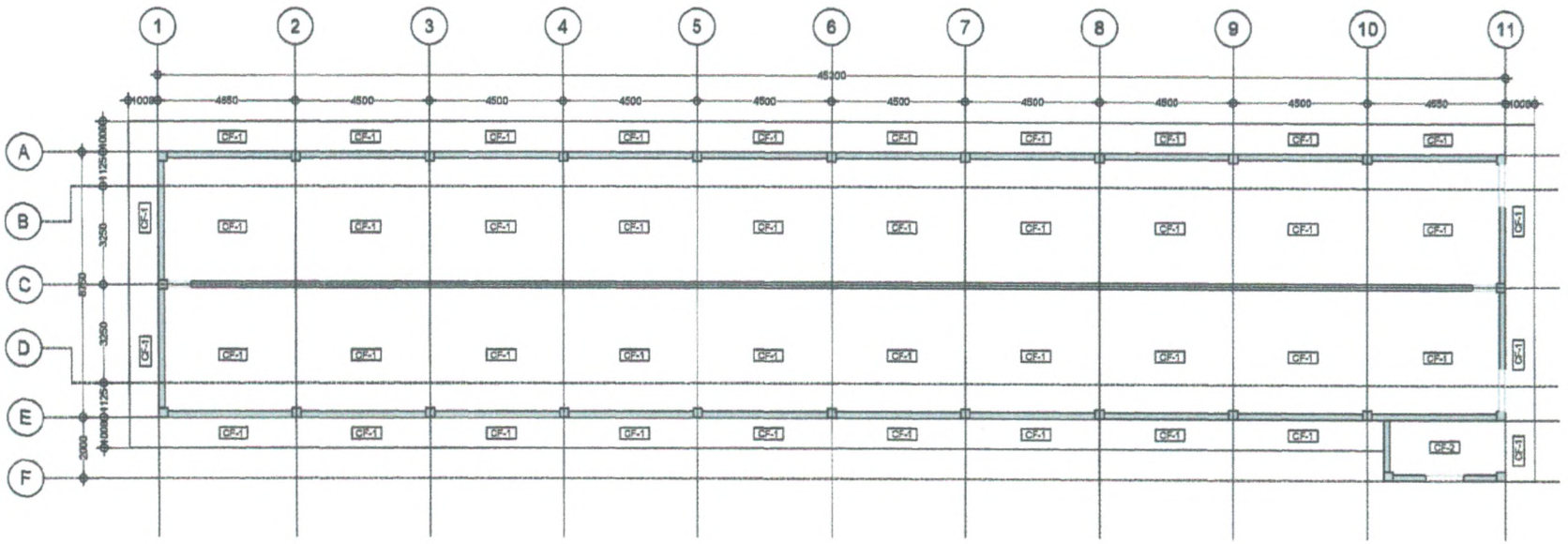


A 2-24 RIGHT SIDE ELEVATION
300 HEADS FINISHER BUILDING
SCALE 1:150

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

	REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, MANUAL AND SPECIFICATIONS DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI L. CARPIO ENGINEER V ENGINEERING PLANS DESIGNS, AND APPROPRIATE TECHNOLOGY DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE AGRICULTURE DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RIDO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. [illegible]-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - HIGH VALUE CROPS PROGRAM	SHEET CONTENT [illegible] DATE	SHEET NO. A-2 7 of 11

LEGEND	
CEILING FINISHES	
CF-1	6MM THICK FIBER CEMENT BOARD IN FLAT PAINT FINISH ON STANDARD METAL FURRING SPACE @ 600MMx600MM O.C. B.W.
CF-2	OPEN CEILING

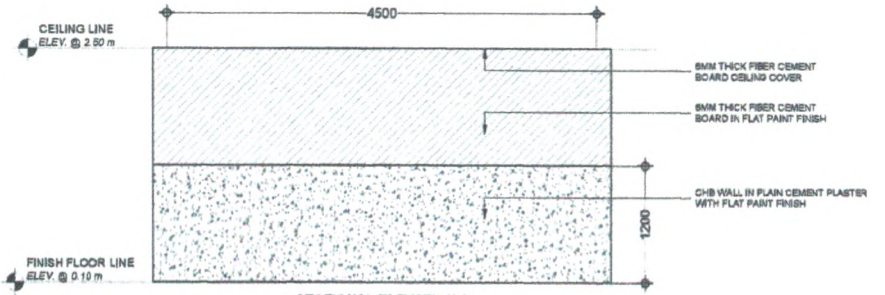


A 2-26 REFLECTED CEILING PLAN
100 HEADS FINISHER BUILDING
SCALE 1:150

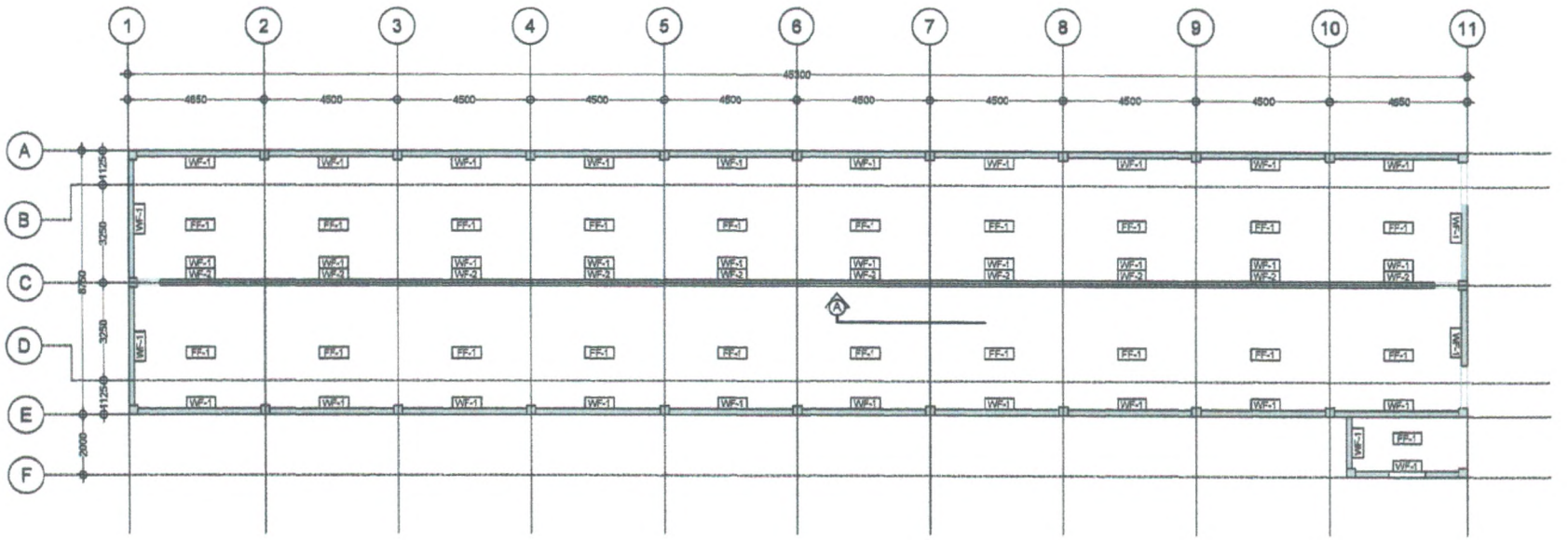
NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, DESIGNS, AND SPECIFICATION DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI U. CARPIO ENGINEER V ENGINEERING PLANS, DESIGNS AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. ACLAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE – NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT REFLECTED CEILING PLAN DATE	SHEET NO. A-2 8 of 11

LEGEND	
FLOOR FINISHES	
FF-1	ROUGH CONCRETE
WALL FINISHES	
WF-1	PLAIN CEMENT PLASTER IN PAINT FINISH
WF-2	6MM THICK FIBER CEMENT BOARD IN PAINT FINISH



SECTIONAL ELEVATION A



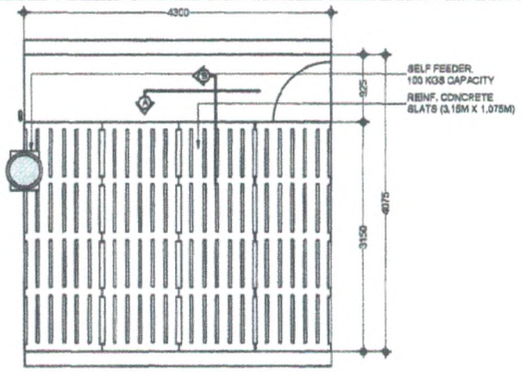
FINISHES PLAN

A / 2-26 — FOR MEANS FOR FINISHER BUILDING

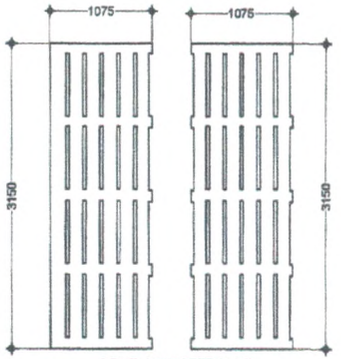
SCALE 1:150

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

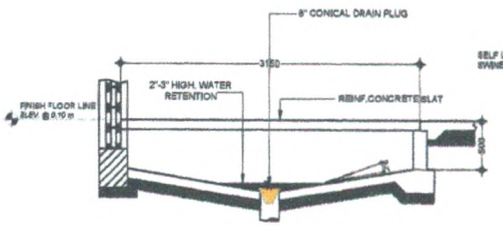
REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, DRAWINGS, AND SPECIFICATIONS DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI L. CARPIO ENGINEER VI ENGINEERING PLANS, DRAWINGS, AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RIDO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. VIGILAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL SWINE HERD PROGRAM	SHEET CONTENT FINISHES PLAN DATE	SHEET NO. A-2 9 of 11



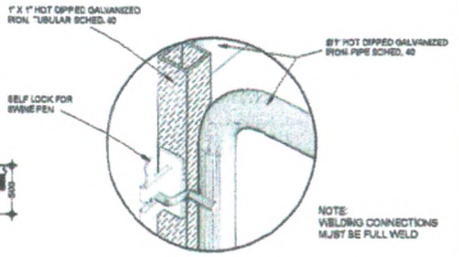
PLAN



REINF. CONCRETE SLATS

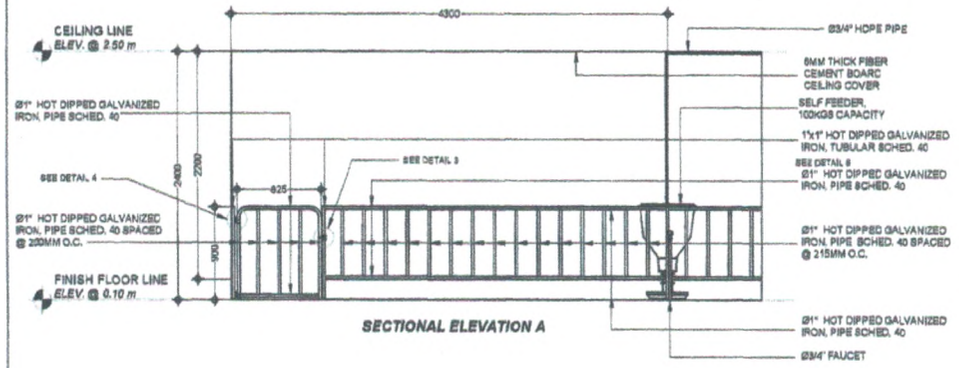


SECTIONAL ELEVATION C

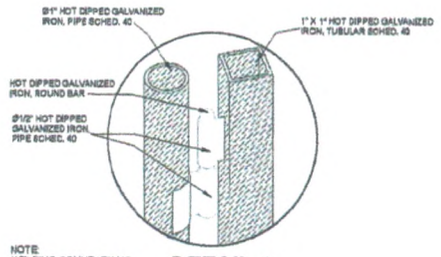


DETAIL 3

FINISHER PEN'S DOOR LOCK

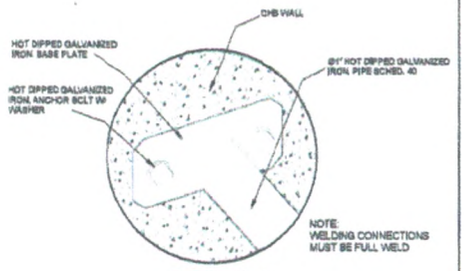


SECTIONAL ELEVATION A

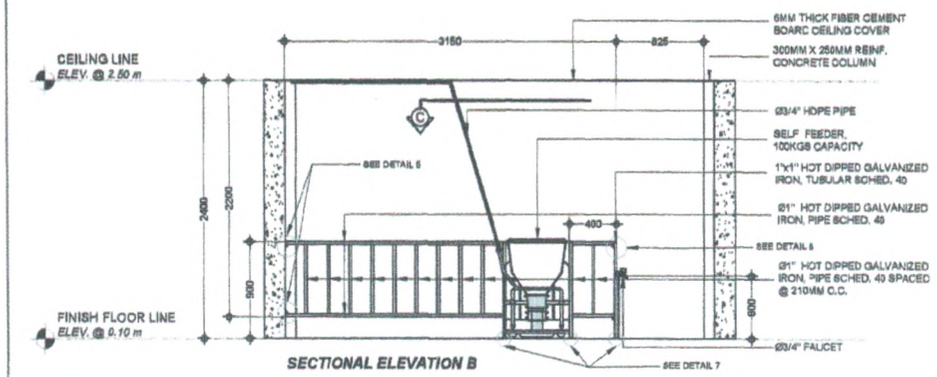


DETAIL 4

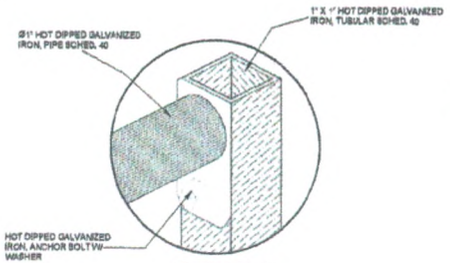
FINISHER PEN'S DOOR HINGE



DETAIL 5

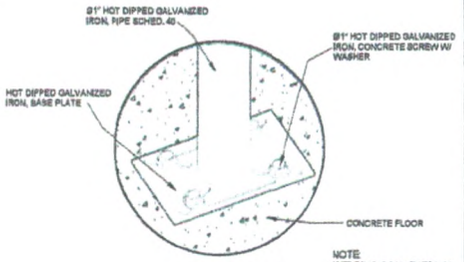


SECTIONAL ELEVATION B



NOTE: WELDING CONNECTIONS MUST BE FULL WELD

DETAIL 6



NOTE: WELDING CONNECTIONS MUST BE FULL WELD

DETAIL 7

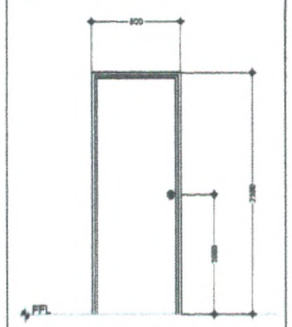
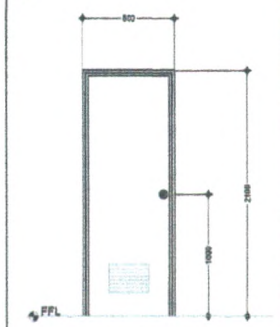
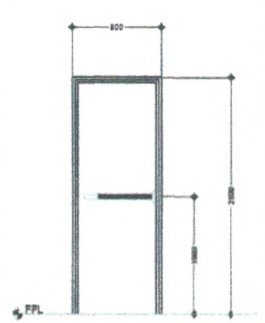
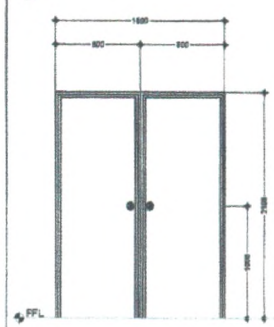
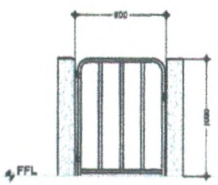
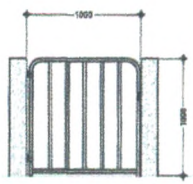
A 2-27 FINISHER PEN DETAILS

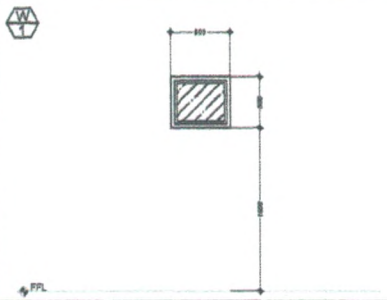
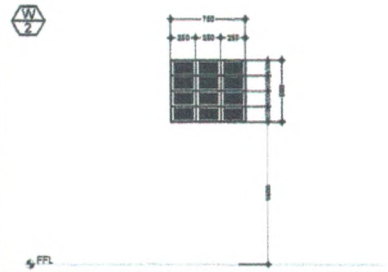
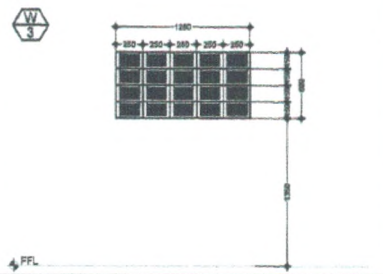
SCALE NTS

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY: ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI U. CARPIO ENGINEER V ENGINEERING PLANS, DESIGNS AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. MCLAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - LIVESTOCK PROGRAM	SHEET CONTENT FINISHER PEN DETAILS DATE	SHEET NO. A-2 10 of 11

SCHEDULE OF DOORS AND WINDOWS

	D1	D2	D3	D4	D5	D6
						
DESCRIPTION: DOOR & JAMB	50MM THICK HOLLOW CORE SINGLE LEAF WOODEN LAMINATED FLUSH DOOR W/ 2"X4" SOLID WOOD JAMB & HEAD IN CHOCOLATE BROWN FINISH	50MM THICK HOLLOW CORE SINGLE LEAF PVC LAMINATED FLUSH DOOR W/ LOUVER IN LAMINATED FINISH W/ PVC JAMB & HEAD	50MM THICK HOLLOW CORE SINGLE LEAF WOODEN LAMINATED FLUSH DOOR W/ 2"X4" SOLID WOOD JAMB & HEAD IN CHOCOLATE BROWN FINISH, FANIC PUSH BAR DEVICE & HARDWARE	50MM THICK HOLLOW CORE DOUBLE LEAF WOODEN LAMINATED FLUSH DOOR W/ 2"X4" SOLID WOOD JAMB & HEAD IN CHOCOLATE BROWN FINISH	SINGLE LEAF Ø1" GALVANIZED IRON PIPE GATE IN NON-CORROSIVE SILVER FINISH	SINGLE LEAF Ø1" GALVANIZED IRON PIPE GATE IN NON-CORROSIVE SILVER FINISH
LOCATION:	DISINFECTION AREA AND FINISHER BUILDING	DISINFECTION AREA	DISINFECTION AREA	FEED STORAGE ROOM	PATH WALK	PATH WALK
ACCESSORIES:	DOOR KNOB W/ COMPLETE LOCKSET AND HINGES	DOOR KNOB W/ COMPLETE LOCKSET AND HINGES	NONE	DOOR KNOB W/ COMPLETE LOCKSET AND HINGES	COMPLETE GATE LOCKSET AND HINGES	COMPLETE GATE LOCKSET AND HINGES
NO. OF SET:	5 SETS	1 SET	2 SETS	1 SET	1 SET	3 SETS

	W1	W2	W3	
				
DESCRIPTION: WINDOW	POWDER COATED ALUMINUM FRAME AWNING WINDOW W/ 6MM THICK TEMPERED GLASS	4" CONCRETE LOUVER BLOCKS, 12 PCS (4 ROWS & 3 COLUMNS)	4" CONCRETE LOUVER BLOCKS, 20 PCS (4 ROWS & 5 COLUMNS)	
LOCATION:	DISINFECTION AREA (TOILET)	FEED STORAGE ROOM	CONTROL ROOM	
NO. OF SET:	1 SET	2 SETS	1 SET	

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DESIGN CRITERIA

LIVE LOAD	= 75 PSF
ROOF LOVE LOAD	= 10.445 PSF
SLATS	= 70 PSF
WIND LOAD	= 280 KPH
SEISMIC LOAD	= 0.4 C

GENERAL NOTES

A. CONCRETE UNITS

1. ALL CONCRETE, UNLESS OTHERWISE STATED, SHALL BE DESIGNED AS FOLLOWS:

ELEMENTS / UNIT	STRUCTURAL	SLAB
A. MINIMUM COMPRESSIVE STRENGTH (28 DAYS)	28 MPA	20.68 MPA
B. AGGREGATE SIZE (MINIMUM)	20 MM	20 MM
C. MAXIMUM SLUMP	100 MM	100 MM

2. OWNER OR CONTRACTOR SHALL NOTIFY ENGINEER IF LOCAL CONDITIONS OFFER FROM THE LISTED ABOVE.
3. ALL CEMENT TO BE TYPE GU.
4. CONCRETE COVER FOR REINFORCING STEEL BE AS FOLLOWS:

CONCRETE COVER FOR REINFORCEMENT STEEL	MEASUREMENT
A. CONCRETE DEPOSITED DIRECTLY AGAINST EARTH	70 MM
B. CONCRETE EXPOSED TO EARTH BUT POURED AGAINST FORMS.	50 MM
C. BEAM STIRRUPS, COLUMN/ PEDESTAL TIES, AND SLAB ON GRADE	38 MM
D. SUSPENDED SLABS AND WALLS, EXCEPT AS NOTED ON [A], [B], AND [C].	28 MM

5. ALL CONCRETE SHALL BE KEPT MOIST FOR A MINIMUM OF SEVEN (7) CONSECUTIVE DAYS IMMEDIATELY AFTER POURING BY THE USE OF WET BURLAP, FOG SPRAYING, CURING COMPOUND OR OTHER APPROVED METHODS.

B. MASONRY UNITS

1. MASONRY WORK SHOULD CONFORM TO ASTM C 55 (LATEST EDITION) (VERIFY W/ LOCAL AUTHORITY).
2. STRUCTURAL DESIGN OF MASONRY TO ASTM C 129 (LATEST EDITION) (VERIFY W/ LOCAL AUTHORITY).
3. MORTAR TO ASTM C 270 (LATEST EDITION)
4. ALL CONCRETE BLOCKS HOLLOW CORES SHALL BE FILLED WITH MORTAR.
5. USE LIGHTWEIGHT MASONRY BLOCK WITH COMPRESSIVE STRENGTH OF 5 MPA.
6. ALL GROUT TO BE NON-SHRINK, MON-METALLIC, TO CSA A179 (LATEST EDITION) TYPE S. (VERIFY WITH LOCAL AUTHORITY)
7. INSIDE FACE OF ALL MANURE GUTTER WALLS TO BE PARGED. (VERIFY ENVIRONMENTAL COMPLIANCE WITH LOCAL BUILDING AUTHORITY).

C. REINFORCING STEEL

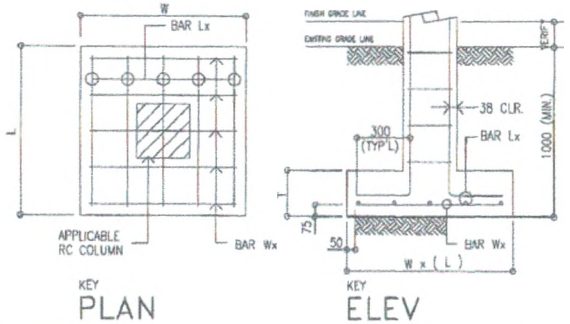
1. ALL REINFORCING STEEL SHALL BE HIGH BOND DEFORMED BARS CONFORMING TO ASTM A 615 M WITH YIELD STRENGTH (fy) OF 414 MPA FOR 10ø OR LARGER.
2. ALL BENDING DETAILS, DIMENSIONS, ANCHORAGE, CUT-OFF LENGTHS, BAR SUPPORTS, SPACERS, AND LOCATION OF REINFORCING SPLICES SHALL BE IN ACCORDANCE WITH ACI CODE LATEST EDITION, UNLESS OTHERWISE SHOWN.
3. ALL REINFORCING SPLICES SHALL BE LOCATED AT POINTS OF MIN. STRESS, UNLESS OTHERWISE SHOWN.
4. PROVIDE CORNER BARS TO MATCH HORIZONTAL WALL REINFORCING ON THE OUTSIDE FACE OF ALL EXTERIOR CORNERS.

D. WATER PROOFING

1. WATERPROOF THE INTERIOR PIT FLOORS AND WALLS TO PREVENT A WATER LEAKAGE, INGRESS OR SEEPAGE IN CONCRETE STRUCTURES OR ANY CEMENTIOUS SUBSTRATE BEFORE POURING, IF NEEDED. THE FORMATION AND DEVELOPMENT OF INSOLUBLE CRYSTAL INTO WATER BEARING CAPILLARIES AND FISSURES EFFECTIVELY BLOCKS THE FURTHER PASSAGE OF WATER AND ENSURES PERMANENT WATER TIGHTNESS FOR THE LIFE OF THE STRUCTURE.
2. PLACE A 0.15 MM POLYETHYLENE VAPOR BARRIER ON PIT AND FLOOR SLAB BEFORE CONCRETE POURING.

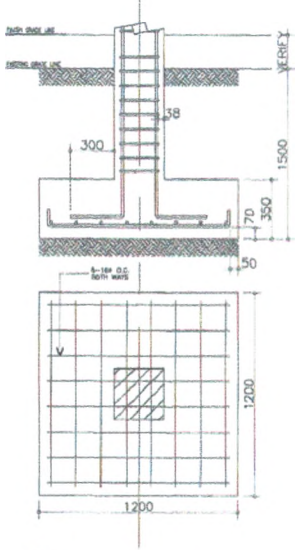
E. FOUNDATION & EXCAVATION

1. PRESUMED SOIL BEARING CAPACITY IS 3000 PSF (14647.29 KG/M²) ON FIRM VIRGIN SOIL OR COMPACTED ENGINEERED FILL. BEARING CAPACITY SHALL BE VERIFIED BY THE OWNERS GEOTECHNICAL ENGINEER PRIOR TO PLACING FOOTING CONCRETE.
2. FILL MATERIAL SHALL BE FREE OF ROOTS. WOOD OR OTHER ORGANIC MATERIAL AND COMPLY WITH THE REQUIREMENTS OF THE GEOTECHNICAL REPORT. MATERIALS USED FOR FILL UNDER FOOTINGS AND WITHIN BUILDING LIMITS SHALL BE TESTED AND APPROVED FOR THE USE BY THE GEOTECHNICAL TESTING AGENCY.
3. ALL FILL MATERIALS SHALL BE SELECTED IN ACCORDANCE WITH THE GEOTECHNICAL REPORT. MATERIALS SHALL BE CLEAN, LOW PLASTIC SOIL WITH A PLASTICITY INDEX OF 10 OR LESS (MAXIMUM OF 10), LIQUID LIMIT OF 45 OR LESS (MAXIMUM OF 45), UNIT WEIGHT OF 120 PCF, AND SHALL BE FREE OF FIBROUS ORGANIC MATERIALS. PARTIALLY WEATHERED ROCK MATERIALS MAY BE USED FOR STRUCTURAL FILL PROVIDED THE MATERIAL CAN BE REDUCED TO MAXIMUM DIMENSIONS OF 6 INCHES.
4. FILL PLACED BELOW FOOTING BASE ELEVATION AND WITHIN THE TOP 12 INCHES OF SOIL SUB GRADE BELOW PAVEMENTS SHALL BE COMPACTED TO AT LEAST 98 PERCENT OF THE MATERIAL'S MAXIMUM DRY DENSITY PER ASTM D-698. FILL PLACED ABOVE FOOTING ELEVATION FOR SUPPORT OF THE LIGHTLY LOADED FLOOR SLABS (250 PSF OR LESS) OR MORE THAN 12 INCHES FROM THE FINISHED SUB GRADE LEVEL WITHIN THE PAVEMENT AREAS SHOULD BE COMPACTED TO AT LEAST 95 PERCENT OF THE MAXIMUM DRY DENSITY PER ASTM D-698. THE FILL SHALL BE PLACED AND COMPACTED AT MOISTURE CONTENTS WITHIN A RANGE OF 1 PERCENT BELOW TO 3 PERCENT ABOVE THE MATERIAL'S OPTIMUM MOISTURE CONTENT PER ASTM D-698.
5. UTILITY LINES SHALL NOT BE PLACED THROUGH OR BELOW FOUNDATIONS WITHOUT THE STRUCTURAL ENGINEERS APPROVAL.
6. CONTRACTOR SHALL REMOVE AND REPLACE UNACCEPTABLE SOILS IN ACCORDANCE WITH THE GEOTECHNICAL REPORT. ALL SOILS WITH PLASTICITY INDICES GREATER THAN 10 SHALL BE REMOVED TO A DEPTH OF NOT LESS THAN 3'-0" OR GREATER THAN 10 SHALL BE REMOVED TO A DEPTH OF NOT LESS THAN MATERIAL OCCURS BELOW FOUNDATIONS.
7. FOUNDATION WALLS RETAINING EARTH SHALL BE BRACED AGAINST BACK FILLING PRESSURES UNTIL FLOOR SLABS AT TOP AND BOTTOM ARE IN PLACE.
8. FOUNDATION WALLS OR GRADE BEAMS HAVING EARTH PLACED ON EACH SIDE SHALL HAVE BOTH FILLED SIMULTANEOUSLY TO MAINTAIN A COMMON ELEVATION.
9. DO NOT PLACE CONCRETE IN ANY EXCAVATION CONTAINING WATER, OTHERWISE REMOVE THE WATER AND RE-COMPACT.
10. EARTH FORMED FOOTING SHALL CONFORM TO THE SHAPE, LINES, AND DIMENSIONS AS SHOWN ON FOUNDATION PLAN. ALL WATER SHALL BE REMOVED BEFORE DEPOSITING CONCRETE.
11. BEFORE PLACING CONCRETE, ALL EMBEDDED ITEMS SHALL BE PROPERLY LOCATED, ACCURATELY POSITIONED, AND MAINTAINED SECURELY IN PLACE.
12. THE CONTRACTOR SHALL COORDINATE AND VERIFY ALL DIMENSIONS PRIOR TO STARTING CONSTRUCTION, AND ANY DISCREPANCY SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
13. PERIMETER FOUNDATION MUST NOT EXCEED 1/4" ELEVATION VARIATION ALONG ANY 50' DISTANCE OR BUILDING LENGTH.
14. PERIMETER FOUNDATION TO EXTEND BELOW WATER LINE. VERIFY REQUIRED DEPTH WITH LOCAL BUILDING OFFICIALS PRIOR TO PROCEEDING WITH FOUNDATION WORK.
15. THE NATIONAL FARM BUILDING CODE LATEST EDITION AND ALL PERTINENT RECOMMENDATIONS OF CSA STANDARDS A23.1 AND A23.3 HAVE BEEN REFERENCED FOR THE DESIGN AND CONSTRUCTION OF ALL WORK ON THIS PROJECT. LOCAL PROFESSIONAL ENGINEER TO REVIEW DESIGN FOR COMPLIANCE WITH LOCAL BUILDING CODES.
16. CONTRACTOR TO VERIFY ALL DIMENSIONS PRIOR TO COMMENCING WITH THE ALSO HE/SHE MUST NOTIFY OF ANY DISCREPANCY PR DEVIATION IN EXISTING CONDITION.
17. FLOOR TO BE ONE CONTINUOUS POUR, NO CONSTRUCTION JOINTS. IF CONSTRUCTION JOINTS ARE REQUIRED, VERIFY DESIGN WITH ENGINEER.
18. STRIP ALL TOPSOIL, ENSURE ALL ORGANIC MATERIAL IS REMOVED.
19. INSITU SOIL SUBGRADE TO BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
20. ALL FILL MATERIAL SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING 6" AND SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
21. WHERE SUITABLE SITE FILL IS NOT AVAILABLE, CLEAN SAND OR GRAVEL SHALL BE USED.
22. ORIENTATION AND LAYOUT OF WASTE WATER TREATMENT PLANT IS SUBJECTED TO THE TERRAIN/SLOPE OF THE PROPERTY.



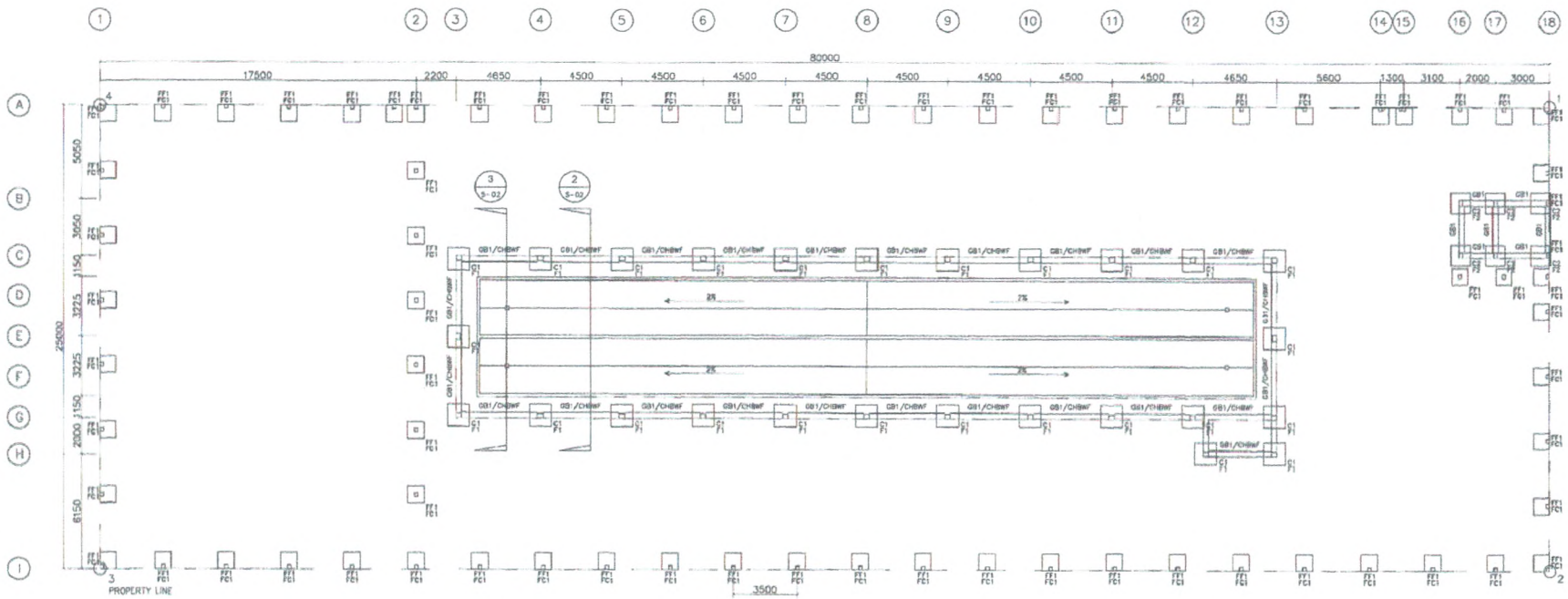
1 / S-01 SCHEDULE OF COLUMN FOOTINGS
SCALE NTS. (MM)

FOOTING MARK	FOOTING SIZE			STEEL REINFORCEMENT	
	L	W	T	BAR Wx	BAR Lx
F1	1200	1200	300	8-16ø	8-16ø
F2	1100	1100	300	6-16ø	6-16ø

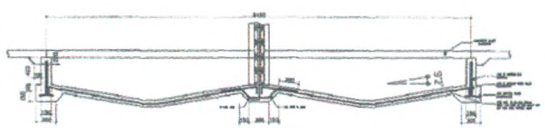


2 / S-01 C1; F1 DETAILS
SCALE NTS. (MM)

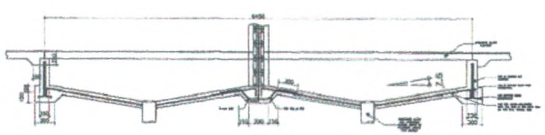
REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ERDIN A. BIALZA ENGINEER II	REVIEWED & EVALUATED BY ENGR. DENNIS I. TACTAC ENGINEER V	RECOMMENDING APPROVAL ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III	APPROVED BY ENGR. ARIODEAR C. RICO DIRECTOR IV	CONCURRED BY DR. RUTH S. MICLAT-SONACO DIRECTOR	SHEET CONTENT GENERAL NOTES FOUNDATION DETAILS OF FIXTURES DATE February 18, 2022	SHEET NO S-1 1 of 9



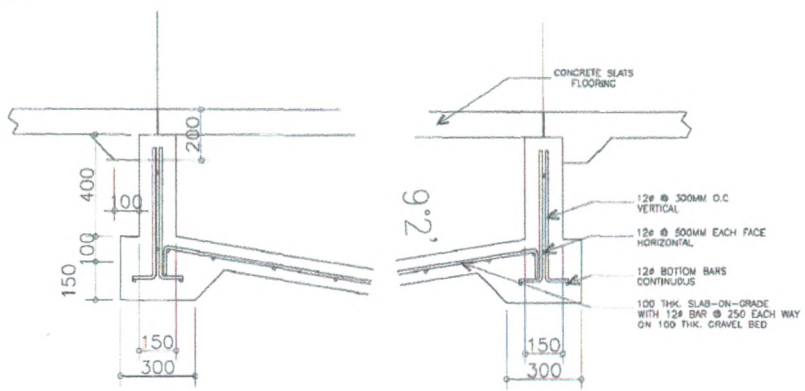
1 / S-02 FOUNDATION PLAN
SCALE 1:250 MM



2 / S-02 PIT WALL DETAIL
SCALE NTS. (MM)



3 / S-02 SUMP PIT DETAIL
SCALE NTS. (MM)



4 / S-02 BLOW UP DETAIL
SCALE NTS. (MM)

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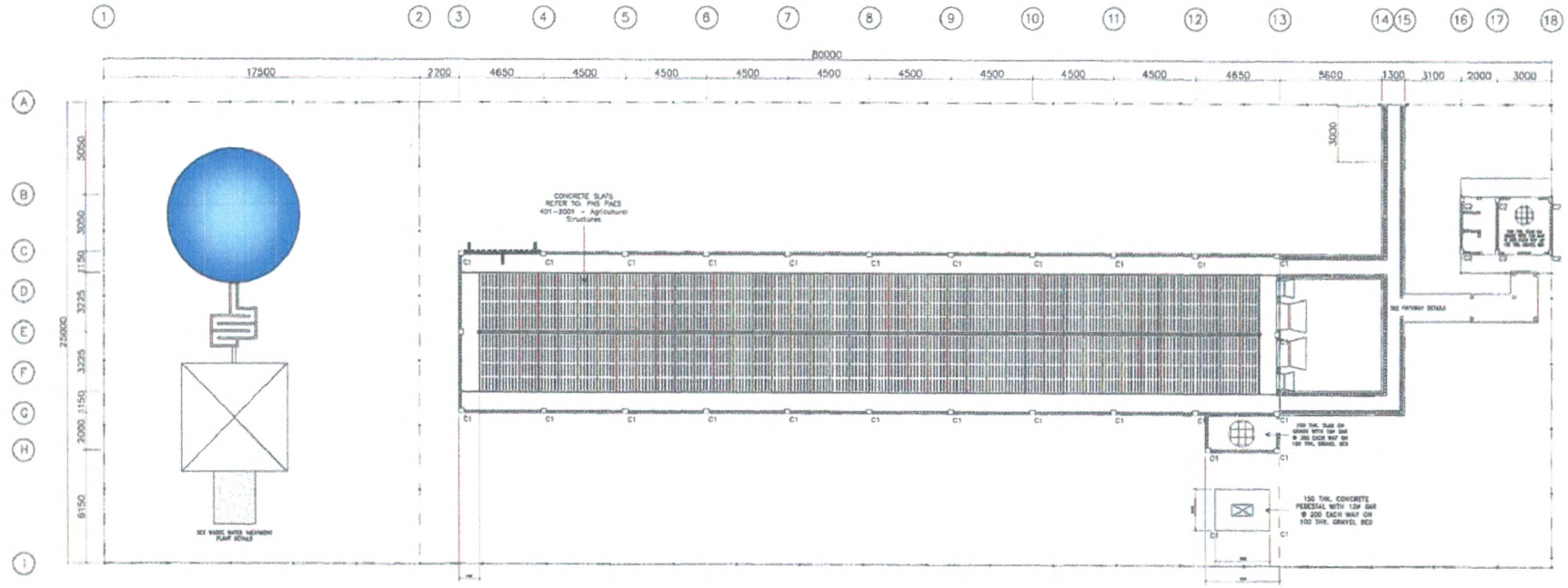


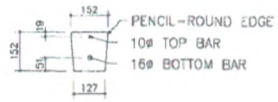
1 / S-03 GROUND FLOOR FRAMING PLAN
SCALE 1:250 MM

NOTES ON BACKFILLING:

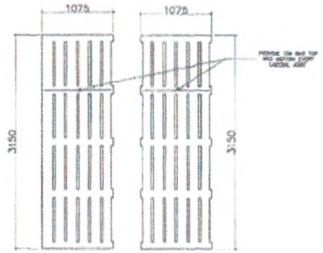
1. EARTH FILLING SHALL BE OF GOOD QUALITY SOIL; NON-PLASTIC TO AVOID SETTLEMENT.
2. FILL SHALL BE COMPACTED IN LAYERS OF 200 MM. TO A RELATIVE DENSITY OF 95%.
3. REMOVE/REPLACE TOP SOIL WHICH ARE HIGHLY PLASTIC TO AVOID CRACKING OF SLAB ON GRADE.

LEGEND:

125THK CHB WALL W/ 10ø @ 600 EA. WAY (TYPICAL)



2 / S-03 CONCRETE SLATS DETAIL
SCALE NTS. (MM)



3 / S-03 CONCRETE SLATS
SCALE NTS. (MM)

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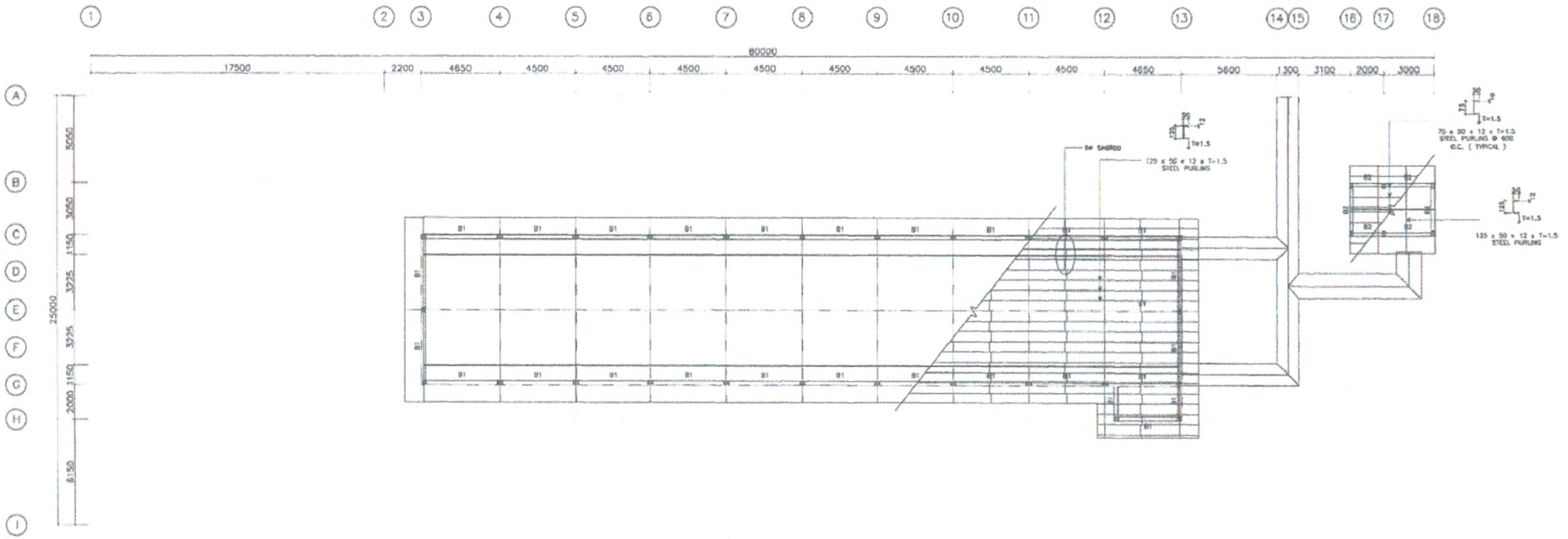
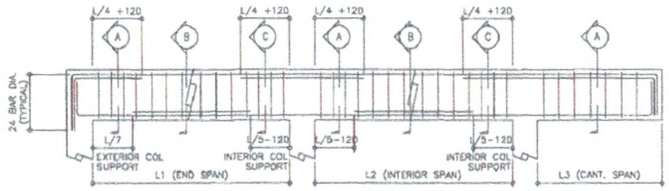
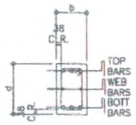


1 S-04 ROOF PLAN
SCALE 1:250 MM

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. EROHY A. BALZA ENGINEER I SPECIAL PROJECT ENGINEERING DIVISION	REVIEWED & EVALUATED BY: ENGR. DENNIS I. TACTAC ENGINEER V SPECIAL PROJECT ENGINEERING DIVISION	RECOMMENDING APPROVAL ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY DR. RUTH S. MICLAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL INSPIRE PROGRAM	SHEET CONTENT ROOF PLAN DATE February 18, 2022	SHEET NO S-4 4 of 9



TYPICAL BEAM ELEVATION TYPE A



SECTION

1 S-05 SCHEDULE OF BEAMS

SEE KEY PLANS AND KEY SECTIONS

LEGEND :
CE – CONTINUOUS END
Nmax – MAXIMUM NUMBER OF REBARS PER LAYER ALLOWABLE IN A GIVEN WIDTH OF BEAM

BEAM MARK	SIZE (MM)		BEAM TYPE	SIZE (MM)	STEEL REINFORCEMENTS						Nmax	WEB (MM)	STIRRUPS	
					SECTION A		SECTION B		SECTION C				SIZE	SPACING
	b	d			TOP	BOTT	TOP	BOTT	TOP	BOTT				
B1	250	300	A	16ø	2	2	2	2	2	2	2	2-10ø	10ø	1 @ 50; 5 @ 100; REST @ 150
B2	200	300	A	12ø	3	2	2	3	3	2	3	2-10ø	10ø	1 @ 50; REST @ 200

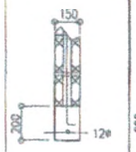
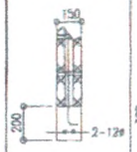
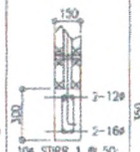
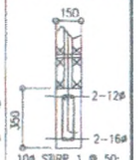
2 S-05 SCHEDULE OF COLUMNS

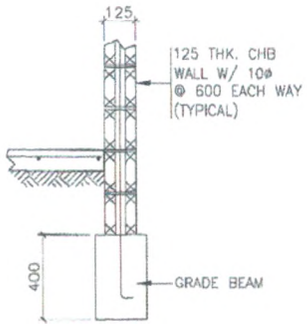
SCALE NTS. (MM)

COL MARK / FLR LVL	C1	C2
FOUNDATION TO 1ST FLOOR LEVEL	6-16ø VERTICAL BARS W/ 10ø TIES 1 @ 50; 8 @ 75 REST @ 150	6-16ø VERTICAL BARS W/ 10ø TIES 1 @ 50; 8 @ 75 REST @ 150

3 S-05 LINTEL BEAM SCHEDULE

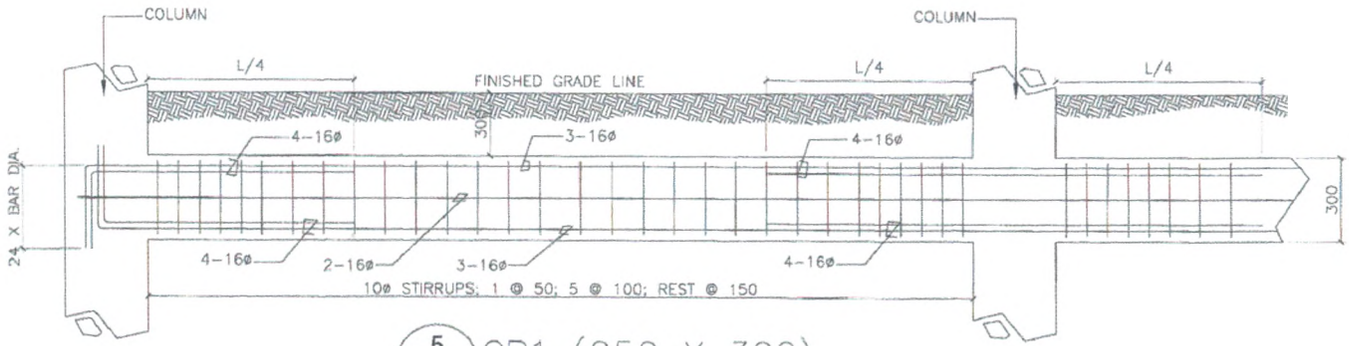
ABOVE DOOR / WINDOW OPENINGS ON CHB WALL (EXTEND 0.30M. FROM EDGES OF MASONRY OPENINGS)

			
MAX SPAN 1.20M	MAX SPAN 2.50M	MAX SPAN 3.50M	MAX SPAN 4.00M



4 S-05 CHB WALL ON GB

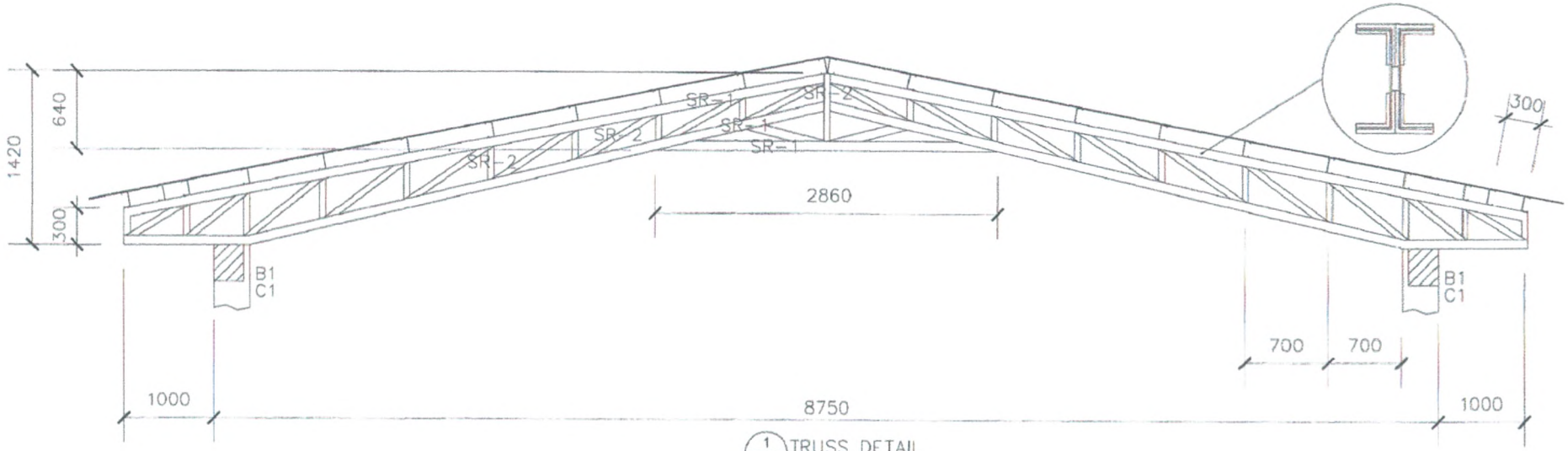
SCALE NTS. (MM)



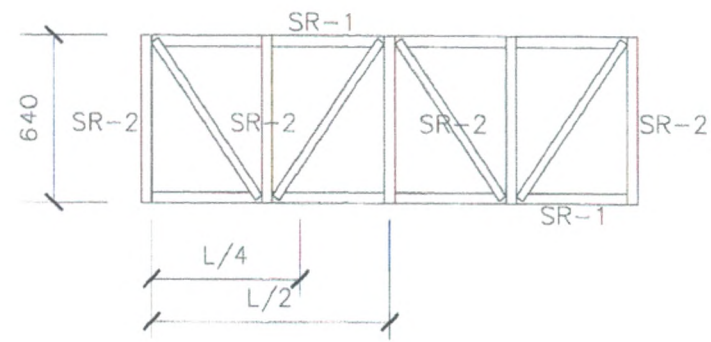
5 S-05 GB1 (250 X 300)

SCALE NTS. (MM)

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ENGRIT V. BIALZA ENGINEER SPECIAL PROJECT UNDERTAKING	REVIEWED & EVALUATED BY ENGR. DENNIS I. TACTAC ENGINEER V SPECIAL PROJECT ENGINEERING DIVISION	RECOMMENDING APPROVAL ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY ENGR. ARIODEAN C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY DR. RUTH S. MIGUAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - TECHNICAL ASSISTANCE PROGRAM	SHEET CONTENT SCHEDULE OF BEAMS SCHEDULE OF COLUMNS SCHEDULE OF LINTEL BEAM CHB WALL DETAIL DATE February 18, 2022	SHEET NO S-5 5 of 9



1 / S-06 TRUSS DETAIL
SCALE NTS. (MM)



2 / S-06 LATERAL TRUSS DETAIL
SCALE NTS. (MM)

3 / S-06 SCHEDULE OF STEEL MEMBERS
SEE KEY PLANS AND KEY SECTIONS

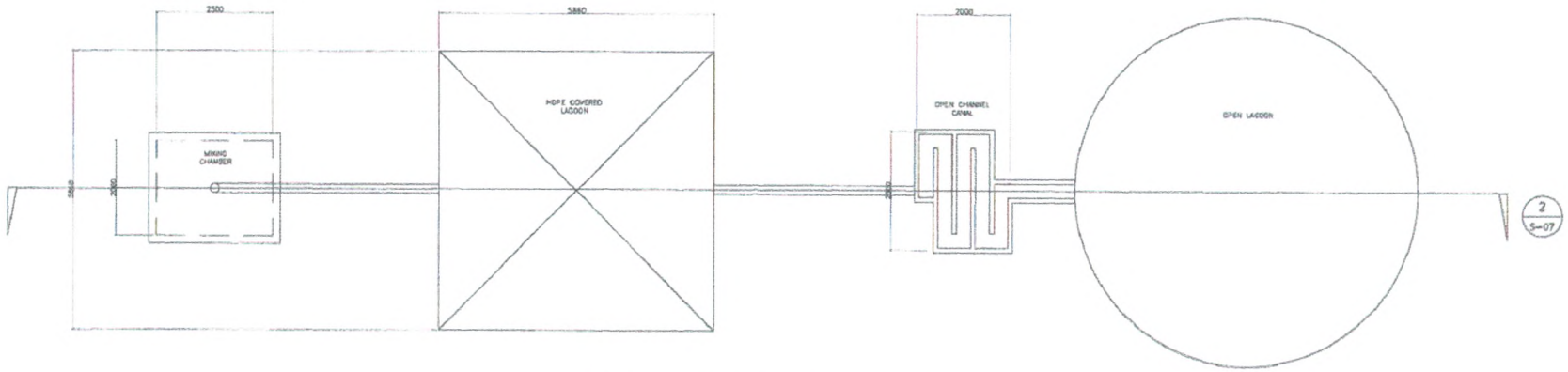
MEMBER MARKS	AISC DESIGNATION
SR-1	L 3" x 3" x 5 MM
SR-2	L 2" x 2" x 5 MM

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING

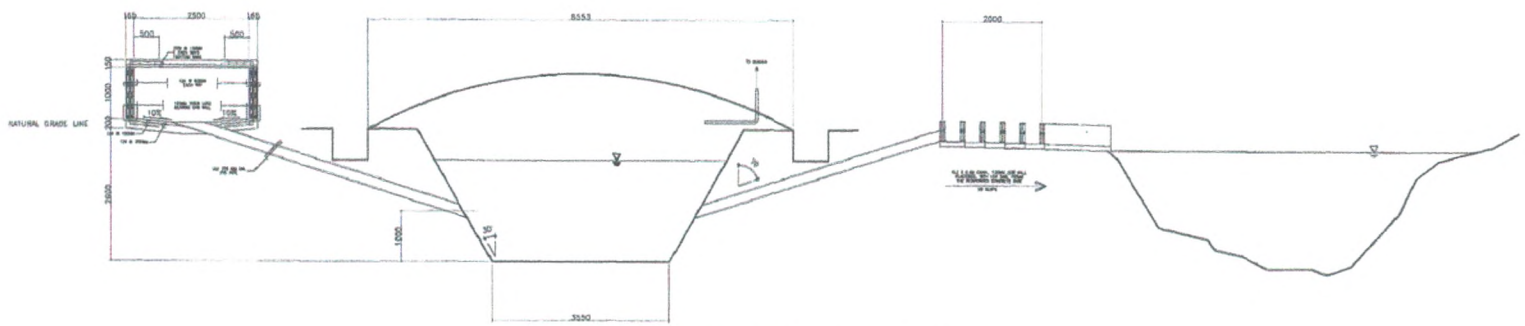
PROJECT TITLE: PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM

PREPARED BY	REVIEWED & EVALUATED BY	RECOMMENDING APPROVAL	APPROVED BY	CONCURRED BY
ENGR. ERDIE C. BIALZA	ENGR. DENNIS L. TACTAC	ENGR. JUANA T. TAPEL, Ph.D	ENGR. ARIODEAR C. RICO	DR. RUTH S. MOLAT-SONACO
ENGINEER II	ENGINEER V	DIRECTOR III	DIRECTOR IV	DIRECTOR
SPECIAL PROJECT ENGINEERING DIVISION	SPECIAL PROJECT ENGINEERING DIVISION	OFFICE OF THE ASSISTANT DIRECTOR	OFFICE OF THE DIRECTOR	DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM

SHEET CONTENT: TRUSS DETAIL, SCHEDULE OF STEEL MEMBERS
DATE: February 18, 2022
SHEET NO. S-6
6 of 9

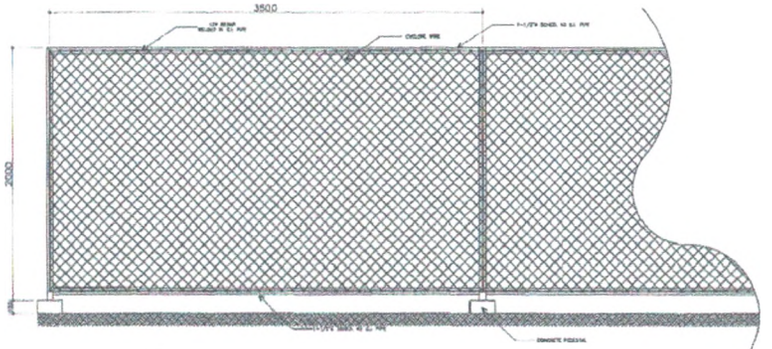


1 / S-07 WASTE WATER TREATMENT PLANT STRUCTURAL DETAIL
SCALE NTS. (MM)

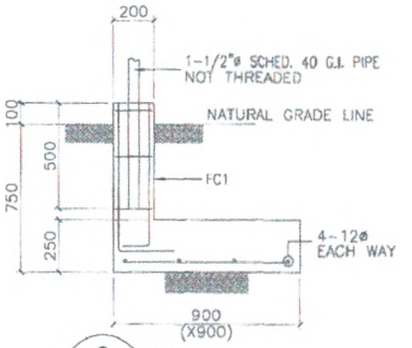


2 / S-07 WASTE WATER TREATMENT PLANT CROSS SECTION
SCALE NTS. (MM)

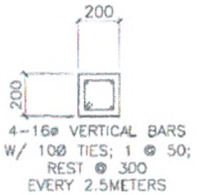
REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ERDITH A. BIALZA ENGINEER SPLGU PROJECT ENGINEERING DIVISION	REVIEWED & EVALUATED BY ENGR. DENNIS I. TACTAC ENGINEER V SPLGU PROJECT ENGINEERING DIVISION	RECOMMENDING APPROVAL ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE REGIONAL DIRECTOR	APPROVED BY ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY DR. RUTH S. MICONI-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT WASTE WATER TREATMENT PLANT DETAIL DATE February 18, 2022	SHEET NO S-7 7 of 9



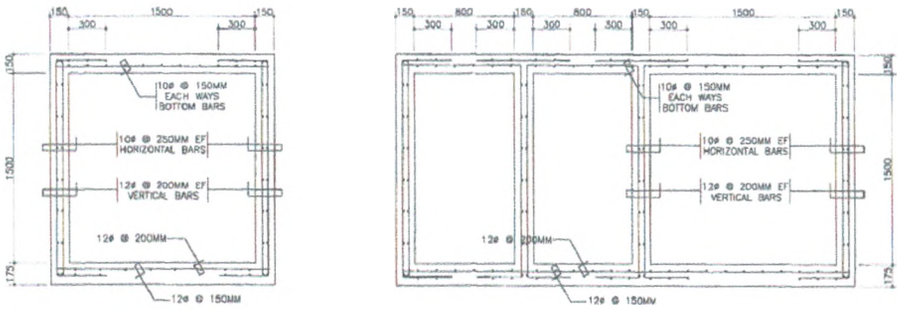
1 / S-08 CYCLONE WIRE DETAIL
SCALE NTS. (MM)



2 / S-08 FF1
SCALE NTS. (MM)

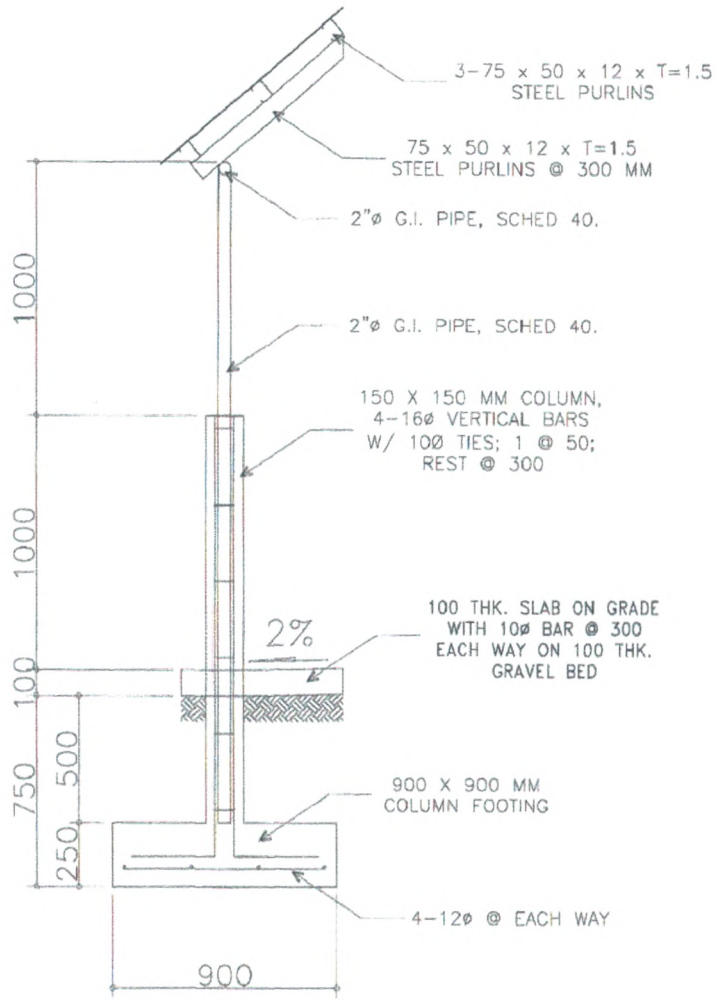


3 / S-08 FC1
SCALE NTS. (MM)

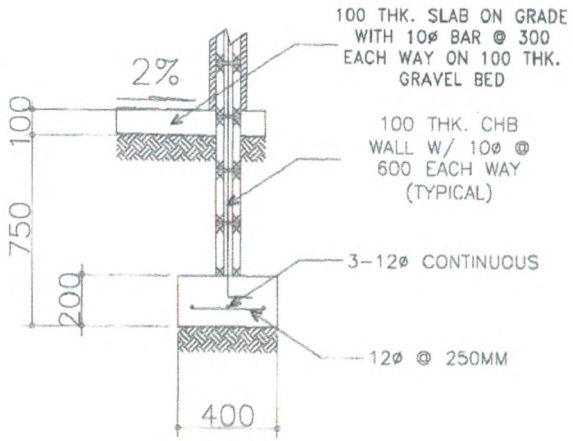


4 / S-08 SEPTIC TANK DETAIL
SCALE NTS. (MM)

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ERDYN J. BIALZA ENGINEER II	REVIEWED & EVALUATED BY ENGR. DENNIS I. TACTAC ENGINEER V	RECOMMENDING APPROVAL ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III	APPROVED BY ENGR. ARIODEAR C. RICO DIRECTOR IV	CONCURRED BY DR. RUTH S. MICLAT-SONACO DIRECTOR	SHEET CONTENT CYCLONE WIRE DETAIL FENCE FOUNDATION DETAIL SEPTIC TANK DETAIL DATE February 18, 2022	SHEET NO S-8 8 of 9



1 / S-09 PATHWAY COLUMN DETAIL
SCALE NTS. (MM)



2 / S-09 PATHWAY WALL DETAIL
SCALE NTS. (MM)

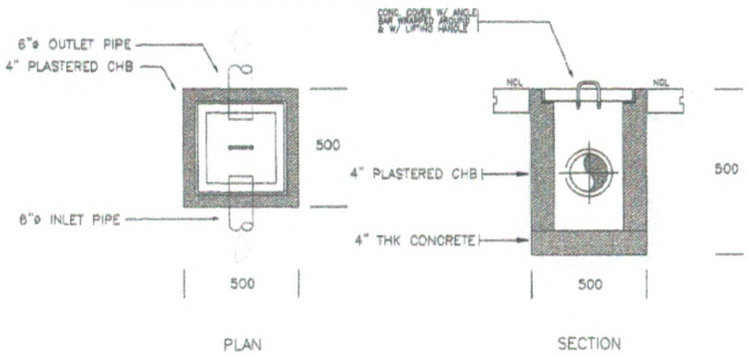
REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ERDHYA. BALZA ENGINEER III PROJECT ENGINEER	REVIEWED & EVALUATED BY: ENGR. DENNIS L. TACTAC ENGINEER V PROJECT ENGINEER	RECOMMENDING APPROVAL ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. MICLAT-BONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT PATHWAY DETAILS DATE February 18, 2022	SHEET NO S-9 9 of 9

PLUMBING GENERAL NOTES:

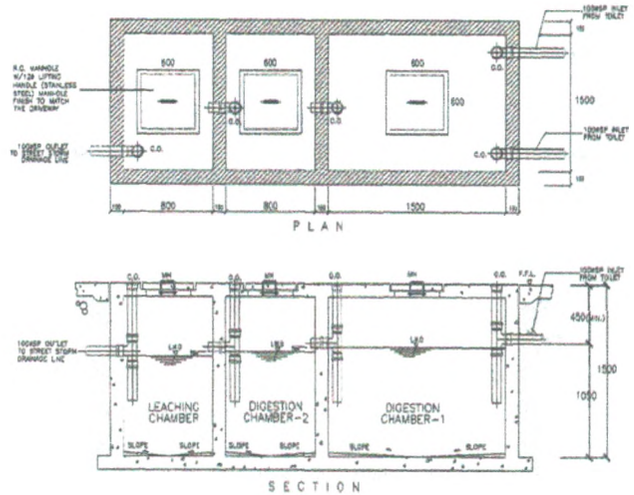
1. ALL PLUMBING WORKS INCLUDED HEREIN SHALL BE EXECUTED ACCORDING TO THE PROVISIONS OF THE NATIONAL PLUMBING CODE, THE NATIONAL BUILDING CODE AND THE RULES AND REGULATIONS OF THE LOCAL GOVERNMENT.
2. COORDINATE THE DRAWING WITH OTHER RELATED DRAWINGS AND SPECIFICATION. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY OF ANY DISCREPANCY FOUND THEREIN. HIS DECISION SHALL BE FINAL
3. ALL PIPES SHALL BE INSTALLED AS INDICATED ON PLANS. ANY RELOCATIONS REQUIRED FOR PROPER EXECUTION OF OTHER TRADE SHALL BE WITH PRIOR APPROVAL OF THE ENGINEER.
4. PROPOSED SANITARY UTILITIES SHALL CONFORM TO THE ACTUAL LOCATION, DEPTH, AND INVERT ELEVATION OF EXISTING PIPES AND STRUCTURES AS VERIFIED BY THE CONTRACTOR
5. ALL FIXTURES SHALL BE VENTED, UNLESS OTHERWISE NOTED.
6. THE CONTRACTOR SHALL VERIFY ALL EXISTING UTILITIES AT SITE AND COORDINATE THE WORKS WITH THE SEWER EFFLUENT DISPOSAL AND WATER LINE SERVICE CONNECTING POINT.
7. ALL SLOPES FOR HORIZONTAL DRAINAGE SHALL MAINTAIN 1% UNLESS OTHERWISE SPECIFIED.
8. SIZE OF WATER SUPPLY PIPES TO FIXTURES SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
9. THE CONTRACTOR SHALL VERIFY ALL EXISTING UTILITIES AT SITE, COORDINATE THE WORKS WITH THE SEWER LINE EFFLUENT DISPOSAL POINT AND WATER LINE SERVICE CONNECTING POINT.
10. THE WORK THROUGHOUT SHALL BE EXECUTED IN THE BEST AND MOST THOROUGH MANNER KNOWN TO THE TRADE AND TO THE SATISFACTION OF THE ENGINEER.
11. ALL PIPES SIZES ARE IN MILLIMETERS AND ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
12. THE EFFLUENT SHOULD CONFORM TO THE D.A ADMINISTRATIVE ORDER 2007-26 OR THE GUIDELINES ON THE PROCEDURES AND TECHNICAL STANDARDS FOR THE ISSUANCE OF A CERTIFICATION ALLOWING FOR THE SAFE RE-USE OF WASTE WATER FOR THE PURPOSE OF IRRIGATION AND OTHER AGRI-CULTURAL USE.

LEGENDS:

MH	MANHOLE		FLOAT VALVE
VTR	VENT THRU ROOF		CHECK VALVE
SV	SEPTIC VAULT		
DS	DOWN SPOUT		
FD	FLOOR DRAIN		
KS	KITCHEN SINK		
LAV	LAVATORY		
SH	SHOWER		
	GATE VALVE		
	WATER METER		
CO	CLEANOUT		
SPS	SOIL PIPE STACK		
WLR	WATER LINE RISER		
	WATER LINE		
	DRAINAGE LINE		
	SEWER LINE		



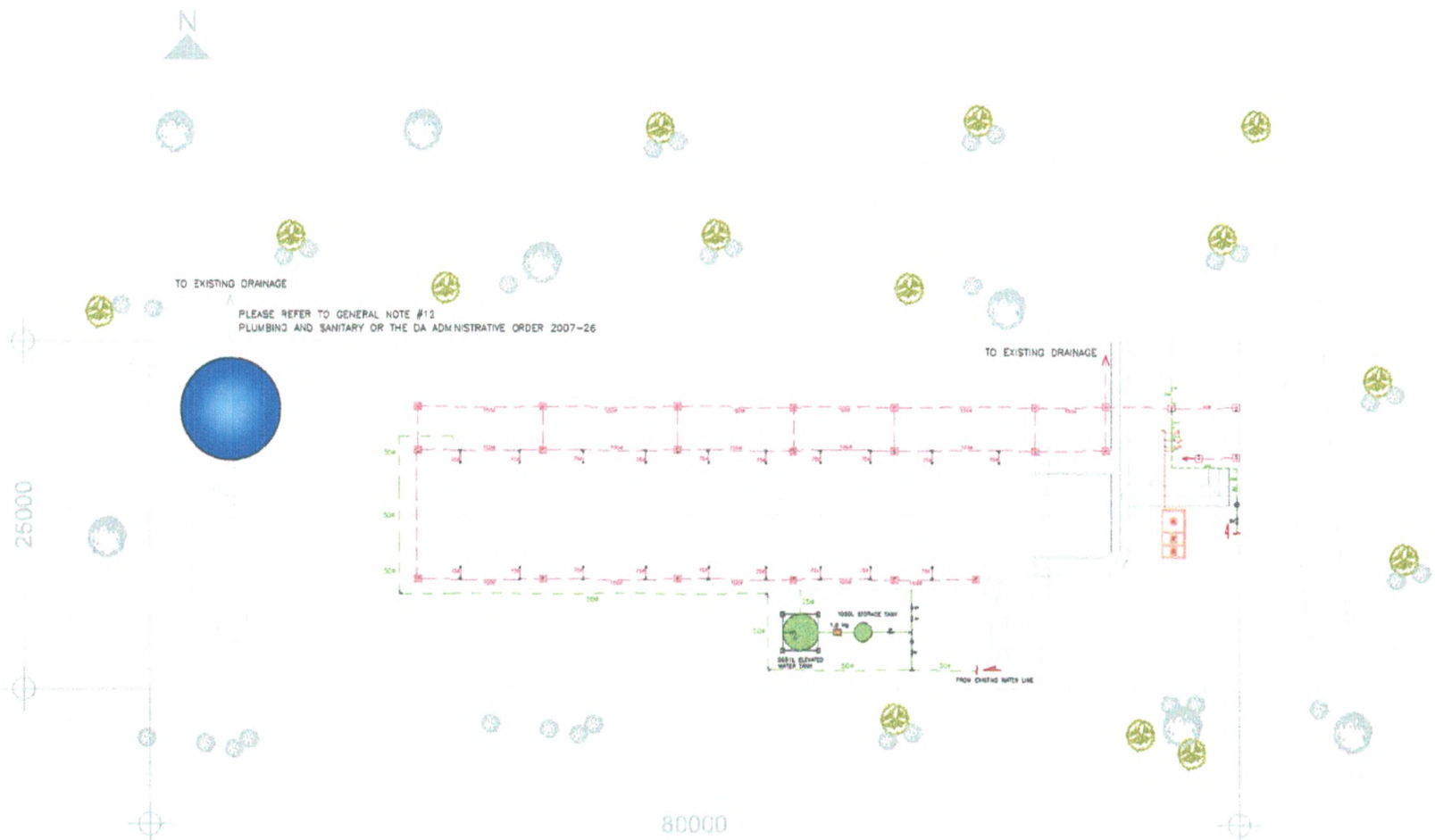
P 1 CLOSED CATCH BASIN
NOT TO SCALE



P 1 SEPTIC TANK DETAIL
DISINFECTION AREA
NOT TO SCALE

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. RENREN JAY R. PASIA ENGINEER I ENGINEERING PLANS, DESIGNS, AND SPECIFICATION DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI L. CARRIO ENGINEER V ENGINEERING PLANS, DESIGNS, AND SPECIFICATION DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. MIRANDA-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT PLUMBING GENERAL NOTES SEPTIC TANK DETAIL CPVC CANAL DETAIL DATE	SHEET NO. P-1 1 of 7

31/02



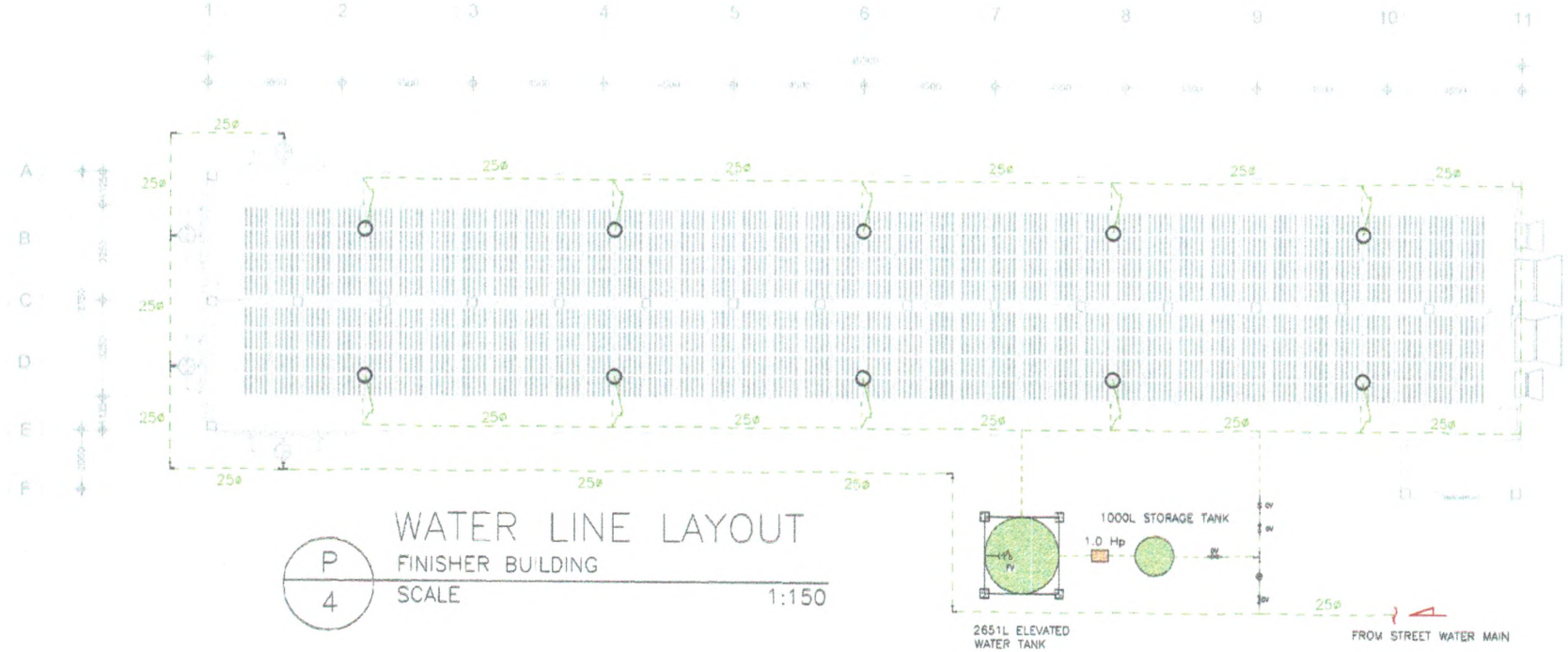
P 2 FARMSTEAD PLAN PLUMBING LAYOUT

SCALE 1:300

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY: ENGR. RENREM JAY R. PASIA ENGINEER II ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI L. CARRIO ENGINEER VI ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR G. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. MIRLAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL SWINE PROGRAM	SHEET CONTENT SITE DEVELOPMENT PLAN PLUMBING LAYOUT DATE	SHEET NO. P-2 2 of 7

LEGEND

	WATER LINE	CV	CHECK VALVE
GV	GATE VALVE		STORAGE TANK
M	WATER METER		ELEVATED WATER TANK



WATER LINE LAYOUT

FINISHER BUILDING

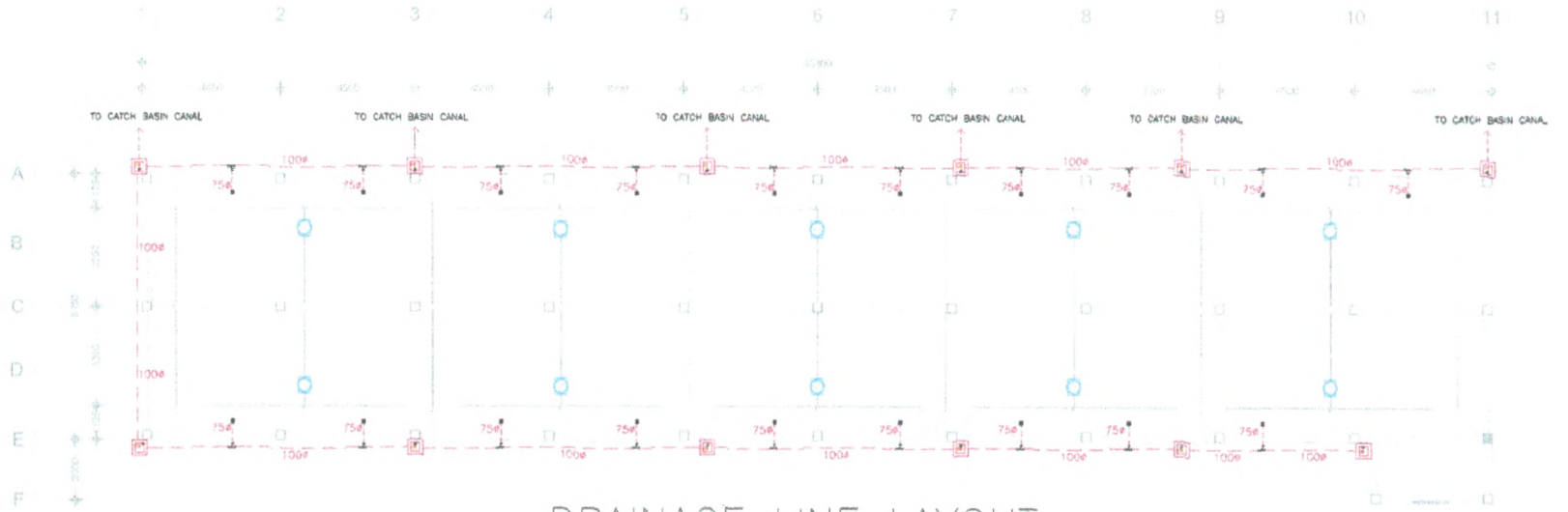
SCALE 1:150

P / 4

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. RENREN BRYAN PASIA ENGINEER II	REVIEWED & EVALUATED BY: ENGR. NOEMI C. CARPIO ENGINEER V	RECOMMENDING APPROVAL ENGR. JUANA T. TAPEL, Ph.D DIRECTOR IV	APPROVED BY ENGR. ARIODEAR C. RICO DIRECTOR IV	CONCURRED BY DR. RUTH S. [illegible]-SONACO DIRECTOR	SHEET CONTENT WATER LINE LAYOUT FINISHER BUILDING DATE	SHEET NO. P-4 4 of 7

LEGEND

	DRAINAGE LINE
	CATCH BASIN
	FEEDER



DRAINAGE LINE LAYOUT

P / 5

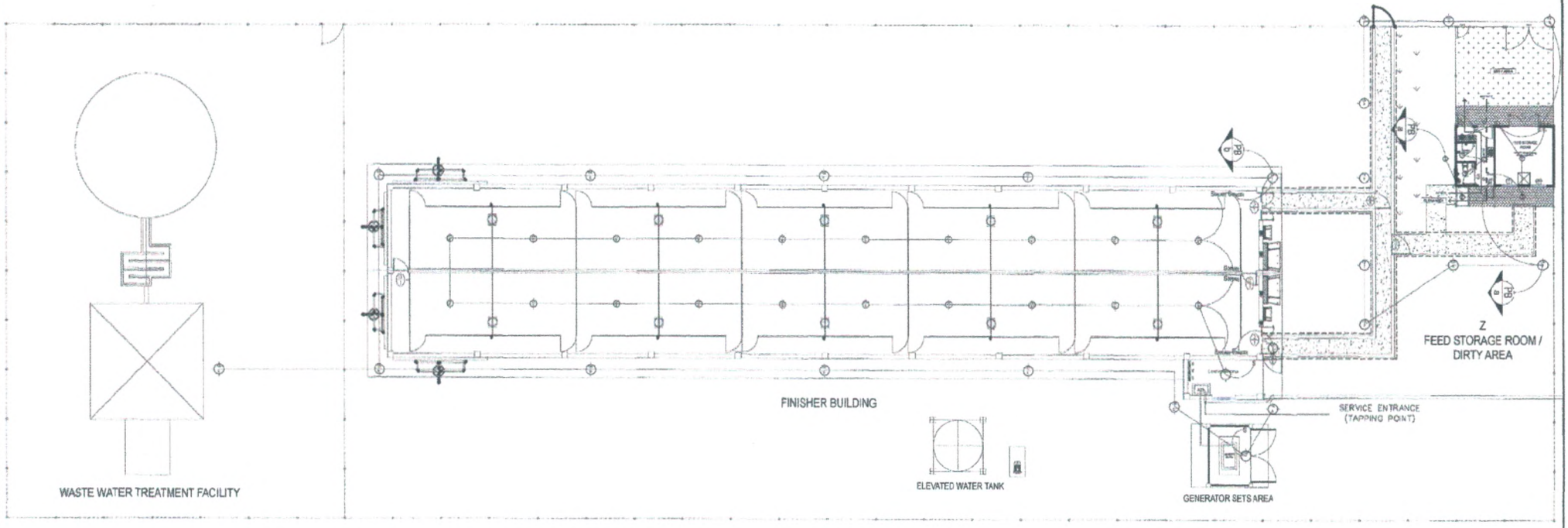
FINISHER BUILDING

SCALE 1:150

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE: PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY: ENGR. HENREN JAY K. PASIA ENGINEER I	REVIEWED & EVALUATED BY: ENGR. NOEMI L. CARPIO ENGINEER V	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV	CONCURRED BY: DR. RUTH S. NICOLAS-SONACO DIRECTOR	SHEET CONTENT: DRAINAGE LAYOUT FINISHER BLDG DATE:	SHEET NO. P-5 5 of 7

LEGEND:

SYMBOL	DESCRIPTION
	1-100W LIGHTING OUTLET
	1-24W LIGHTING OUTLET @50lux
	POWER OUTLET, DUPLEX
	PANEL BOARD, MARKED AS"DP"
	CIRCUIT HOMERUN
S1	SWITCH, 1-GANG
S2W-1	2-WAY SWITCH, 1-GANG
	PUMP
ATS	AUTOMATIC TRANSFER SWITCH



LIGHTING LAYOUT

SCALE: 1:100

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. EMMANUEL R. LANUZA ENGINEER III STANDARDS REGULATION AND ENFORCEMENT DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI L. CARPIO ENGINEER V ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. MIGUELA SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT FARMHOUSE CERTIFICATION PLAN LIGHTING OUTLET DATE	SHEET NO. FE-1 1 of 5

21/02

ITEM	DESCRIPTION	QUANTITY	DESCRIPTION
①	WATER PUMP	1	1HP,230V,1PHASE
②	GENERATOR SETS	1	20KVA,230V,1PHASE
③	SELF FEEDER	10	SELF FEEDER (100kg capacity)
④	SUBMERSIBLE PUMP	4	0.5HP,230V,1PHASE
⑤	EXHAUST FAN	2	50" GALVANIZED CONE FAN
⑥	EXHAUST FAN	2	24" GALVANIZED CONE FAN
⑦	COOLING PAD	2	1.8 X 3.6 M WALL-MOUNTED
⑧	COOLING PAD	2	1.8 X 4.8 M. WALL-MOUNTED

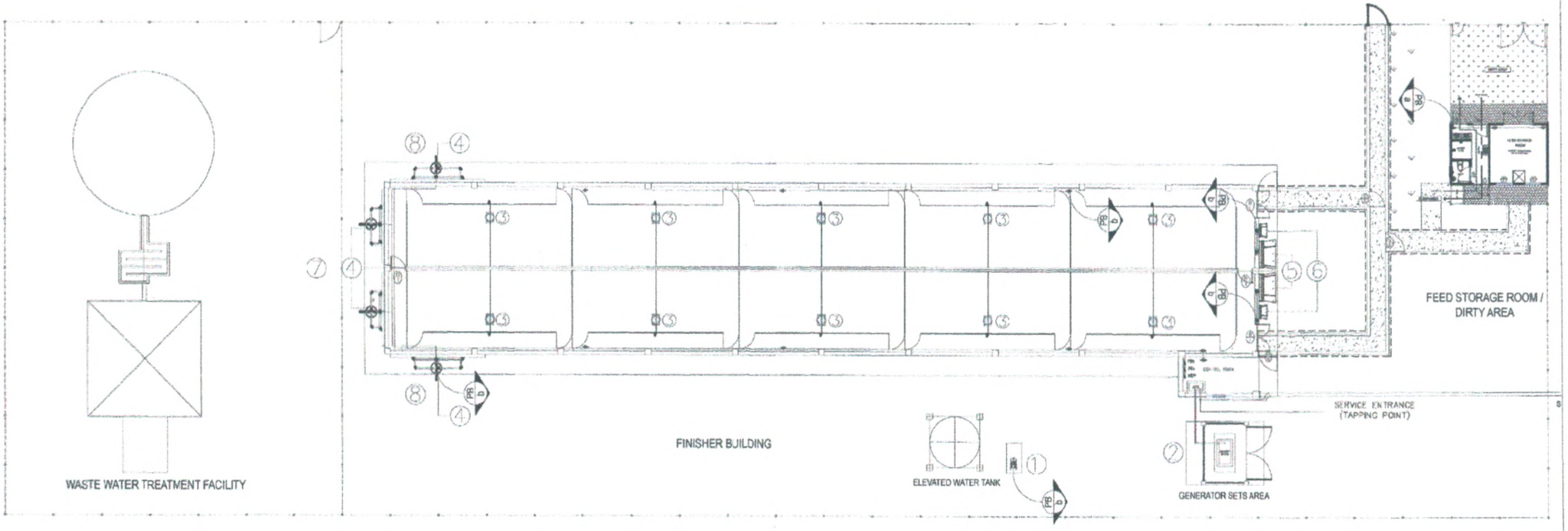
FINISHER BUILDING
2 ROWS OF 10 PENS
PENS ARE 4.3 X 3.15 METERS
15 ANIMALS PER PEN
AT 0.9 SQ.M PER ANIMAL

LOCAL BUILDING
BUILDING IS CURTAIN SIDED
CEILING HEIGHT IS 2.40 METERS

FLOORING IS TOTAL CONCRETE SLATS (EXCEPT WALKWAY)
3.15 M X 1.075 M GANG SLATS

LEGEND:

SYMBOL	DESCRIPTION
	1-100W LIGHTING OUTLET
	1-24W LIGHTING OUTLET @50mix
	POWER OUTLET DUPLEX
	PANEL BOARD, MARKED AS "DP"
	CIRCUIT NUMBER JN
S1	SWITCH, 1-GANG
S2W-1	2-WAY SWITCH, 1-GANG
	PUMP
ATS	AUTOMATIC TRANSFER SWITCH



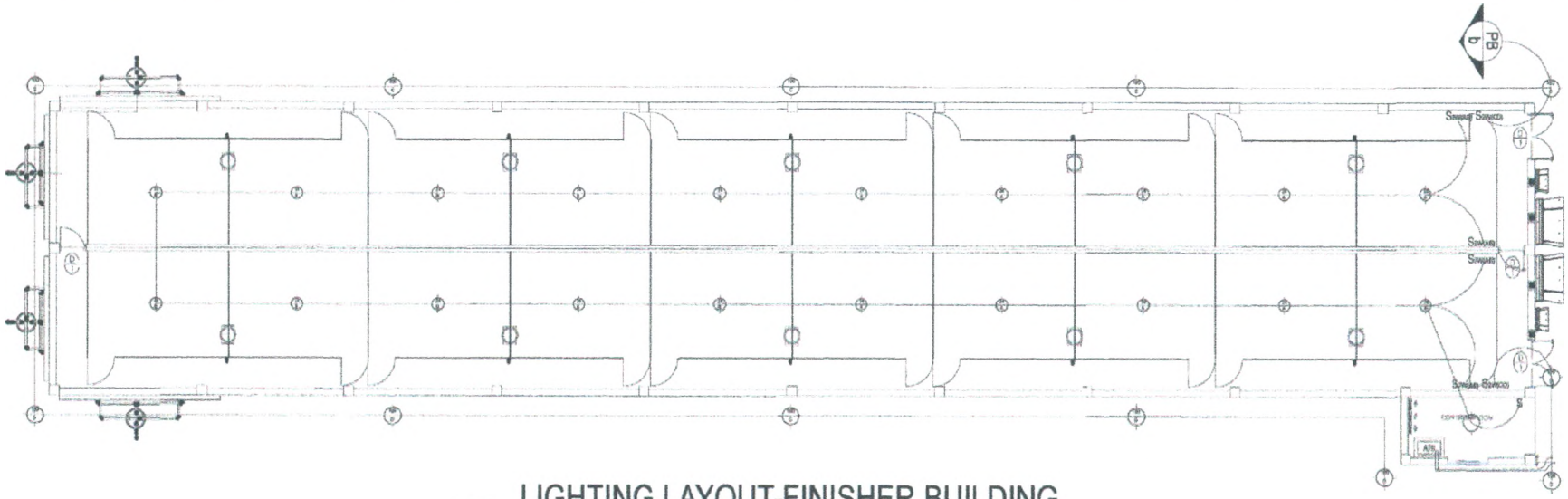
POWER LAYOUT
SCALE: 1:100

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING

PROJECT TITLE: PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM

PREPARED BY: ENGR. EMMANUEL R. LANUZA, ENGINEER III, STANDARDS REGULATION AND ENFORCEMENT DIVISION
REVIEWED & EVALUATED BY: ENGR. NOEMI L. CARPIO, ENGINEER V, ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION
RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D, DIRECTOR III, OFFICE OF THE ASSISTANT DIRECTOR
APPROVED BY: ENGR. ARIODEAR C. RICO, DIRECTOR IV, OFFICE OF THE DIRECTOR
CONCURRED BY: DR. RUTH S. MOLAT-BONACO, DIRECTOR, DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM

SHEET CONTENT: POWER LAYOUT
DATE:
SHEET NO. FE-2
2 of 5



LIGHTING LAYOUT-FINISHER BUILDING

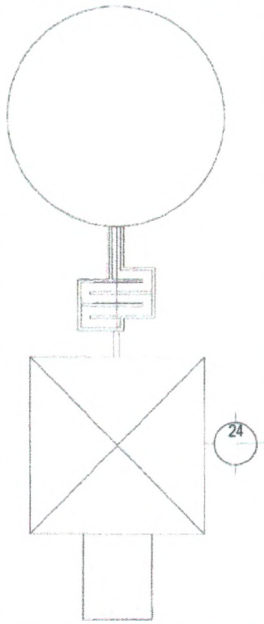
FE 3-1

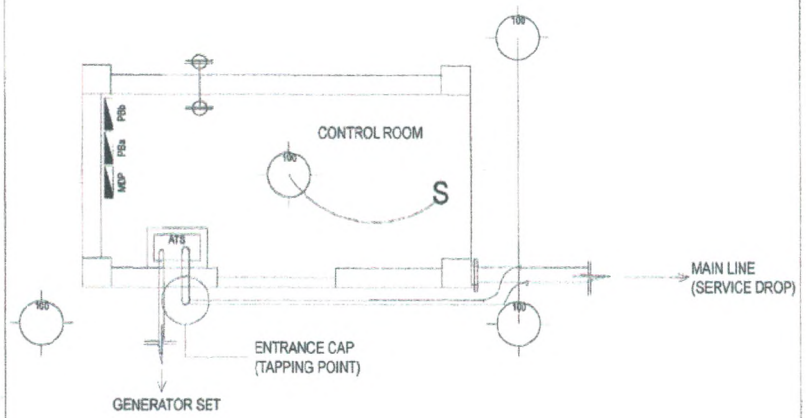
300 HEADS FINISHER BUILDING

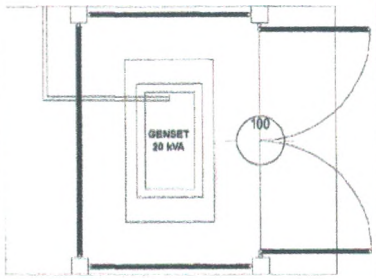
SCALE: 1:150

LEGEND:

SYMBOL	DESCRIPTION
	1-100W LIGHTING OUTLET
	1-24W LIGHTING OUTLET @50lux
	POWER OUTLET, DUPLEX
	PANEL BOARD, MARKED AS"DP"
	CIRCUIT HOMERUN
S_1	SWITCH, 1-GANG
S_{2W-1}	2-WAY SWITCH, 1-GANG
P	PUMP
ATS	AUTOMATIC TRANSFER SWITCH







GENERATOR SETS

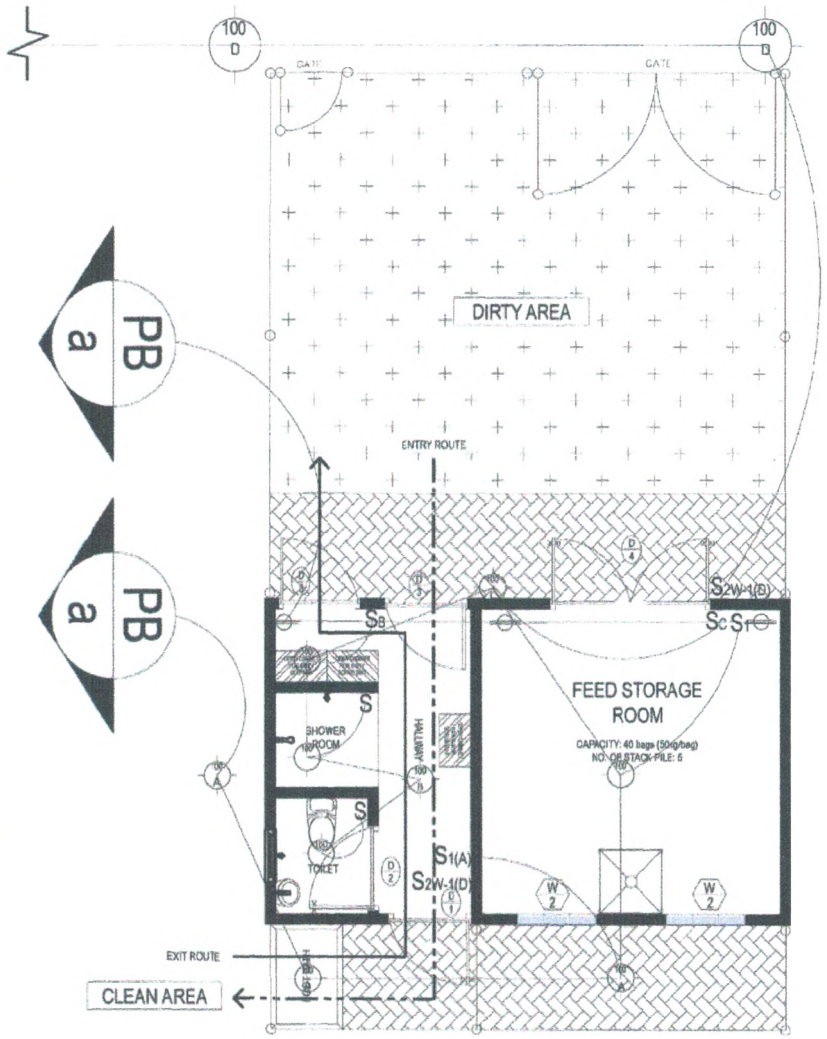
LIGHTING LAYOUT - WASTE TREATMENT FACILITY, CONTROL ROOM, AND GENERATOR SET

FE 3-2

300 HEADS FINISHER BUILDING

NOT TO SCALE

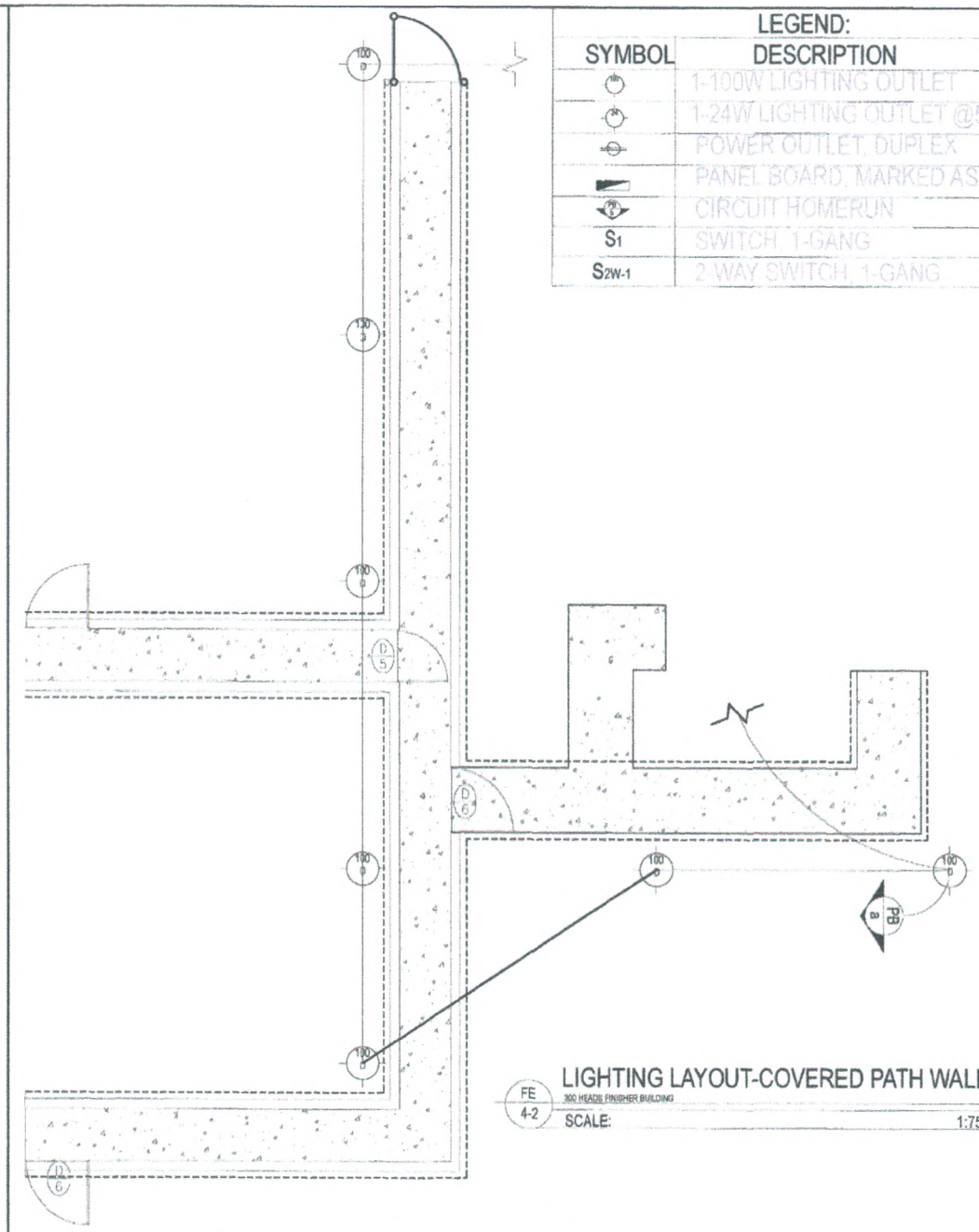
REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. EMMANUEL R. LANUZA ENGINEER III STANDARDS REGULATION AND ENFORCEMENT DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMIL L. CARPIO ENGINEER V ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY ENGR. ARIODEAR C. RICO DIRECTOR V OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. PIGUAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT LIGHTING LAYOUT FINISHER BUILDING BIOGAS FACILITY GENERATOR SET & CONTROL ROOM DATE	SHEET NO FE-3 3 of 5



FE 4-1 LIGHTING AND POWER LAYOUT-SHOWER ROOM AND FEED STORAGE ROOM

300 HEADS FINISHER BUILDING

SCALE: 1:50



LEGEND:

SYMBOL	DESCRIPTION
	1-100W LIGHTING OUTLET
	1-24W LIGHTING OUTLET @50lux
	POWER OUTLET, DUPLEX
	PANEL BOARD, MARKED AS "DP"
	CIRCUIT HOMERUN
S1	SWITCH, 1-GANG
S2W-1	2-WAY SWITCH, 1-GANG

FE 4-2 LIGHTING LAYOUT-COVERED PATH WALK

300 HEADS FINISHER BUILDING

SCALE: 1:75

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. EMMANUEL R. LANUZA ENGINEER III STANDARDS REGULATION AND ENFORCEMENT DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI T. CARPIO ENGINEER V ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. MICLAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT LIGHTING AND POWER LAYOUT : DISINFECTION AREA & FEED STORAGE ROOM LIGHTING LAYOUT COVERED PATHWALK DATE	SHEET NO. FE-4 4 of 5

ITEM	DESCRIPTION	QUANTITY	DESCRIPTION
①	WATER PUMP	1	1HP,230V,1PHASE
②	GENERATOR SETS	1	20KVA,230V,1PHASE
③	SELF FEEDER	10	SELF FEEDER (100kg capacity)
④	SUBMERSIBLE PUMP	4	0.5HP,230V,1PHASE
⑤	EXHAUST FAN	2	50" GALVANIZED CONE FAN
⑥	EXHAUST FAN	2	24" GALVANIZED CONE FAN
⑦	COOLING PAD	2	1.8 X 3.6 M WALL-MOUNTED
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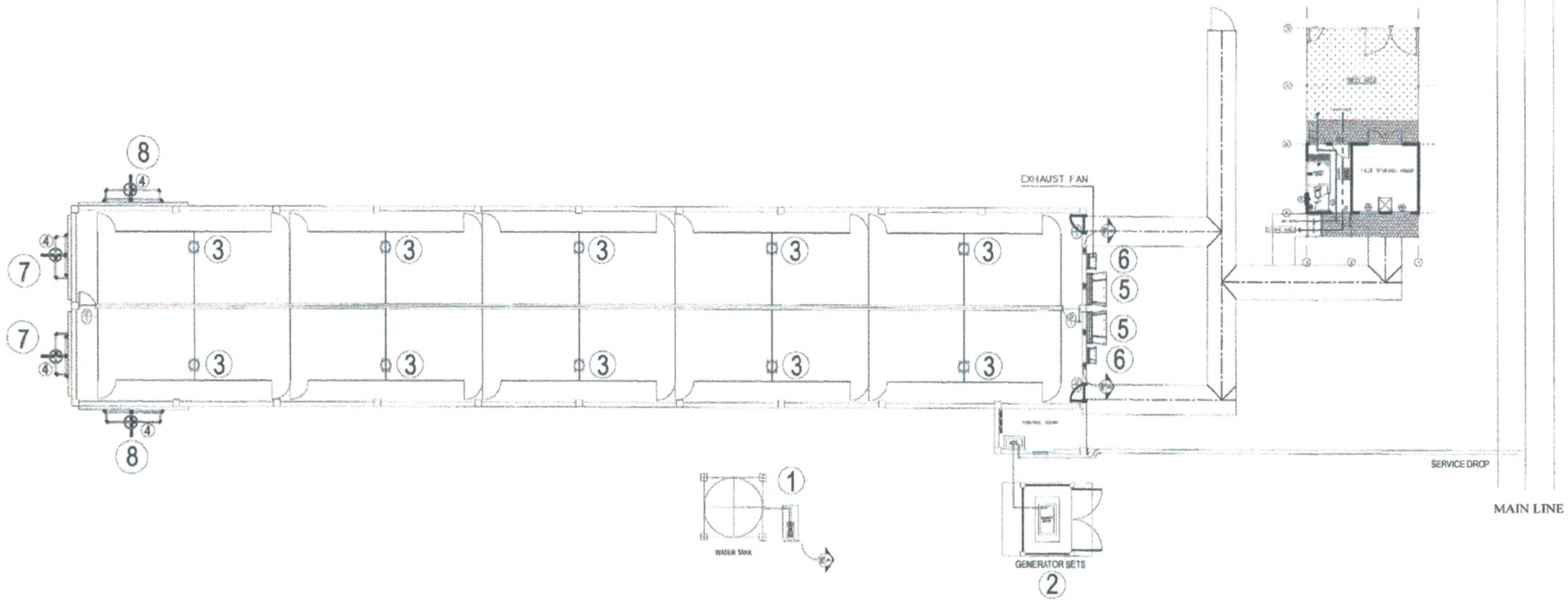
FINISHER BUILDING
2 ROWS OF 10 PENS
PENS ARE 4.3 X 3.15 METERS
15 ANIMALS PER PEN
AT 0.9 SQ.M PER ANIMAL

LOCAL BUILDING
BUILDING IS CURTAIN SIDED
CEILING HEIGHT IS 2.40 METERS

FLOORING IS TOTAL CONCRETE SLATS
(EXCEPT WALKWAY)
3.15 M X 1.075 M GANG SLATS



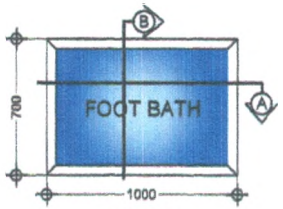
MEP 1 MACHINERY AND EQUIPMENT PLAN
300 HEADS FINISHER BUILDING
SCALE: 1:180

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING

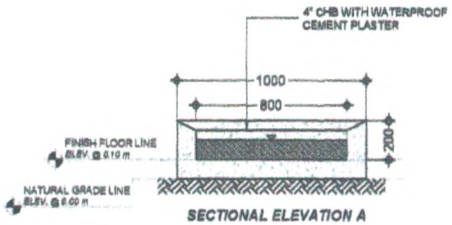
PROJECT TITLE: PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM

PREPARED BY	REVIEWED & EVALUATED BY:	RECOMMENDING APPROVAL	APPROVED BY	CONCURRED BY:
ENGR. EMMANUEL R. LANUZA	ENGR. NOEMI L. CARPIO	ENGR. JUANA T. TAPEL, Ph.D	ENGR. ARIODEAR C. RICO	DR. RUTH S. MCLAT-SONACO
ENGINEER III	ENGINEER V	DIRECTOR III	DIRECTOR IV	DIRECTOR
STRENGHEN REGULATION AND ENFORCEMENT DIVISION	ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	OFFICE OF THE ASSISTANT DIRECTOR	OFFICE OF THE DIRECTOR	DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM

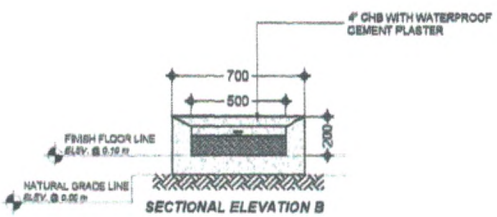
SHEET CONTENT: MACHINERY & EQUIPMENT PLAN
DATE:
SHEET NO.: MEP-1
1 of 3



TOP VIEW

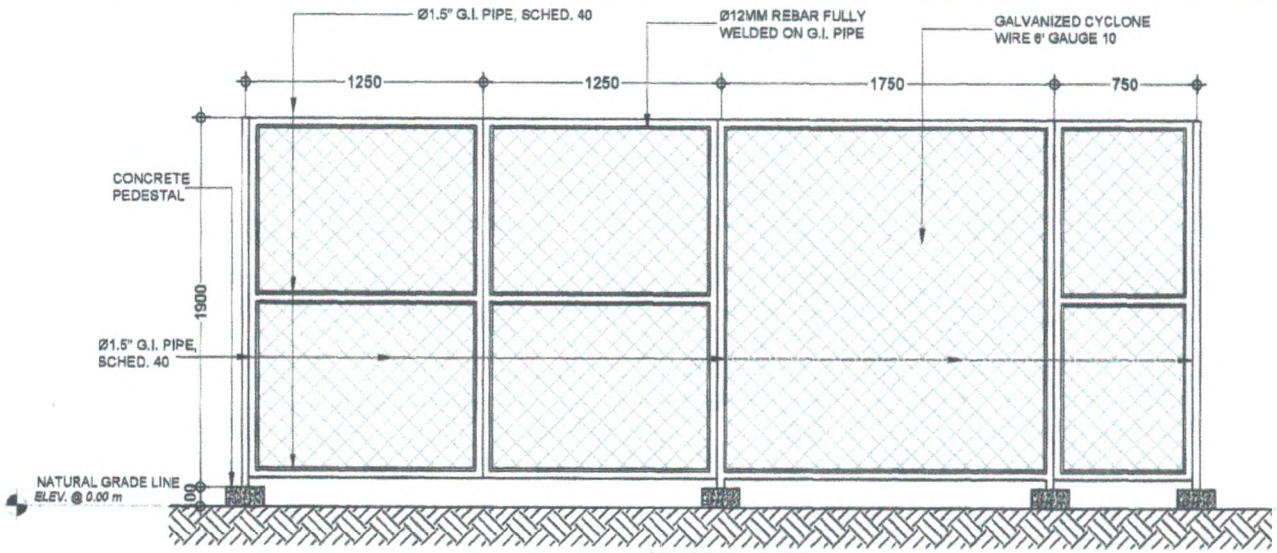


SECTIONAL ELEVATION A

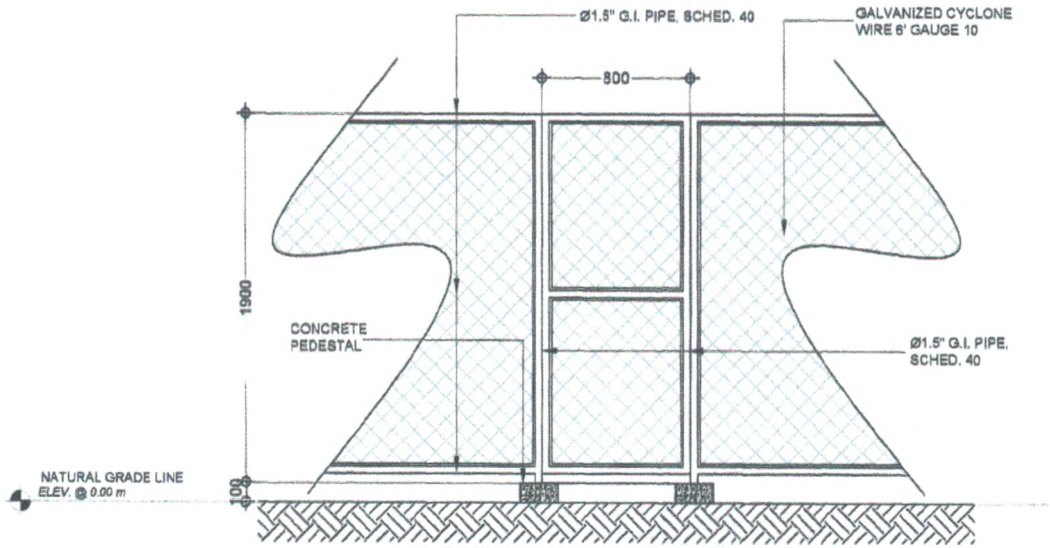


SECTIONAL ELEVATION B

AU 8-1 FOOT BATH DETAILS
SCALE: 1:25



AU 8-2 MAIN FARM GATE
SCALE: 1:25

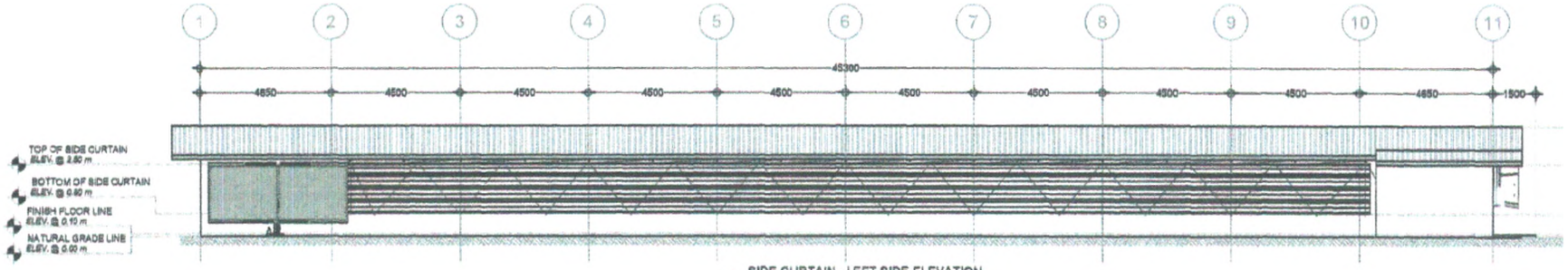


AU 8-3 PATH WALK & BIOGAS FACILITY GATE
SCALE: 1:25

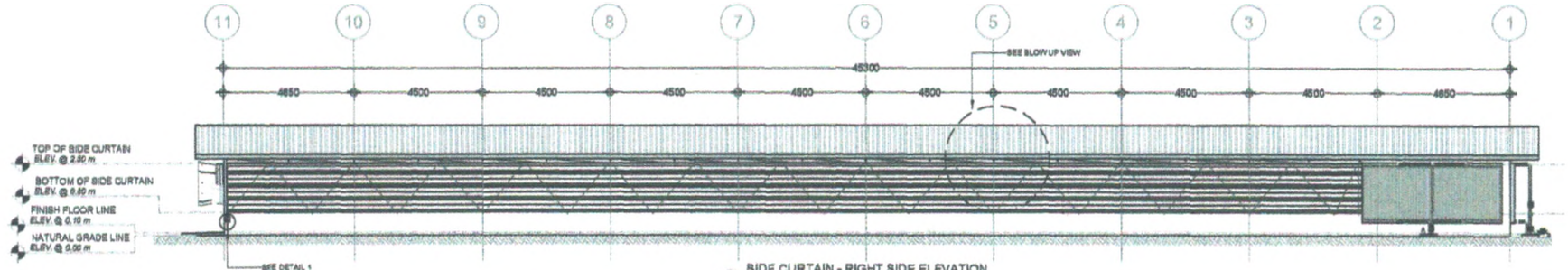
NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMIE CARPIO ENGINEER IV ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. MICLAT-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT FOOTBATH DETAILS MAIN FARM GATE PATH WALK & BIOGAS FACILITY GATE DATE	SHEET NO. AU-1 1 of 4

21/04



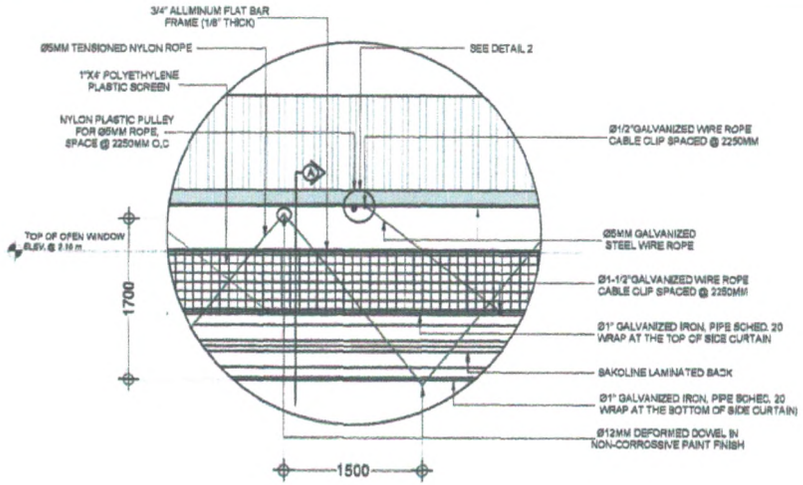
SIDE CURTAIN - LEFT SIDE ELEVATION



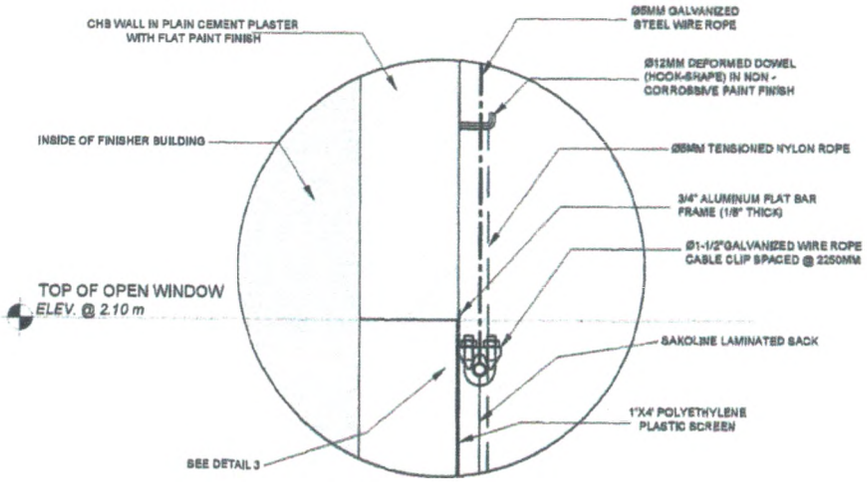
SIDE CURTAIN - RIGHT SIDE ELEVATION

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

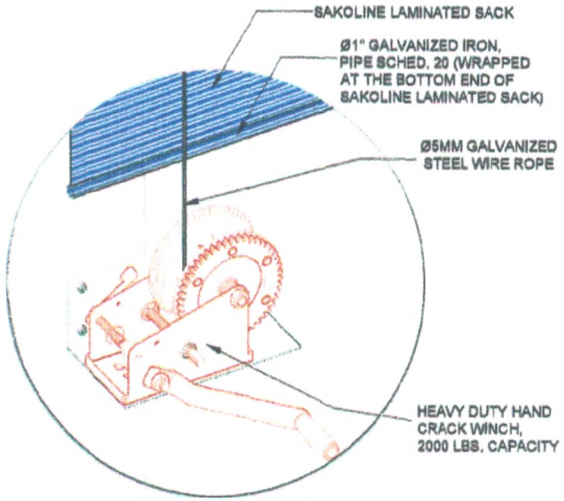
REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS DESIGN AND SPECIFICATIONS DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI U. CARPIO ENGINEER V ENGINEERING PLANS DESIGN AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. [illegible]-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT SIDE CURTAIN - LEFT SIDE ELEVATION SIDE CURTAIN - RIGHT SIDE ELEVATION DATE	SHEET NO. AU-1 2 of 4



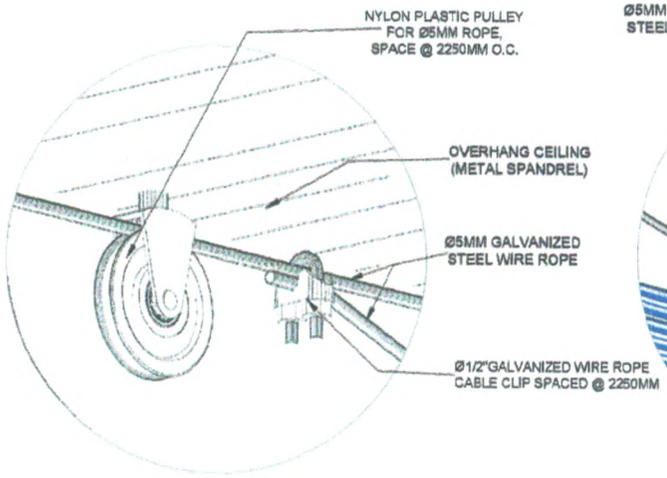
BLOW UP VIEW



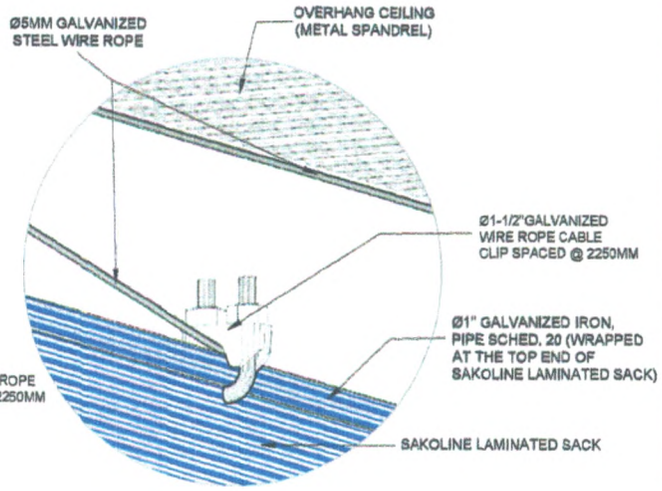
SECTIONAL DETAIL A



DETAIL 1



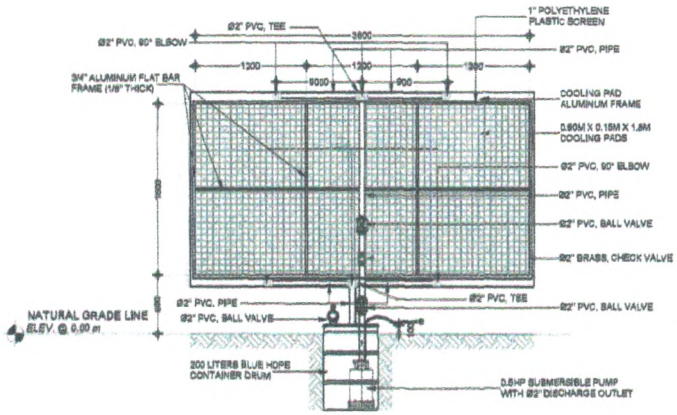
DETAIL 2



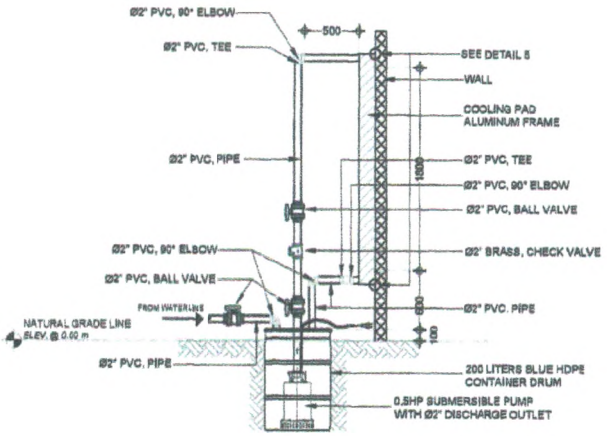
DETAIL 3

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

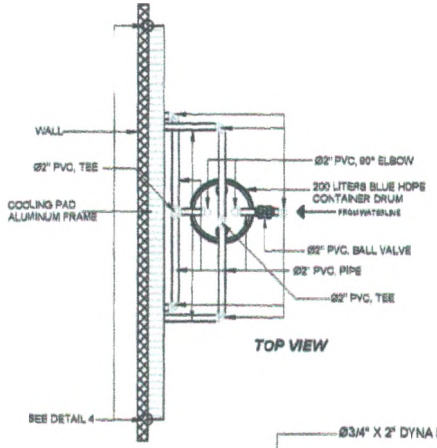
REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	REVIEWED & EVALUATED BY: ENGR. NOEMI L. MARPIO ENGINEER III ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. [illegible]-SONACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT [illegible] DATE	SHEET NO. AU-1 3 of 4



FRONT VIEW



SIDE VIEW

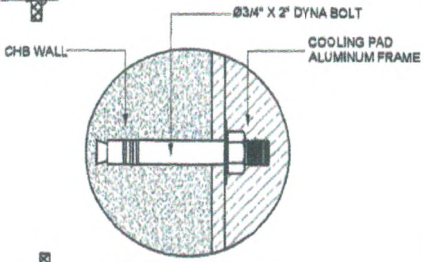


TOP VIEW

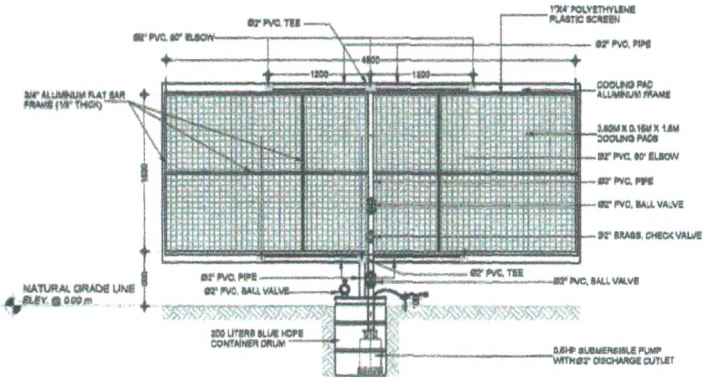
AU 8-6 REAR COOLING PAD DETAILS

SCALE: NTS

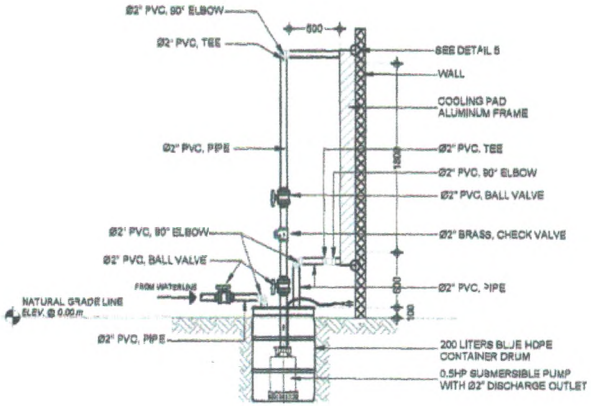
NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)



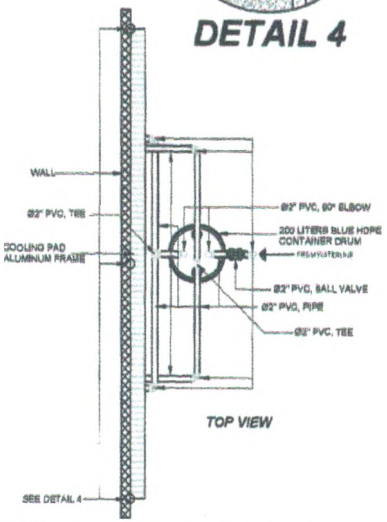
DETAIL 4



FRONT VIEW



SIDE VIEW



TOP VIEW

AU 8-7 SIDE COOLING PAD DETAILS

SCALE: NTS

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS (mm)

REPUBLIC OF THE PHILIPPINES DEPARTMENT OF AGRICULTURE BUREAU OF AGRICULTURAL AND FISHERIES ENGINEERING	PROJECT TITLE PROPOSED MODULAR DESIGN OF 300 HEADS FINISHER BUILDING FOR INTEGRATED NATIONAL SWINE PRODUCTION INITIATIVES FOR RECOVERY AND EXPANSION (INSPIRE) PROGRAM	PREPARED BY ENGR. ROMEL A. CABALLERO ENGINEER I ENGINEERING PLANS, DRAWING AND SPECIFICATION SECTION	REVIEWED & EVALUATED BY: ENGR. NOEMI U. CARPIO ENGINEER V ENGINEERING PLANS, DESIGNS, AND SPECIFICATIONS DIVISION	RECOMMENDING APPROVAL: ENGR. JUANA T. TAPEL, Ph.D DIRECTOR III OFFICE OF THE ASSISTANT DIRECTOR	APPROVED BY: ENGR. ARIODEAR C. RICO DIRECTOR IV OFFICE OF THE DIRECTOR	CONCURRED BY: DR. RUTH S. MIC[illegible]ACO DIRECTOR DEPARTMENT OF AGRICULTURE - NATIONAL LIVESTOCK PROGRAM	SHEET CONTENT REINFORCED COOLING PAD FINISHER DETAILS DATE	SHEET NO. AU-1 4 of 4