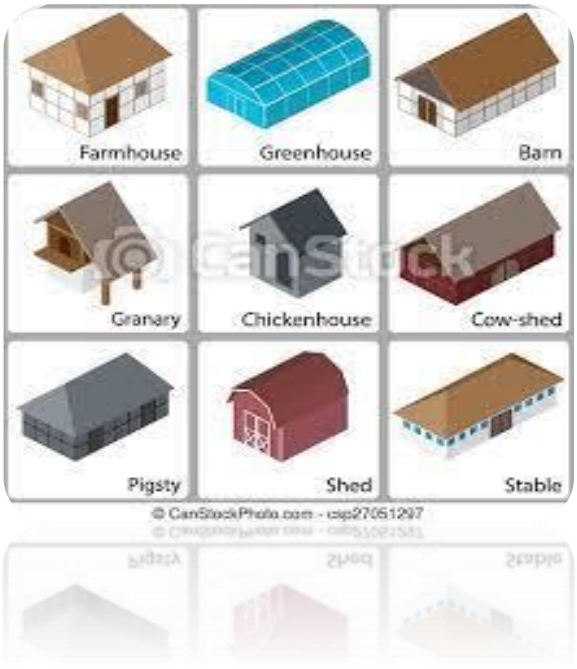
RATHINAM TECHNICAL CAMPUS (AUTONOMOUS)

DEPARTMENT OF AGRICULTURE ENGINEERING

AI8612 – DRAWING OF FARM STRUCTURES



Anna University - Regulation: 2017

B.E AGRICULTURE ENGINEERING

LAB MANUAL

VISION OF THE DEPARTMENT

The Agriculture Engineering department aims to produce well informed technocrats, who will be able to integrate engineering and technology inventions with farming and contribute towards sustainable growth in agriculture production across the globe.

MISSION OF THE DEPARTMENT

M1: To prepare the students with in depth Engineering knowledge and skills so as to face the challenges in Agriculture namely Farm Mechanization, Soil and Water Conservation, Agricultural Processing and Post harvest value addition, Bio Energy utilization and Precision farming and prove their prowess and expertise as Agriculture Engineers.

M2: To equip the graduates to meet global challenges in agricultural growth.

M3: To create ample opportunity to interact with industries and institutions and sign MOUs for mutual benefits.

GENERAL INSTRUCTIONS

The following instructions should be strictly followed by students in the CAD Lab:

- Students should wear lab coat in CAD lab.
- Students are advised to enter the CAD lab WITH FORMAL SHOES ONLY.
- They are not supposed to move the systems and monitors.
- They should enter in the login name and password assigned to each student.
- Students are advised to complete their record work before the next class.
- Students are asked to logout from their area and switch off the computers before leaving the lab.
- Students can access the printers through lab technician.
- Students have free access to use the computers and software available in the lab.
- During the laboratory hours, accessing the internet is strictly prohibited.
- Computer games are strictly prohibited in the CAD lab.

DRAWING OF FARM STRUCTURES

OBJECTIVES:

- To conceive and design various farm structures related to agricultural engineering.

COURSE OUTCOMES (COs)

After completion of the course, Students are able to,

COs	Knowledge level	Course Outcomes
CO 1	K4	The student will be able to understand the planning and layout of farmstead
CO 2	K4	The students also will be able to design of small barn, loose housing andmilking parlor, poultry house, sheep house.
CO 3	K4	The students also will be able to design of ventilation system for dairy and poultry house, Silos -over ground and under -ground and hey storage.
CO 4	K4	The students also will be able to design of farm fencing system, machinery andequipments shed and workshops.
CO 5	K4	The students also will be able to design of septic tank and sanitary structures, rural/farm roads andculverts

DRAWING OF FARM STRUCTURES

List of Experiments Mapping with COs, POs &PSOs

Ex.No	NAME OF EXPERIMENTS	COs	POs	PSOs
1	PLANNING AND LAYOUT OF FARMSTEAD	CO1	1,4,8,9,10, 12	1
2	DESIGN OF STALL BARN	CO2	1,2,3, 8,9,10,12	2
3	DESIGN OF LOOSE HOUSING AND MILKING PARLORS	CO2	1,2,3, 8,9,10,12	2
4	DESIGN OF POULTRY HOUSE	CO2	1,2,3, 8,9,10,12	2
5	DESIGN OF SHEEP/ GOAT HOUSE	CO2	1,2,3, 8,9,10,12	2
6	DESIGN OF VENTILATION SYSTEM FOR DAIRY AND POULTRY HOUSE	CO2	1,2,3, 8,9,10,12	2
7	DESIGN OF SILOS -OVER GROUND ANDUNDER GROUND AND HAY STORAGES	CO2	1,2,3, 8,9,10,12	2
8	DESIGN OF FARM FENCING SYSTEM	CO2	1,2,3, 8,9,10,12	2
9	DESIGN OF MACHINERY AND EQUIPMENTS SHED AND WORKSHOPS	CO2	1,2,3, 8,9,10,12	2
10	DESIGN OF SEPTIC TANK AND SANITARY STRUCTURES	CO2	1,2,3, 8,9,10,12	2
11	DESIGN OF RURAL/FARM ROADS ANDCULVERTS	CO2	1,2,3, 8,9,10,12	2
Content Beyond Syllabus				
12	DESIGN OF FARM TRUSSES	CO2	1,2,3, 8,9,10,12	2
13	DESIGN OF BIOGAS PLANT	CO2	1,2,3, 8,9,10,12	2

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AI8612 – DRAWING OF FARM STRUCTURES

Ex. No: 1 **Date:**

PLANNING AND LAYOUT OF FARMSTEAD

Aim: To Study about the planning and layout of farmstead

LOCATION OF FARMSTEAD:

A farmstead is satisfactory, if individual buildings are properly designed for function they serve primary objective of good planning are sanitation and will bring of human being and animals. The most convenient location of farmstead is,

- The farmstead should be located near the centre of farm or in middle of longside.
- Location at one side or even at corner near a road is helpful in processing farm supplies and in disposing farm produce.
- A site having high elevation and good drainage.
- It should be located near permanent source of water supply.
- Sites which have trees around will provide shade and protection againsthigh wind.

SIZE AND ARRANGEMENT OF THE FARMSTEAD:

The farmstead area is occupied by residential buildings, dairy barn, bullock shed, poultry house, etc. and area varies from 3 to 5 %.

Residential building should be located away from the cattle shed. The silo pit and feed storages should be located near animal shelter. Milk room should be located 6m away from barn.

PLANNING OF FARM RESIDENCE:

The residential building is the heart of farmstead. It should be constructed and designed that the owner has the satisfaction of staying and to take maximum advantageof sunlight. The Traditional designs of village houses.

- Construction is unsatisfactory.
- Windows are too small.
- Rooms are too small.
- Kitchen is not properly constructed to remove smoke.
- Animals are kept in or around the house.
- Surroundings are used as waste disposal place.

A good house should have following facilities.

- BEDROOMS: The number depends on size of family.
- VARENDA: for both sitting out and house work.
- Food grain store.
- Fuel wood store.
- Animal shelter.
- Animal fodder store.
- Latrine cum urinal and bathing place.
- Sitting room cum DALAN.
- Open space inside or outside the house.
- Space for biogas plant and slurry dump.
- Space for kitchen garden.
- Space for washing purpose
- Space for farm tools and machinery storage.

WATER SUPPLY:

Water is mainly used for household, livestock, processing of milk products and irrigation.

WATER SUPPLY AND HEALTH:

Water is need met by wells, ponds, streams, and rivers. If water is need more than 20000 litres per day or hour, open walls ponds or river are necessary to meet the need. If Water rate is less than half of water requirement per hour then there is adequate supply. If water exceeds by 25% a large capacity storage tank may be used at peak demand.

LINKAGE BETWEEN WATER AND HEALTH:

Water and health are linked in more than one ways. Poor quality of water causesdiseases and death. The cost of safe drinking water is testimony to the economic loss.

EXAMPLE: 1

Determine the size of an overhead water tank for a farmstead demanding a maximum ofabout 40,000 litres of water per hour for two hours during noon and only about 25,000 litres per hour during rest of period. The tube will is capable of supplying at the rate of only 28,000 litres per hour.

Sol;

- Total quantity of water demanded during peak period = 40, 000*2 = 80,000 litres
- Total quantity of water supplied during peak period = 28,000*2 = 56,000 litres
- Storage capacity of overhead tank = 80,000-56,000 = **24,000 litres**

Result:

Thus the planning and layout of the farmstead was studied.

Ex. No: 2 **Date:**

DESIGN OF STALL BARN

Aim: To Study the design aspects of stall barn.

DAIRY BARN:

When planning a new dairy barn size and location with relation to farm fields. Roads should be considered. The requirement of dairy cows and calves should be considered location of folder and feed storage location expansion of business should be considered milk house should be located on clean well drained site near barn but separated by 6m long paved passage in tropical countries like India. It is better to have enclosed barn in east must direction topography determine the drainage pattern.

TYPES OF DAIRY BARN:

There are three types of dairy barns such as,

- The stanchion barn
- Loose housing barn with milking parlour.
- Open air barn.

STANCHIAN BARN:

It is a modern dairy farms in which large number of cattle can be handed in one barn unit individual feeding and management and management of animals are possible for eight or more cows a two row barn with either face in or face out arrangement may beselected by keeping central drive unit the farm tractor with manure cart can be driven themanure alley can be eliminated in face in type, which saves about 20% compared to faceout type.

GUTTER:

It is usually 45cm wide and 15cm deep slope of 2% should be provided.

COW STALL:

The surface of floor may be lift rough but it should not accumulate water slope may be provided to allow drainage of water into gutter.

MANGERS:

Mangers width ranges from 75 to 90cm. The back of mangers is about 60cm abovethe floor. Feed alley is passage between outer wall and mangers and it is 102cm wide issufficient.

WALLS AND CEILINGS:

The height of wall may be 204m cable roof is used height of ceiling vary between sand 505m for barn to 10 to 11 wide. Walls are made of good quality bricks. The roof trustis constructed of timber span of 10 to 11m steel trusses are preferred cement asbestos sheets are lighter but tiles are insulator concrete roof is costly. Thatch roof should be avoided because there is chance of fire.

DOORS AND WINDOWS:

Door should be 204m to 207m wide on both side sliding doors should be used. Inhot climates doors are avoided 0. 37sq.m of window area per cow is desirable.

Loose Housing Barn:

In this cows are housed in a covered or partially covered yard they are milking in batches special milking house called milking parlour or milking house system.

Open Air Barn:

They do not have cover; cows are fed and milked in field they live. This is called open air barn.

Result:

Thus the design aspects of small barn.

Ex. No: 3 **Date:**

DESIGN OF LOOSE HOUSING AND MILKING PARLOUR

Aim: To Study the design of loose housing and milking parlour

LOOSE HOUSING BARN:

It is not commonly practiced in India. It permits animals to move freely, it is simple and economical construction of feeding and shelter places barn is kept unpaved under hot climate it is not necessary to cover entire barn, a small shed can be constructed. The area required per cow depends upon climate. The floor space for both loafing and feeding is 9-11sq.m per cow. Manage space range between 70 and 75cm wide.

MILKING PARLOUR:

The milking parlors or milking room is a room where cows are milked but not housed, it is essential part of most of barn including sanction barn or stall barn. Provision must be made for cows to pass easily from feed area. The milking room in common use is known as tandem with angle or two string state arrangement it is possible to milk as many 10 to 15 cows in each stall.

The herring bone milking parlor is widely used when a milk housing consisting of compressor room, cold rooms, snilk room, wash room and loading platform, it is located 2.4m away from the barn.

Result:

Thus the loose housing and milking parlor was design successfully.

Ex. No: 4 **Date:**

HOUSING OF POULTRY HOUSE

Aim: To Study the housing of poultry house

POULTRY HOUSE:

The object of poultry housing is to keep of comfortable it aims at removing excess moisture the bird's breath out from lungs with moisture it causes diseases. Draft in poultry house affect their health so it avoids draft site should be at height not more protected from prevailing winds. Light is essential window area should be at height not more than 75cm from floor level window area should be about 1/4th total floor area.

HOUSING REQUIRMENTS:

The floor area for hen varies with size of breed, number 0.046sq.m per bird.

TYPES OF POULTRY HOUSE:

- Wire floored poultry house.
- Deep litter poultry house.
- Cage house.

A. WIRE FLOORED POULTRY HOUSE:

It makes use of 12.14 gauge expanded metal or welded wire mesh for making their floors. The floor is 45cm above ground level and shape of 15% floor of nest may be made wood or cloth with 12-15% slope. The roosts are placed for birds to take rest 20% slope in roof.

B. DEEP LITTER POULTRY HOUSE:

It aims at keeping poultry house inside shed all the time, litter of about depth of 15-20cm it may be chopped paddy straw and rise husk. Well-developed decomposed litter after using good manure. Floor area of 0. 36sq.m per bird is provided 2.4*2.4m shedcan accommodate about 16 birds.

C. CAGE HOUSE:

It is generally built in warm region cage are built in continuous rows. These may be one to four rows of these cages. Cages are made of metal steel wire and provided with slope 0.6*0.2*0.45 is dimension of cage to house on bird. Droppings are allowed to fall down earth or concrete floor. Cages are place at height between 75 and 90cm from the floor.

Result:

Thus the design aspects of poultry house was studied.

Ex. No: 5 **Date:**

DESIGN OF SHEEP/ GOAT HOUSE

Aim: To Study the design of sheep house

SHEEP HOUSING:

Sheep housing is primarily for wool, meat and skin sometimes for milk sheep barnshould be located near pastures protection should be located near jackets and wolves. The earth floor is considered satisfactory for both shed as well as open yard concrete floor helps the shelter clean.

SPACE REQUIREMENTS FEEDING AND FEEDERS:

Sheep are allowed to graze pastures but provision is also made for stall. Feeding 2kg of roughage and 225gm of concentrate per animals 1: 12 sq. m floor area per animal water through should be properly placed in barn when large animal is raised on farm an efficient drafting yard is required for handling and the lamps. Silage in superior to hay. Cows about 20kg silage is fed and for sheep and goat.

Silage of 3.5kg per animal per day is fed. Feeding through and manager should be suitably designed. Free standing feeders are in use of Indian dairy farms. But improved design ensures proper feeding and least wastages. Even balls can be made to rest on bars of feeders such design discourage trapping and would not make feeding difficult.

Result

Thus the design of sheep house was studied.

Ex. No: 6 **Date:**

DESIGN OF VENTILATION SYSTEM FOR DAIRY POULTRY HOUSE

Aim: To Study the design of ventilation system for dairy poultry house

VENTILATION:

Ventilation system in live stock housing serve an important function, maintaining a comfortable animal environment typically a manure dairy cow will breath out four to fir gallons of water per day water vapour and produce 600 to 700 watts of heat.

VENTILATION SYSTEM REQUIREMENTS:

AIR EXCHANGE:

Sufficient air exchange is accomplished by the material driving forces of wind andbuoyancy.

FLEXIBILITY:

Ventilation needs continuous minimum an exchange is required to remove moisture constantly produced by the animals. This minimum air exchange is vital during the sub-freezing weather.

PROPER BARN CONSTRUCTION:

During hot weather condition a property constructed dairy barn should act as sunshade ventilation opening provide air movement pass the animals to remove extra heat reduce typical drops in milk production during extremely high temperature of fans may require to increase the air flows in cross cows.

NATURALLY VENTILATED BULIDING COMPONENTS:

Several keys feature and characteristics are required in a proper functioning material ventilation system. These features include the building site, separation and orientation ridge or peak openings and are required to manage the building.

During cold winter, some continuous air inlet openings that allows fresh air to enter the building is required. Locate the openings under the laver on the size openings equal to one half the ridge opening, and locate on both sides of building.

Additional side wall openings and end wall openings at animal level provide cross ventilation through animal zone. During the summer the barn serves as a sum shade to complete or full wall openings are optimal.

NATURAL VENTILATION BUILDING MANAGEMENT:

Management of naturally ventilated building is important to operation proper management

and adjustments of ventilation openings are important to assure comfort during these periods.

WINTER:

- Ridge and eave inlets open.
- Air inlets maybe partially closed.
- Side walls and end walls are closed and fastened.

MILD WINTER / SPRING:

- Ridge and eave inlets fully open.
- Upper side wall and end wall openings adjusted to maintain comfortableenvironment.

SUMMER:

- Ridge and eaves open.
- Side walls and end walls completely open to provide air movements.

Result:

Thus the design of ventilation system for dairy poultry house was studied.

Ex. No: 7 **Date:**

DESIGN OF SILOS OVER GROUND AND UNDER GROUND AND HAY STORAGE

Aim: To Design of Silos over ground and underground and hay storage.

THE SILOS:

It is used to store and protect animal fodder in an ideal condition. The target for lengthshould be 6-12 mm. silos may be classified into two types

- Tower silos
- Horizontal silos

PERMANENT TOWER SILOS:

It is cylindrical shape made up of wood or metal loading is difficult either mechanical loader or a large capacity is essential wall must be strong to avoid cracking. The cost is higher than horizontal silos.

HORIZONTAL SILOS:

It is used as a temporary permanent storage structure

- Pit
- Trench
- Surface sios

Thus the silos can be easily filled unloaded without special treatment. The spoilage ofsilos ranges 20-30%

FILLING AND PACKAGING:

Trench and pit silos can be easily filled by storage chopped silos should be levelledspread and packed through packing, provide good silos. Silos should be covered by dry paddy

SILAGE EFFLUENT:

It is serious as pollutant of ground and surface water the bio chemical oxygen demand be a greater of 150 times than domestic sewage BOD ranges from 250 to 400 mg/l. The standard BOD is 20 mg/l.

PIT SILO:

It is circular deep well which is lined all along side and sealed from bottom. It is made in area where soil is deep and water table level is slow. When silo is opened for removing the silage no body showed enter till the gas are removed.

FEEDING:

Silo is fed by hand and moved silage push cart. The size of cart should be such that in one trip half the member of animals may be supplied with silage. A cow is feed 3kgof silage. Silage nation is 14-18 kg per cow per day.

SIZE AND CAPACITY OF SILO:

The correct diameter of silo depends on the quantity of silage to be fed daily to prevent spoilage. Silage should be removed at rate of 10 cm day. The diameter is 6m anddepth is 2-3 times of dia.

TRENCH SILOS:

It is made easily without any investment on which cement and sand. Unlined silo give meter spoilage filling and packing and scaling must be carefully done. the silo shouldbe roofed and located on sloping ground.

Result:

Thus the silos over ground and underground and hey storage was designed.

Ex. No: 8 **Date:**

DESIGN OF FARM FENCING SYSTEM

Aim: To design the farm fencing system.

FARM FENCING:

A Fence is a barrier which is used either for animal to definite area on keepingthem out of particular area. Dead on live hedges, earth or masonry walls ditches are widely used as fences. Fencing is classified into five types.

1) Woven Mesh Type

   a) Large Mesh Type

   b) Close Mesh Type

   c) Hexagonal

2) Barbed wire fencing

3) Plain wire fencing

4) Welded Plain wire fencing

5) Electric Fencing

WOOVEN MESH TYPE:

It is used for large animal's cattle's horse's buffalos etc. space between vertical wire is15 and 30 cm and horizontal wire is closed at bottom and increases towards top of fenceclose mesh type is used for poultry house rabbits and goats. Horizontal woven type wiresare uniform all through their height.

BARBED WIRE FENCING:

It is generally made up of two stands of wire twisted together spacing between varies b/w 7.5

to 15 cm. It is made of 14 gauge wire and in roll of 50 kg stretching to 160 m long.The spacing of wire is in following order

1) Ground and first wire = 15 cm
2) First and second wire = 15 cm
3) Second and Third wire = 15 cm
4) Third and Fourth wire = 22.5 cm
5) Fourth and Fifth wire = 30 cm
6) Fifth and Top wire = 30 cm

It is effective than plain wire and cheaper than wooven wire fencing.

PLAIN WIRE FENCING:

It is used for large cattle fencing spacing is same. It is available in various diameter.

WELDED WIRE FENCING:

It is similar to woven and available in rolls of 100 m having height varying from 1 to 15m.

ELECTRIC FENCING:

An electric fencing consists of one or more stands of bar wire supported by insulator connected to fence emerging unit to form a barrier to cattle. The fence controller appliesa high voltage current b/w fence wire and earth the voltage varies from 6000-15000 volts. Under different condition. It is low cost. Current should not exceed 0.008 amp.

FARM GATES:

Careful consideration should be given to type of gates to be selected. The ideal gate isof simple construction. Easy to operate and of sufficient height and maximum strength.

FENCING POST:

Fence post are made of wood angle iron pipes depending upon cost and availability ofmaterials

wooden posts are best suited for cheap and temporary fencing.

Result:

Thus the farm fencing was designed successfully.

Ex. No: 9 **Date:**

DESIGN OF MACHINERY AND EQUIPMENTS

Aim: To design the machinery and equipment.

It is still a controversial issue whether it is economical to provide storage houses for farm machines and implements studies so far however indicate that is more economical to protect implements and machinery by means of sample type of storage structures then to the let those be exposed to weather

The machinery storage structure may be of either in front open type or may be openon both sides to make it convenient for tractors structures 10cm thick wall laid in cementsand mortal may be built to offer safe enclosure from the back.

FARM WORKSHOP

A farm workshop is desirable on a large farm for maintenance and repair farm equipment and buildings. A sustainable amount of time and money can be saved and extra work and inconvenience avoided on farm by moving a fully planned and well equipped workshop.

The types of power and machinery used as also important for there is no need fordiesel pump fuel for calibration pump if diesel tractors or engines are not used on the farm.

FLOOR

A 10cm thick cement concrete or thick floor is considered to be satisfactory minimum 2percent slope across the shop for quick disposal of water the slope of the ramp can be 4percent of more if should rise from the ground level to the floor level of the shop.

WALLS

Walls may be made of either bricks laid in cement mortar or metal sheet. Brick wallthickness of is usually 22.5cm large hemispherical sheds are sometimes constructed andthree have no side walls only in the front and at the back walls are provided with gates for the entrance and for exit.

ROOF

For large size workshop, corrugated galvanized iron roof is widely used. It is reasonably economical and lighter uncomfortable heat during summer days can be avoided either placing the roof at great height of fixing layer of insulation board below theroof of by fixing few exhaust fans to promote air exchange.

Result:

Thus the equipment and machinery were designed successfully.

Ex. No: 10 **Date:**

DESIGN OF SEPTIC TANK AND SANITARY

Aim: To design the septic tank and sanitary

SANITATION:

Safe disposal of all human sewage and domestic waste is necessary to protect the health and prevent disease. It should not make surroundings ugly and unhygienic. It should not be disposed of in stream on pond. These criteria can be met by discharge of domestic sewage into septic tank and soakage pit.

SEPTIC TANK:

The principal on which a septic tank works in a bacteria until liquify and organic material into liquids and gases for most part. The three important functions of septic tankare,

a. The removal of solid from sewage as it from the tank. Solids are discharge and remaining as discharge.
b. The decomposition of solid sewage under anaerobic condition.
c. The storage of sludge and scum.

LOCATION:

Sewage disposal should not cause contamination of any stream or other source. It should be located downhill from source of water supply. It generally that septic tank should never be than 30m from source of water supply if water is expected to rise about 1.2m to ground surface. It should be located in areas liable to be flooded.

CAPACITY OF TANK:

Capacity determines the dimensions of tank for family of five members the tank capacity may be kept about 2.8cm for additional member capacity should not be smaller than 21cm tank is divided into two (or) more compartments. Bricks should be laid in good Cement and should led laid plastered. At least 1.25cm thick cement plaster shape may be either rectangular or square depth may be range between 0.75 and 15m.concrete about 7.5 cm thicknesses they are placed about 15 to 22.5cm away side walls. Usually provide at15cm below ground level.

CLEANING:

The tank should be inspected at least once in two years and cleaned before sludgelevel reaches the bottom of outlet. Depth of sludge should be measured.

Result:

Thus the septic tank and sanitary was designed successfully.

Ex. No: 11 **Date:**

DESIGN OF RURAL / FARM ROADS AND CULVERTS

Aim: To design the rural farm roads and culverts

INTRODUCTION:

This manual offers highway engineer a comprehensive set of guidelines to assist and simplify the process of desiring small bridges and culverts. These structures are an essential part of every road networks. They are few more common them large bridges are simpler to design and construct for the purpose of manual small buildings (i.e) talking are sperm to bridge a two have highway to bridge a dual car wage way.

PLANNING:

The first part of manual is concerned with planning site navigation. Planning involves site also necessary at this stage of the available resource are thus has having on the material to be mud and hence the type of structures.

SITE SURVEY:

For a river crossing, the cheapest bridges site and the one that has the largest potential service life is that which is an straight reach of river has well defined bricks has reasonable straight approach roads permits a square as crossing as possible has good foundation condition.

SUBSTRUTURES AND FOUNDATIONS:

The essential features are, foundation slabs that transmit the weight of the animals and directly supporting soil. Front walls with bearing shelves that support the super structure soil of the embankment wing walls or retaining walls.

SUPER STRUCTURES:

It is further divided into reinforced concrete. Reimposed are reinforced concrete and steel blames and timber.

REINFORCED CONCRETE SUPER STRUCTURE:

This section presents standard design for concrete slab decks from 4m to 12m spans.

BEARINGS:

The simplest form of bearing is made by casting the concrete slabs on to the abutment felt separating the two concrete surfaces.

COMPOSITE SUPER STRUCTURES:

The advantages are,

ii. The deck weight can be less than of equally all concrete structures.

iii. The offsite prefabrication of the main load reduced the work necessary on site resulting rapid construction.

iv. Steel is a reliable material which is supplied of consistent reliability to beproduced.

PARAPETS:

Circular section has been selected for the rails that are readily made for badlydamaged post or rails.

TIMBER:

Seasoned logs should be used whenever possible. They should be closely matched and positioned same way. Five further chapter in manual discuss,

- Low level water crossings culverts
- Emergency and temporary structures
- Bridge building materials

Result:

Thus the rural farm roads/culverts were designed successfully.

Ex. No: 12 **Date:**

DESIGN OF FARM TRUSSES

Aim: To design the farm trusses.

FARM TRUSS

A truss is a pre-assemble fabrication of woods, steel, or aluminum embarked to form the building. The weight of the roof is transferred to the side walls as from the ground or building foundation.

DESIGN OF TRUSS

It can be seen from the stress distribution of a loaded Bram that the greatest stressoccurs at the top and bottom extremities of the bram. This led to the improvement on a rectangular section by introducing the I-section by which the large flanges curve situated bam. In effect the flanges are carried the bending in the form of the tension stress in one flange and compression stress in other while the shear was carried. A truss concentratesthe maximum amount of the as far away as from the natural axis. As resulting from largematerial exist can be resisted.

Resistance of a truss at a section is provided by $M=C\times h=T\times h$

Where,

C=T in parallel cords

C= Compression in the top chord of the truss T=Tension in bottom chord of supported truss h=Vertical height of truss section

if either C, T or h can be increased from the truss will be capable of resisting heavierloads. The value h can be increased by making a deeper truss.

- A framework on truss can be considered as a bram with the major part of the webis removed.
- The pitched roof is the best example of this although the original shape was probably designed. They are used to support a roof covering in conjunction with Purling which are members laid longitudinally across the rafters. The roof covering being attached to the purling. The arrangement of internal bracing depends on thespan. Rafters are normally divided into equal heights and ideally, the purlins are supported at the joints to the axial forces.
- The internal bracing members of a truss should be triangulated and as far as possible. So that long members are in tension and in compression are short to avoid buckling problems. The thick line indicates struts. The lattice grinder is alsocalled as truss at top and bottom.
- The following steps should be considered when designing a truss.
- Select general layout of truss members and truss spacing.

- Estimate external loads to be applied including self-weight of truss purlins and roofcovering with loads.
- Determine critical loading. It is usual to consider dead loads alone.
- Analyse frame work to find forces in all members.
- Select material and section to produce in each member, a stress exceeds thepermissible value.
- The pitch or slope of a roof depends on locality. Imposed loading and type ofcovering for corrugated steel and asbestos roofing sheets.

Result:

Thus the farm truss was designed successfully

Ex. No: 13 **Date:**

DESIGN OF BIOGAS PLANT

Aim: To design the biogas plant.

BIOGAS.

Plant matter created by process of photosynthesis is called biomass, it includes all plant life, trees, agricultural plants, bush grass, algae and livestock waters photosynthesis is a naturally occurring process which desires its energy requirement fromsolar radiation.

$$H_2O+CO_2 \rightarrow CH_2O+O_2$$

It is seen that in the process, water and carbon-di-oxide are converted into organicmaterial the gas produced by biomass is called biogas. Biogas is obtained through the fermentation of animal waste and other biomass in a digestion chamber. Biogas is a mixture of methane(45-75%) and CO_2 the production of biogas is a particular significancefor India because large cattle population.

TYPES OF BIO-GAS PLANT

The Indian designs of biogas plants have the following arrangement for gas storageand hence plants are classified as,

- Floating dome type.
- Fixed dome type.
- Plants with separate digests and gas holder (Buller math design).
- Flexible bag biogas plants.

IMPROVED INDIAN BIOGAS PLANTS

- Kachacha-Pacca biogas plant (PAV Ludhiana model).
- Capsule plant of $3m^3$ capacity (HPAVI Palampur model).
- Janatha biogas plant (Govt implement factory Bhuvaneshwar model).

- IARI biogas plant (Pusa,Delhi).
- Bharat plant (GEDA,Vadadara).
- Ganesh plant (Rampur).
- Deena bandhu plant (Lucknow).
- Kamdhena plant (Maharashtra).

PROBLEM:

Design the $3m^3$ digester of KVIC biogas plant assume retension time as 40 days and diameter depth ratio as 0.7.

SOLUTION:

Given:

Gas production/day = $3m^3$

Retension period = 40 days

Height and diameter of digester ratio = 0.7

Assume:

Density of slurry = $1000kg/m^3$

$1m^3$ of gas = 25 kg of dung

Volume of digester = $\frac{Weight\ of\ slurry}{Density\ of\ slurry}$

$= \frac{75+75}{1000} * 40$

$= \frac{150}{1000} * 40$

$= 6\ m^3.$

Actual volume of digester, add 10% = 6/10 = 0.6

Actual volume = 0.6 + 6 = $6.6m^3$.

$\frac{\pi}{4} * D^2H = 6.6$

$\frac{D}{H} = 0.7$

$D = 0.7H$

$\frac{\pi}{4} * (0.7H)^2 H = 6.6$

$H^3 = 17.14$

$H = 2.6m.$

Therefore,

$D = 0.7H = 0.7*2.6$

$= 1.8m.$

Diameter of gas holder= Diameter of digester – 0.2

$= 1.8-0.2$

$D = 1.6m.$

Height of gas holder

$\frac{\pi}{4} * D^2H = 1.5m^3$

$\frac{\pi}{4} * (1.6)^2 * H = 1.5$

$H = 0.746m.$

Result:

- Height of digester = 2.6m.
- Diameter of digester = 1.8m.
- Diameter of gas holder = 1.6m.
- Height of gas holder = 0.746m.