

GENERAL PRINCIPLES FOR CONSTRUCTION OF ENCLOSURES (LPM-605)



Dr. S. P. Sahu, M.V.Sc., Ph.D. (LPM)

Head

Department of LPM

Bihar Veterinary College, Patna- 800 014

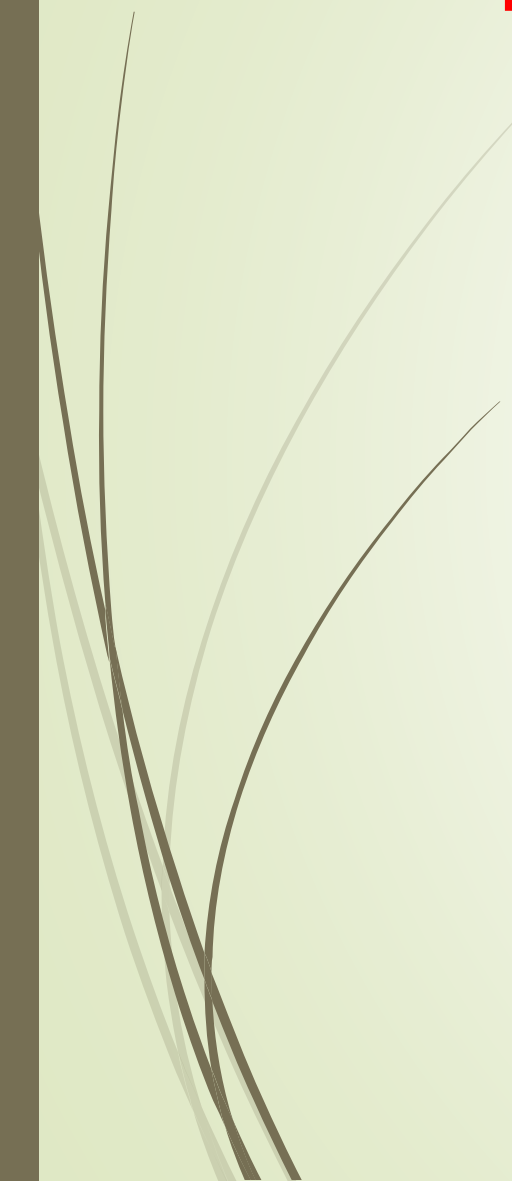
www.basu.org.in

General principles for construction of enclosures

- **Enclosure:** Any part of a building that physically separates the external from the interior environment.
- A building consists of a collection of enclosures surrounded by separators of the interior environment and separators of the exterior environment.
- Animal physiology is capable of tolerating a definite range of environmental conditions.
- Beyond this range, health, production and well being are compromised.

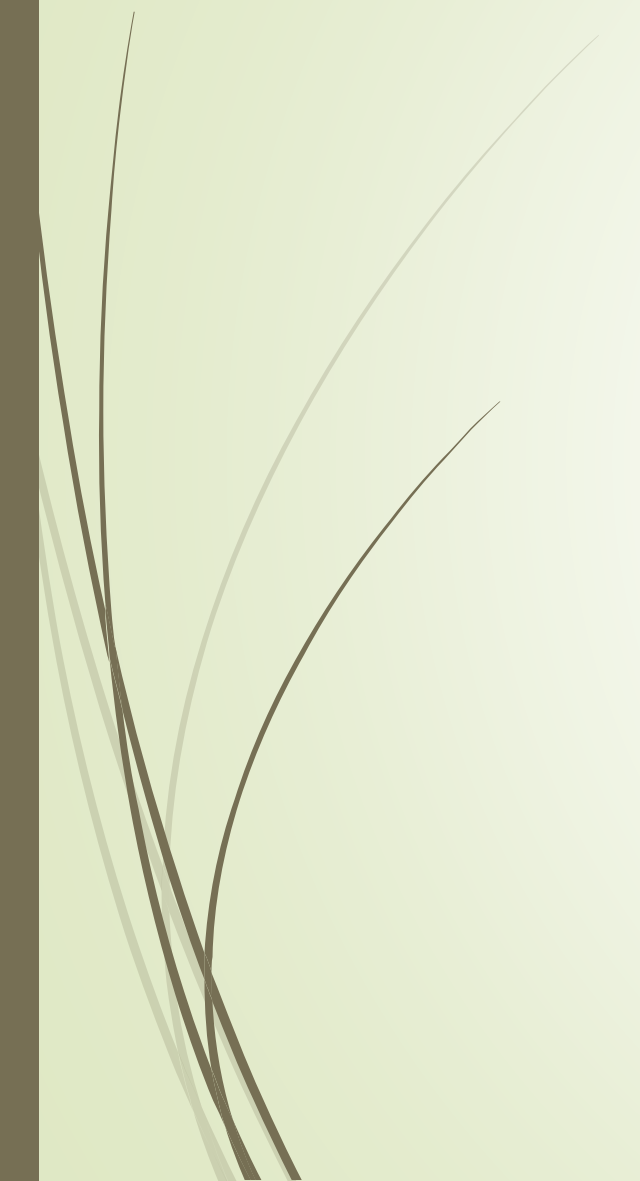



Physical components of the building enclosure include:

- The roof system
 - The wall system including windows and doors
 - The foundation system
 - The floor system
- 



Principles of building enclosure:

- Strength and rigidity
 - Control of heat flow
 - Control of air flow
 - Control of water vapour flow
 - Control of liquid water movement
 - Stability and durability of materials
 - Fire protection
 - Aesthetic considerations
 - Cost
- 



Consideration of environmental phenomena having impact on enclosures:

- Structural loads
- Climate and weather
- Seismic forces (shaking of ground)
- Noise and vibration
- Soil type
- Topography
- Organic agents (aerobic life forms such as insects and mould)
- Inorganic agents (natural and artificial substances such as methane)



General functions of the enclosure:

- **Support:** To support, resist and transfer all structural forms of loading imposed by the interior and exterior environments.
- **Control:** To control, air transfer, heat, sound, access and security, privacy and the provision of daylight.
- **Finish:** To finish the enclosure surfaces in terms of visual, aesthetic and durability.
- **Distribute:** To distribute services or utilities such as electricity, water, feed, waste disposal and communications.

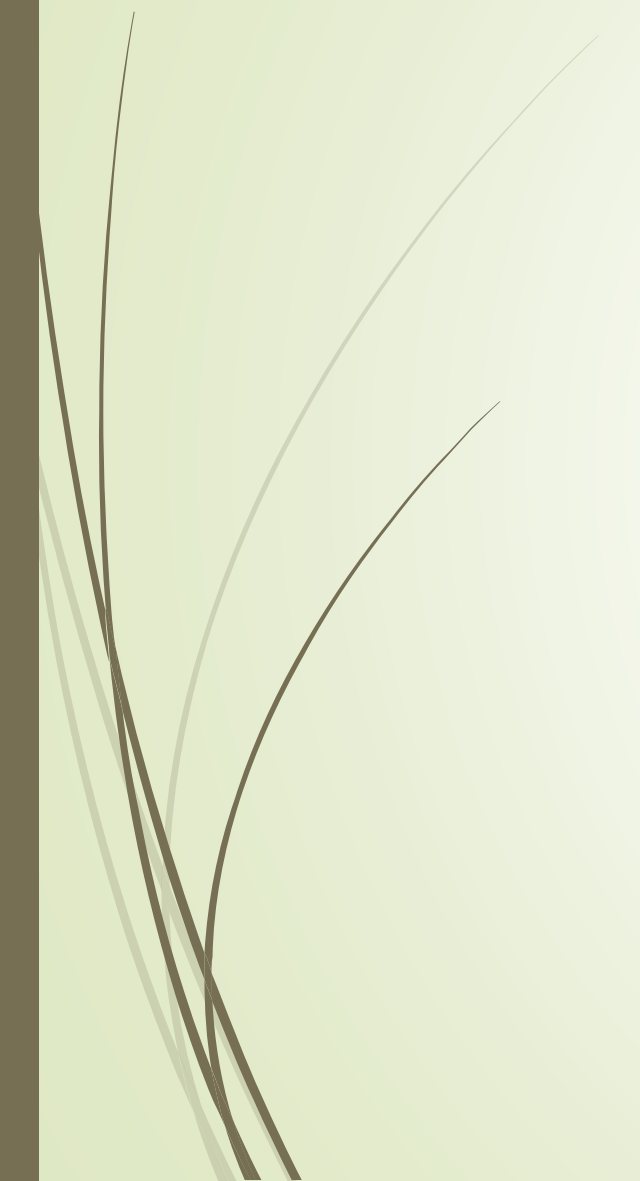


Types of enclosures:

- **Monolithic enclosures:** Involve a single material acting as the structure, the cladding and interior finish.
- **Composite enclosures:** Separate materials or combinations of materials are used for critical control functions. Ex. control of heat transfer or air leakage.



Categories of enclosure types:

- Compact or distributed.
 - High rise or low rise.
 - Transparent or opaque.
 - Massive or lightweight.
 - Temporary or permanent.
 - Single or multiple units.
 - Hybrids: Combinations of the above.
- 



Enclosure design:

- **Climatic conditions:** Cold-dry, hot-humid and arid climatic region.
- **Microclimatic conditions:** Due to site, orientation and height.
- **Purpose to enclose:** Adult animals, young ones, stores.
- **Availability of resources:** Money, labour, material, time.



Principles of enclosure design:

1. Complete load transfer path:

- Including all connections and to the ground for all loads.
- From roofs to foundations.
- From floors to walls to foundation.
- From window or canopy to walls to foundations.

2. Control rain penetration:


- By proper siting, building shape and surface features.
- Deflection, drainage and drying are the proven approaches to rain control.
- Orient and shape of the building to deflect rain.
- Use of surface features, drips and flashing to redirect water off the building and away from critical joints.
- Ensure that the amount of mass (storage and drying capacity) and its absorptance is matched to its exposure and the climate.
- Deflect as much rain from the building as possible with good details.

3. Control of air flow:

- By using an effective air barrier to prevent draft air.
- A strong, durable and continuous air barrier can be placed anywhere within the enclosure.
- Consider inspection, repair and replacement.
- The construction of the air barrier is critical, so all joints and interfaces must be tight.




4. Control of vapour diffusion:

- By providing appropriate layers of vapour resistance throughout the assembly.
 - Reduce the risk of condensation of vapour within walls by making it difficult to enter the enclosures and relatively easy to leave.
 - Vapour barriers should be located close to the warm side of the wall.
- 



5. Control of unwanted solar radiation:

- ▶ Provide exterior shade and solar control glazing to control glare and excessive solar heating.
 - ▶ Interior shading *does not* control solar heat gain well.
 - ▶ West facing side causes the most overheating during summer
- 



6. Make enclosure as part of the building system:


- ▶ Control interior conditions to the levels that the chosen enclosure design can tolerate. Ex. ventilate to control RH.



7. Scope for future expansion:

- ▶ Attempt to design an enclosure that allows for repairs, improvements, changes in use, additions and deletions.



Considerations for enclosure designing:

- Design to create an environment for optimal animal production.
 - Adequate ventilation and suitable interior temperature.
 - Readily accessibility to fresh water and adequate nutritious required feed.
 - Adequate space for freedom of movement.
 - Adequate light for satisfactory inspection.
- 

- 
- 
- Flooring neither harm nor cause undue strain.
 - Avoidance of unnecessary mutilation.
 - Dry and comfortable surface for animals to rest and prevent breeding of internal and external parasites and other pathogens.
 - Emergency provision in case of breakdown of essential mechanical equipments.
 - Rapid diagnosis and treatment of injured and diseased animals.
 - Overall economy.



THANKS

