

# **GENERAL PRINCIPLES FOR CONSTRUCTION OF ENCLOSURES (LPM-605)**



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# 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
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## 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
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# 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.
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## 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
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## **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.
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- 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**

