

WORKSHOP OF CIGR SECTION II



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ANIMAL HOUSING IN HOT CLIMATES: A multidisciplinary view

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3 Glossary, Basic Definitions and Mitigation Actions

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3.1. Basic Definitions

- **Air conditioning:** The process and/or conditioner for modifying air temperature extremes, such as changing humidity, removing dust or odor, etc., to increase comfort and productivity (usually by mechanical means).
- **Air distribution or circulation:** Pattern of air movement in a livestock building.
- **Air duct:** Pipe, tube or passageway for conveying air.
- **Air inlet:** Opening designed to supply fresh air to a facility, e.g., hole, slot, lower door, etc.
- **Air outlet:** Opening through which exhaust air leaves a facility, e.g., hole, door, window, open ridge, louver or exhaust fan.
- **Cold barn:** Naturally ventilated barn, usually constructed with no or minimum insulation. No supplemental heat is provided and inside temperature varies with outside temperature.
- **Condensation:** Water vapor removed from the air and formed, in a liquid state, on a surface, in a building usually caused by poor insulation and/or high humidity.
- **Conduction:** Heat transfer through or between bodies in physical contact; involves no fluid motion.
- **Controlled or warm environment:** Insulated livestock housing where temperature, humidity, lighting, air movement, radiation, etc., are controlled by appropriate construction and environmental modifications.
- **Convection:** Heat transfer by fluid motion.
- **Dewpoint temperature:** Temperature at which air is totally saturated with moisture.
- **Distribution duct:** Inflatable tube or rigid duct through which ventilation air is distributed in the building.
- **Draft:** Natural air movement with sufficient velocity, humidity, and/or cold temperature to cause discomfort.
- **Earth tempering:** Heating and/or cooling of air by moving it through a buried conductor, using the thermal mass of the earth to moderate air temperatures.
- **Enthalpy:** The heat energy content of an air-water vapor mixture. Includes both sensible heat (indicated by dry-bulb temperature) and latent heat of vaporization (energy content of the water vapor).

- **Evaporation:** Latent mode of heat transfer in which heat is absorbed during water's change in state from liquid to vapor.
- **Evaporative cooling:** The reduction of dry-bulb air temperature by the evaporation of moisture into the air. The heat required for the evaporation is supplied by the sensible heat loss of the air.
- **Fogger:** System for dispersing water in fine droplets to provide evaporation for air cooling.
- **Heat balance:** Condition in a structure or an animal's body in which incoming heat plus that produced inside is exactly offset by that leaving the body or structure.
- **Heat exchanger:** Device that transfers heat between flowing fluids without direct fluid contact; usually metal or plastic tubes with one fluid inside and the other outside.
- **Heat loss:** Common term that refers to gross loss of heat from livestock or a building through surfaces and openings.
- **Heat production:** Heat released during metabolism.
- **Latent heat:** Energy absorbed or released by a material when it changes phases (e.g., from solid to liquid); no temperature change is involved.
- **Lower critical temperature:** Effective environment temperature below which the livestock must increase heat-production rate to achieve heat balance.
- **Mechanical ventilation:** Air movement through a building caused by electrically or hydraulically powered fans.
- **Moisture balance:** Condition whereby water vapor brought into a building, plus that released inside, is exactly equal to that leaving.
- **Natural convection:** Heat transfer caused by the density difference between hot and cold fluids.
- **Natural ventilation:** Air exchange in structures caused by wind, temperature, and air density induced forces.
- **Negative-pressure (or exhaust) ventilation:** System in which air is forcibly vented from the building and in which make-up air from outside is drawn by negative pressure into the building to replace that vented.
- **Positive-pressure ventilation:** System in which outside air is forced into the building, which in turn forces out inside air by positive pressure (synonym: pressure ventilation).
- **Radiant heating:** Heating primarily by thermal radiation.
- **Ridge vent:** Opening along a roof peak for natural ventilation air outlet or an inlet for mechanical ventilation.
- **Sensible heat:** Energy applied to raise or lower the temperature of a material.

- **Shade:** Building or other object used to shield livestock from direct solar radiation; generally lightweight structure with solid or perforated roof and open walls to permit maximum air movement while blocking direct sunlight.
- **Spray evaporative cooling:** Scattering water in drops (and/or intervals). When water particles are very fine it becomes "fogging" or "misting". The difference is in droplet size: a mist droplet is larger than a fog droplet and will drop slowly to the floor evaporating as it falls (so the animal surface can be wetted, but very little, and the floor can keep quite dry); a fog particle stays suspended in the air and evaporates before it touches the surface. Sprinkling means to use large droplets to wet the hair coat and skin of the animals (the floor is also wetted).
- **Thermal environment:** Those environmental components that affect the heat content of an animal's body.
- **Thermal neutral zone:** Environmental temperature at which an animal's body is at equilibrium; i.e., neither tends to gain or lose heat.
- **Upper critical temperature:** Environmental temperature above which the livestock must increase heat loss rate to achieve heat balance.
- **Ventilation:** Exchange of air in a confined space.
- **Warm barn:** A well-insulated livestock housing unit; supplemental heat may be added and indoor temperature is kept above freezing.
- **Zone cooling:** Localized cooling within a larger room by ducts transporting cool air.
- **Zone heating:** Localized heating of a small area within a larger room.
- **Zone ventilation:** Controlled ventilation of a particular part of a space; for example, zone cooling around a sow or snout cooling of a sow.

References

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Standards: ASAE S501 Jan01. Uniform Terminology for Livestock Production Facilities, www.asabe.org.