Factors to consider when erecting Poultry Houses

- Easy accessibility for vehicles, chick truck, litter truck and feed truck.

- Proper drainage of excess water away from houses i.e. rain, cleaning of houses - not run into other houses or natural water systems.

- Security- Close to managers' accommodation, fencing etc.

- Prevailing wind direction is particularly important when erecting naturally ventilated houses.

- Houses should not be less than 15 metres apart, particularly for natural ventilated houses to ensure unrestricted air movement. This hold true for trees and other obstructions in close proximity. It is best to stagger naturally ventilated houses if multiple houses are erected on the same site.

- Climate - very cold - good insulation required
  - very hot - high ceiling houses

- Type of Poultry Farming

- Capital available

- Long axis of building must be in east-west direction to utilise solar radiation as heat source but deviations of 30° can be allowed to utilise prevailing wind conditions.

Naturally ventilated houses (Convection houses)

Various materials may be used in constructing these houses and vary from brick or corrugated iron to wood etc. Most of these houses are built with a cement floor and the construction must allow for easy cleaning of houses.

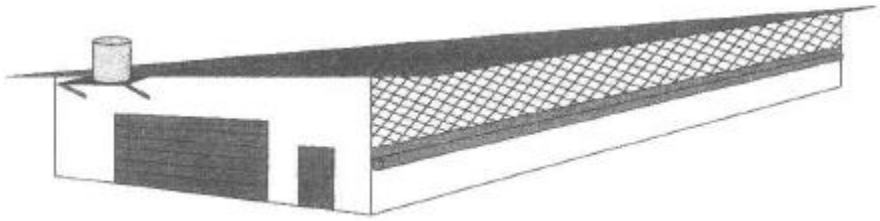
Houses are generally 2 - 3 metres high with flat or pitched roof. Roofs must preferably be insulated to prevent loss of heat in the winter and reduce heat radiation in the summer. Roof overhangs or gutters are important to prevent water being blown onto chickens. The width of houses should not exceed 12 metres. Houses with width exceeding 9 metres are less effectively ventilated without being mechanically assisted by fans. Length is not very important and can exceed 100 metres.

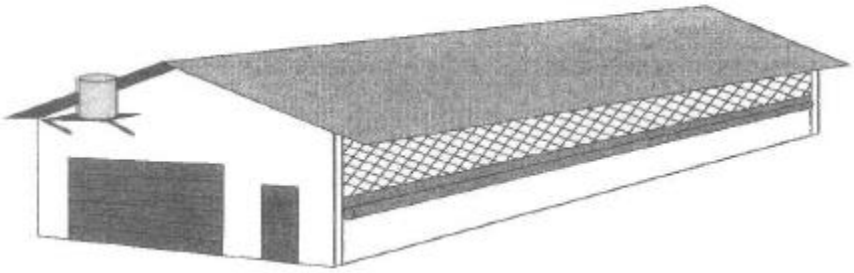
End walls are solid with entrance door and control room in one end. Both side walls are made of solid material up to a height of 0.5 metre and then bird proof chicken mesh to roof height.

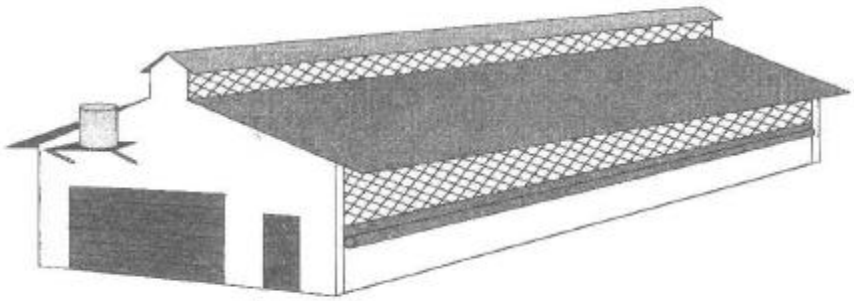
Curtains that can be moved up and down by hand or with manual or automatic wrenches are used to control the opening of the sidewalls to allow for ventilation as required.

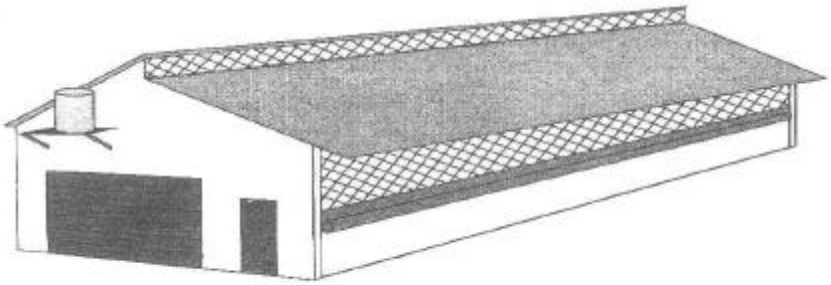
Variations exist which include open roof ridge and solid upper side walls with ventilation flaps. (See following page)

Naturally ventilated houses(Convection houses)









Polythene or paper sheeting :

Used during first few days of chicks life. Feed is placed on the sheeting and ideally must cover 20%-30% of the brooding area to ensure feed is easily available and give chicks a good start.

Feed trays

Used in first few days as for paper sheeting. One tray per 100 chicks additional.

Chain Feeders

Allow 5cm per bird trough feeding space. Not commonly used in broilers.

Tube Feeders

They are manually filled with feed and suspended from roof. Allow 1 tube feeder per 50 birds.

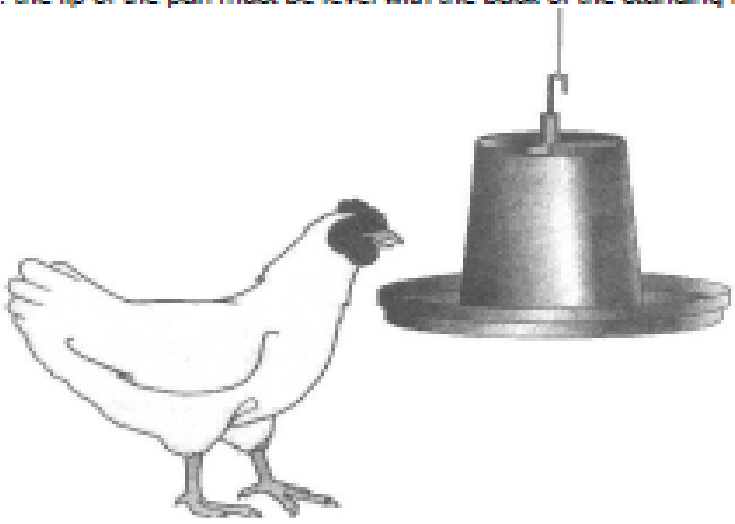
Pan feeders

They are automatically filled and the feed level in the pan is adjustable according to the age of the bird. Allow 1 pan per 50 birds.

The height of feeders are of critical importance.

- too low - feed wastage
- too high - birds cannot feed
- The ideal : the lip of the pan must be level with the back of the standing bird.

Tube feeder



Birds should not have to move more than 3 metres to any drinking or feeding point.

Water is mostly supplied under gravitation from header tank which is situated above the poultry house. Water is often used to supply medication to poultry and it is therefore recommended to have separate header tanks for each house. Water consumption measurement is not generally done in SA, but is a useful indicator of optimum health.

a Chick Waterers (Fonts)

Used in first 3 - 7 days as supplementary drinkers. Allow one per 100 chicks additional to normal permanent drinkers. Must be daily cleaned and filled with fresh water.

b Bell Drinkers

Allow 1 drinker per 100 birds. Bell drinkers are suspended from the roof and automatically filled through gravitation from an overhead header tank. Water level can be adjusted and drinker height is adjusted with age (level with birds' backs). This system is used in broilers and when rearing pullets and breeder birds on the floor. These drinkers need to be cleaned as often as possible.

c Nipple drinkers

This is the preferred drinking system today for all types of birds. It is more expensive to install but return on capital investment is through:

- Cleaner water & improved bird health
- Less labour needed to clean system
- Improve litter condition if managed well

Allow 1 nipple per 12 - 15 birds. Height and pressure of nipples must be constantly adjusted to allow birds to drink at 60° angle.

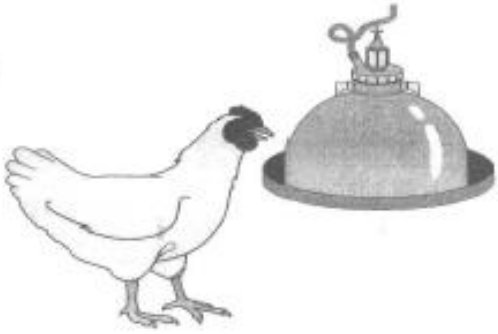
d Cup Drinkers

e Combination of Nipple and Cup

f Trough - unhygienic

Chick fonts

Bell drinker



Nipple and cup drinker

Nipple drinker

STANDARDS OF BROODING TEMPERATURE

The standard temperature at day 1 for all types of chicks is 31 - 32°C. This temperature is maintained for a day or two and then gradually reduced by 2°C per week to reach 21 -24°C by 3 - 4 weeks. Maintain this temperature for the rest of the broiler growing period. In case of breeders and layers the temperature must be reduced to 18°C - 21°C and maintained throughout.

These temperatures are only guidelines. The best indication of chick comfort is chick behaviour. Observe chicks frequently during the first two weeks.

For example :

Comfortable	-	Chicks are evenly spread
Cold	-	Chicks huddle together
Too hot	-	Chicks move to edges of brooding area and pant

THE EFFECT OF ENVIRONMENT TEMPERATURE ON BIRDS BEHAVIOUR AND PERFORMANCE

High environmental temperature

1 Reduced feed intake. Broilers reduce feed intake by 1% for every 1°C increase above required temperature up to 30°C. Above 30°C the % reduction will be higher.

- Slower growth
- Reduced egg production, reduced egg size and shell strength
- Reduced fertility and hatchability

2 Water consumption is nearly two times more at 31°C than at 21°C

- More water excreted in faeces which leads to wet litter

3 Retardation of feathering. In broilers this lead to dermatitis, scratching and high condemnation rate at processing plant.

4 Reduced activity

5 Birds open wings to allow more radiation and convection heat loss

6 Panting at higher temperatures which results in : Increased loss of CO_2 and bicarbonate from blood which lead to respiratory alkalosis.

7 Increased water loss through kidneys leads to excessive potassium loss

8 Heat stress and mortality.

Low Environmental temperature

1 Increased energy is required to maintain body heat. Less energy is available for growth and production.

2 Increased feed intake to compensate for increased energy demand

3 Poor feed conversion

4 Chilling

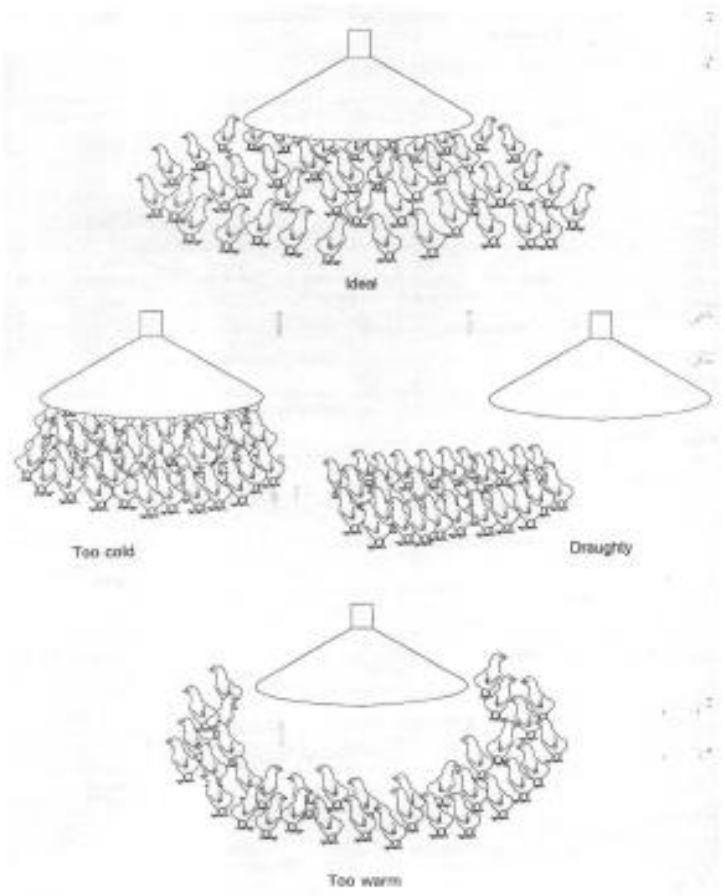
Relative humidity and air movement must be considered in combination with temperature.

Air Movement (Wind chill factor)

In humans :	Wind speed	Effective Temperature
Stand in 1,7°C Environment	Zero Air movement	1,7°C
	16 km/h wind	-6,1°C
	56 km/h wind	-16°C

In Chickens :

30 metre/minute airspeed - 1,7°C cooling effect
152 metre/minute airspeed - 5,6°C cooling effect



Heat stress

Symptoms:

- Reduced activity, sitting down
- Dropped wings
- Panting
- Mortality
  - Congestion and oedema of lungs
  - Congested and cyanotic carcass
- Most mortalities occur during early evenings. This is due to reduced air temperatures and increased humidity. When the saturation point (dew point) is reached, free water in air condensates and aggravates heat stress condition.

Methods to reduce heat stress

- Increase air speed
- House cooling systems – evaporative cooling pads/fogging systems. NB switch of when humidity goes above 70%
- Feed restriction for 4-8 hours. Start 2 hours before anticipated stress period.
- Reduce stocking density during warm months
- Increase water and feeder space
- Walk the birds slowly. Although controversial it helps to release heat trapped under birds and it induce birds to consume more water.
- Cool water down
- Males are more susceptible
- Add electrolytes and water-soluble vitamins to water. Various products are available.
- Spray water on corrugated iron roofs

Bedding material is used to :

- Keep birds warm
- Provide soft surface to walk on
- Absorb moisture

Bedding must be at least 5 cm deep.

Requirements for bedding material:

- Soft without splinters that can damage the feet of the birds
- Not too fine and dusty
- Have good absorption ability – wet litter leads to high ammonia levels and pododermatitis
- Free of toxic chemicals - use untreated shavings
- Free of moulds - Aspergillosis - purchase clean and dry material and store under protection.

Types of bedding materials used :

- Pine wood shavings - best
- Sunflower husks – also good
- Chopped straw - slippery
- Shredded paper - use only in an emergency and then mix with wood shavings.

Whatever ventilation system is used in a poultry house, it must be able to cope with the two main aims of ventilation:

MINIMUM VENTILATION (Air Quality)

This is the minimum ventilation required to maintain the birds' full production potential by ensuring an adequate supply of O_2 while removing waste products like CO_2, ammonia, excess water, dust etc. Minimum ventilation requirements should be totally independent of temperature control.

It should be understood from above statement that the ventilation system must be set up in such a way that minimum ventilation can be achieved without chilling the birds. If the amount of ventilation required to maintain air quality causes the house temperature to drop below the required temperature, then extra heating will be required to maintain house temperature. Avoid drafts on small chicks.

Effects of Ammonia on People and chickens (Jordan p. 513)

Ammonia (ppm)	People	Chickens			
		Fall in egg production	Weight loss	Respiratory lesions	Ocular lesions
20	Smell perceptible			Slight	
25 - 30			Slight	Slight	
50 - 60	Increasing smell		+	+	+
100	Eye and	+	++	+	+
200	Nose irritation	++	+++	++	++

Ammonia blindness - keratitis, corneal oedema and ulceration as a result of prolonged exposure to above 100 ppm ammonia.

Minimum Ventilation

Best done with cross ventilation (CV) under negative pressure with inlet openings directed parallel to ceiling. Negative pressure must be enough to ensure sufficient air speed to allow air movement parallel with ceiling to mix with hot air before going down to the chicks. Total volume of house need to be exchanged every 5 - 8 minutes, or an air volume replacement of 1,5m^3/hour/kg body mass. Air speed of 4 - 5 m/sec is required to prevent cold air from dropping directly down onto birds.

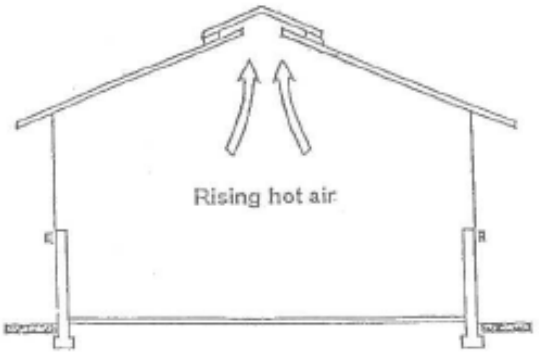
SUMMER VENTILATION (Cooling)

This is the ventilation required to remove excess heat produced in the house, on top of what has been removed by minimum ventilation, to keep the house temperature at the required optimum temperature for the type and age of bird. This is achieved by cooling the air (evaporative cooling) or air movement, which alters the birds' perception of air temperature.

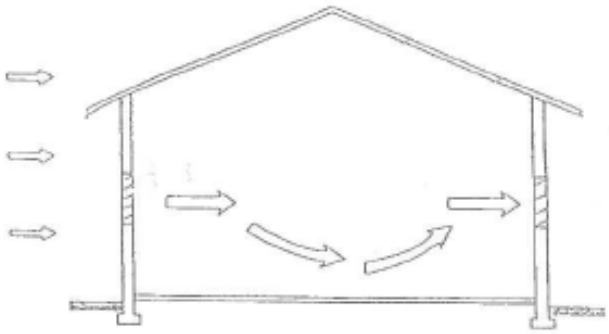
The required ventilation is achieved by the following methods of ventilation:

a Naturally ventilated houses

Air movement is created by positive wind pressure and the thermal stack effect created by rising hot air.



Thermal stack effect



Possitive wind pressure

Summer Ventilation

Best done with evaporative cooling (pads or fogging system) in longitudinally ventilated houses under negative pressure (tunnel ventilation). There must be sufficient air speed to allow the exchange of total house volume in 1 - 3 minutes, or air volume replacement of 7 - 11 m^3 /hour/kg body mass.

Various light programmes are followed:

a Continuous Light

Most broilers are grown on a continuous lighting programme. One hour of darkness each day is often provided to ensure birds will not panic if power failures occur. Sometimes the photoperiod is reduced, especially in the 2nd and 3rd weeks of life with the objective of slowing growth and reducing the incidence of ascites and acute heart failure later in the cycle.

b Intermittent Light

It is claimed that an intermittent programme may reduce bird activity and aid digestion with improvement in feed efficiency and growth rate and marginal saving in electricity cost. With this type of programme it is vital to increase feeder and drinking space, as pressure on both will be much greater.

Examples of broiler lighting programmes :

1	0 - 10 days	continuous light (With one hour of darkness)
	10 - 20 days	14 hours light 10 hours darkness
	20 - 42 days	continuous light

2	0 - 21 days	continuous light (With one hour of darkness)
	22 - 35 days	3 hours on and 1 hour off
	36 - 42 days	2 hours on and 2 hours off

Various other combinations are also followed:

Light intensity for broilers

0 - 7 days - 15 - 25 lux - as bright as possible to help chicks find feed and water

8 - 21 days - gradually reduce to 2,5 lux

after 21 days - 2,5 lux, measured at floor level

Low light intensity reduce bird activity, cannibalism, feather pecking, scratching and improves feed efficiency and down-grading at the processing plant.

Lighting must be evenly distributed through house. Avoid dark patches.

Intermittent programmes are not possible during the day time in open-sided houses and light intensity is mostly more than required.

b Mortality

1st 7 days - 1.5%
42 days - 6%
(1% per week is a good rule of thumb)

c Water

Consumption
- 1,8 - 2 times feed consumption at 21°C

Space
- 1 x 400 mm Bell drinker per 100 birds
- One nipple drinker per 10 - 15 birds

d Feed

Feed Conversion (FCR)	-	1.8
Feed consumption to 42 days	-	3.4 kg
Broiler Starter Feed (0-21 days)	-	900 g, Prot 22%, Energy 3080 ME Kcal/kg
Broiler Grower Feed (21-35 days)	-	1,4 kg, Prot 20%, Energy 3190 ME Kcal/kg
Broiler Finisher Feed (35-42 days)	-	1,6kg, Prot 18%, Energy 3300 ME Kcal/kg
Space	-	1 Pan per 50 birds

e Target Weight

Chick weight	-	40 g
7 days	-	140 g
21 days	-	700 g
42 days	-	2,0 kg
Average daily gain to 42 days	-	47 g

f House Environment

Brooding temperature	-	32°C
10 days	-	27°C
20 days	-	24°C
30 days	-	21°C
42 days	-	21°C
Relative humidity	-	50 - 70%

Ventilation

Minimum - Total House volume replacement in 8 minutes or air replacement of 1,5 m^3 /hour/kg body weight

Summer - Total House volume replacement in 1 - 3 minutes or air replacement of 7-11 m^3/hour/kg

Ammonia - Less than 25 ppm

g Stocking density

Controlled environment: up to 21 birds/m^2
Naturally ventilated : up to 18 birds/m^2 (12 - 14)
Maximum 34 Kg/m^2

h Litter depth - 5 - 7 cm

FLY CONTROL

1 Life cycle

- Lives 3 - 6 weeks
- 600 eggs per fly
- Rotten materials, warm places
- Larvae hatch after a few hours
- Hide in manure - away from the light
- Pupate after 4 - 6 days
- Adult fly after 3 - 26 days (warmer conditions)
- Lay eggs after 3 days

2 Optimum conditions

- Warm, protected environment
- Plant- or animal material in state of decomposition
- Moisture

3 Control

CHICK QUALITY AND BROILER GROWING

The success of broiler growing depends largely on :

1 Day-old chick quality
2 First 7 day growing period

This does not mean that the period after 7 days is not important. A successful starting period can quickly be destroyed by poor management and disease during the later growing period.

DAY OLD CHICK QUALITY

a) Day old chick quality requirements

- Average weight 38g
- Uniformity 80%
- Well hydrated - legs are yellow and fully fleshed
- Well-healed navel
- Bright, alert, active
- No defects e.g. crooked beaks or missing eye
- Normal reaction to day-old vaccine
- Free of pathogens – Salmonella's, Mycoplasmas, AE, CAV, Aspergillosis
- Desired uniform antibody levels

Poor chick quality results in

- High mortality (first 7 days)
- High condemnation rate at processing plant
- Poor growth
- Increased cost per kg meat produced

b) Factors affecting chick quality

Breeder Flock - Age

- Young flocks - small eggs, small chicks, hatch early if mixed with large eggs resulting in dehydration during prolonged hatch
- Old flocks - big eggs, big strong chicks, thin shell eggs - bacterial infections

Disease

- *Salmonella, Mycoplasma*, AE, CAV, Aspergillosis

Breeder Nutrition

- Ca:P ratio - shell quality
- Vit E - encephalomalacia
- Others

Maternal Antibody

- Low ND maternal antibody - more severe vaccine reaction
- Low IBD maternal antibody - risk of early IBD infection
- Others

Egg handling

- On breeder farm
- Transport to Hatchery

Hatchery Environment/ Management

- Storing at Hatchery - temperature, time, humidity
- Pre-incubation - time, temperature
- Setters and Hatchers - temperature, humidity, ventilation
- Transfer from setters to hatchers
- Bacterial and fungal contamination - formaldehyde fumigation

Chick Processing

- Culling of reject chicks
- Handling stress - vaccinations

Chick delivery

- Overheating, chilling, oxygen starvation

Chick starting environment/management

- Temperature, humidity, ventilation
- Feed and water availability
- Lights

FIRST 7 DAYS BROODING PERIOD

a) House preparation

- Clean and disinfect houses
- Cover floor with clean, dry litter (minimum of 5 cm deep) and level it
- Place house equipment in position
- Formaldehyde fumigation is still practised widely
- Place sheets of paper/plastic in the brooding area and cover with feed
- Place extra feed trays filled with feed
- Place one chick font per 50 - 100 chicks in addition to normal house drinkers. Fill chick fonts with water and place on a flat plastic/cardboard sheet to stabilize them in the litter and keep fonts clean.

Commence heating 24 hours before the chicks arrive to ensure that the cement floor, litter and house structure is sufficiently warm. Brooding starts at 31°C and are gradually reduced to 21°C by 21 days.

Light intensity of 25 lux must be provided in the brooding area to ensure that the food and water is clearly visible. Some people believe that water alone should be provided at placement and feed only 2 hours later. For practical reasons both are supplied at same time by most producers.

It is general practice to partition the house off so that brooding can take place in one half of the house (half house brooding). This method is acceptable if enough extra drinker and feeder space are provided. A major advantage is the reduction in heating costs.

b) Chick arrival

- Chicks must be off-loaded as soon as possible especially during warm periods.
- Chick baskets must be turned over near food and water. On arrival all dead chicks must be recorded.
- If house conditions are optimum, chicks will immediately start looking for food and water and spread out evenly within 2 hours.

c) Critical procedures after chick arrival

- Make sure the water and feeder height is accessible to all chicks. Often problems are experienced with uneven flocks and poorly levelled litter.

- Minimum ventilation must be provided without drafts

- Crops must be filled with feed within 2 - 4 hours

- Observe the behaviour of chicks :

    - Noisy (chirping) - something is wrong
    - Huddle together - cold, drafts
    - Sitting at edges of brooding area - too hot
    - Panting - too hot
    - Vent pasting - common sign of too high house temperatures.

Remove supplementary feeding and drinking equipment after 3 - 7 days and extend brooding area to provide more floor space.

The main objective of the first 7 days grow-out is to achieve a mortality of 1%-1.5% or lower and an average weight of 140g.

RECORDS FOR BROILERS

- Number of day old chicks received
- Mortalities (daily)
- Weights of day old chicks, during grow-out and final live weight at processing plant
- Total feed consumption

- FCR - $\frac{\text{Total kg feed consumed}}{\text{Total live weight at plant}}$

- PEF - (Performance Efficiency Factor) $\frac{\text{\% Survivors x live weight x 100}}{\text{Age x FCR}}$

- Condemnation and downgrading at processing plant
- House temperature
- Outside temperature
- Ventilation rate
- Vaccinations