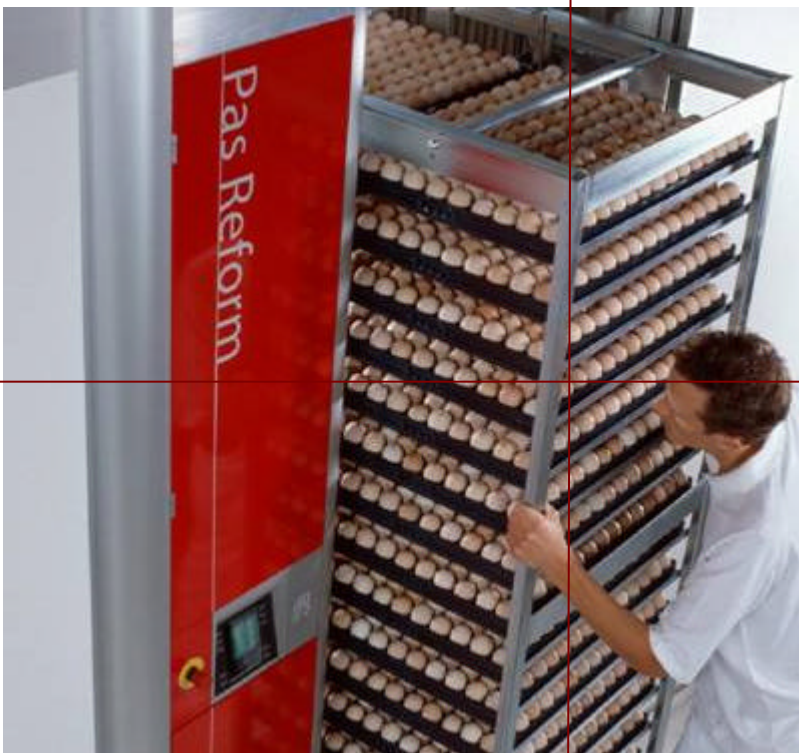


# Incubation Guide

## Broiler



Practical guidelines for the  
incubation of broiler eggs



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# Introduction



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- 1.1 About this manual
- 1.2 Outline of the Incubation Guide
- 1.3 HACCP

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## 1.1 About this manual

*Incubation Guide* is a manual for use in daily hatchery practice.

*Incubation Guide* contains the practical procedures needed for the successful incubation of broiler eggs, from the arrival and quality control of the hatching eggs up to placement of the day-old chicks.

In addition to these procedures, a number of general recommendations for hatchery management are provided. Also included are *Recording forms* which support the use of the procedures.

The procedures contain references to the recording forms, which are numbered to correspond with the chapters in the instructions.

If you still have questions after reading this guide, we would encourage you to contact us. We appreciate all advice, feedback and suggestions from our customers. Please contact Pas Reform at:

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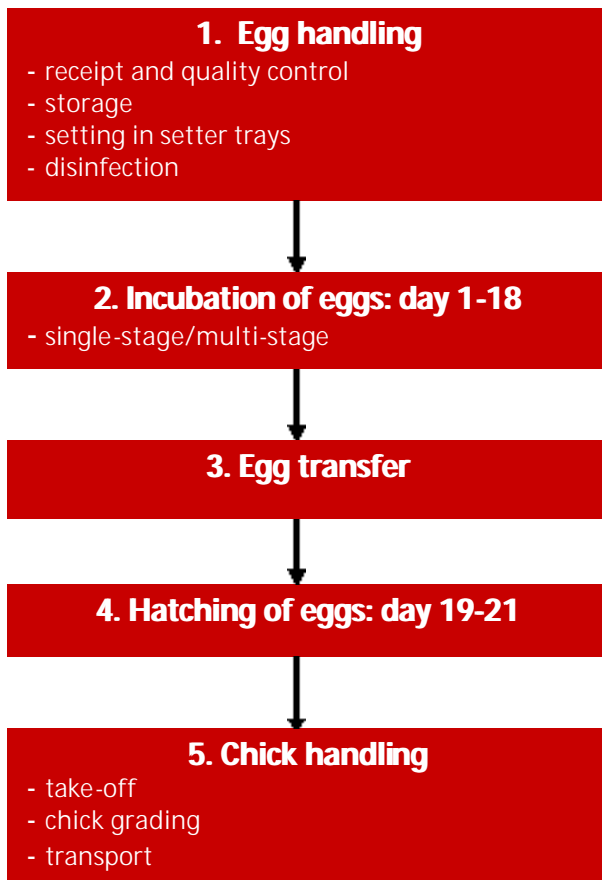
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**Five basic steps in hatchery routing**

## 1.2 Outline of the Incubation Guide

### Routing

The routing 'from egg to chick' is essential in hatchery management. Basically, hatchery routing can be divided into five steps: egg handling, incubation, transfer, hatching and chick handling (see figure). These five steps constitute the framework of this Incubation Guide: each chapter describes one of the steps in hatchery routing. The chapters all begin with a short introduction which generally describes the procedures to be executed in that routing step. The procedures are all structured as follows:

- Objective: the aim of the procedure
- Persons responsible: personnel that usually carry out the tasks described
- Documents: documents related to the procedure, such as other procedures and recording forms
- Definitions: descriptions for a number of specific terms used in the procedure
- Recommended procedure: a step-by-step guideline on how to carry out the tasks
- Additional notes: supplementary advice, precautions etc.

The final chapter summarises general advice to optimise results and ensure durable operation of your hatchery. These recommendations should be interpreted as general guidelines only.



### Golden rules for a hatchery

The structure of recording form 1A 'Golden rules for a hatchery' corresponds with the steps in hatchery routing. 'Golden rules for a hatchery' forms the basis of good hatchery management. Summarising some crucial key aspects that arise in hatchery practice, this list provides a useful tool for hatchery managers in daily hatchery routine.

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## 1.3 HACCP

This *Incubation Guide* provides the hatchery manager with guidelines to operate the hatchery at HACCP (Hazard Analysis and Critical Control Point System) standards. HACCP is a systematic approach to the identification, evaluation and control of hazards in food production. The key element of the HACCP system is its preventive nature meaning that potential food safety hazards are controlled throughout the process. The advantage of using the HACCP system lies in the control it provides at all times over food safety in the processing plant, from receiving raw materials to shipping final product.

The hatchery, as a segment of the food production chain, aims to produce a safe product: vital chicks that are free of pathogens. The hatchery processes will be structured around critical control points (CCPs). CCPs are designed to control potential hazards that are biological, chemical or physical in nature and that may pose a risk to food safety.

### Seven principles of HACCP

The HACCP approach is based on seven principles aimed at identifying hazards in food production, controlling hazards at critical control points in the process and verifying that the system is working properly. The seven basic principles of HACCP are:



1. Identify the hazards and list preventive measures to control them.
2. Determine the critical control points.
3. Establish limits at each critical control point.
4. Establish procedures to monitor the critical control points.
5. Establish corrective actions to be taken in case of a deviation.
6. Establish procedures to verify that the systems are working correctly.
7. Establish effective record-keeping.

This *Incubation Guide* supports the operation of a hatchery at HACCP standards. The use of recording forms is especially useful in the implementation of step 7.

# Egg handling

## 2



- 2.1 Introduction
- 2.2 Egg receipt
- 2.3 Storage of hatching eggs
- 2.4 Setting eggs in setter trays and trolleys
- 2.5 Disinfecting hatching eggs

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## 2.1 Introduction

Egg handling involves receipt, quality control and also usually the storage of hatching eggs. Prior to incubation, eggs are set on setter trays and disinfected.

### Procedure 2.2: Egg receipt

At the breeder farm, eggs can be stored in boxes, egg containers or on setter trays placed in farm trolleys. During transportation from farm to hatchery temperature shocks should be avoided since these affect potential hatchability. Truck climate and hygiene have to be monitored to prevent a deterioration of hatching egg quality before arrival at the hatchery. Egg receipt comprises a general inspection on the quantity and quality of eggs supplied by the breeder farm. Quality control involves the removal of eggs unsuitable for hatching and usually takes place during or after placing the eggs on setter trays. This procedure provides a guide for this inspection.

### Procedure 2.3: Storage of hatching eggs

At the hatchery, eggs are set in setter trays before or after storage. Usually, storage of the eggs prior to incubation is unavoidable. The storage time and, above all, the temperature and relative humidity at which the eggs are stored are very important for the hatching result. The eggs should therefore be stored in special areas (egg storage rooms) where the required temperature and relative humidity can be achieved and maintained. In this procedure, optimum climate conditions for storage are outlined.

**Procedure 2.4: Setting eggs in setter trays and trolleys**  
Batches of eggs leave the storage room only when they have to be prepared for incubation. According to the setting schedule which is composed by the hatchery manager, the eggs are moved from the storage room to the egg traying room. This procedure describes the steps involved in preparing the hatching eggs for incubation.

### Procedure 2.5: Disinfecting hatching eggs

Micro-organisms on the surface of eggshells can have detrimental effects on hatchability and chick quality. Therefore, it is essential that the eggs are disinfected just prior to incubation. At this moment, the fumigation method is the most effective method for sanitising the eggs. This procedure outlines how to fumigate hatching eggs in a separate fumigation room.



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## 2.2 Egg receipt

### Objective:

To verify the numbers and inspect the quality of hatching eggs supplied by the farmer.

### Persons responsible:

Chief and personnel assigned to receive, handle and store eggs.

### Documents:

Recording form 2A: 'Egg receipt form'

Recording form 2B: 'Egg container card'

Recording form 2C: 'Egg quality upon receipt'

Recording form 2D: 'Egg stock list'

Recording form 2E: 'Setter schedule'

### Definitions:

*Egg container*: trolley for transporting stacked pulp or plastic trays with eggs.

*Setter tray*: 150-egg capacity carrier designed to be placed in an incubator.

*Egg ID code*: each batch of eggs should be given a label with a batch-specific identification (ID) code, e.g. a combination of a farm number and egg production date.

*Floor eggs*: eggs laid outside the nest. Floor eggs are heavily contaminated with micro-organisms and should never reach the hatchery at all. But if floor eggs are sent to the hatchery they should be treated and incubated separately.

*Hair-line and cracked eggs*: eggs with fine (hair-line) cracks or large cracks.

*Misshapen eggs*: eggs with shells that have ridges, spiral grooves or a sandpaper-like surface.

*Other poor quality eggs*: eggs with a thin shell and eggs which are not within the normal size range (i.e. eggs that are too small or too big).

### Recommended procedure:

1. On arrival at the hatchery, the eggs are placed in the receipt room. Each batch of eggs is accompanied by recording form 2A: 'Egg receipt form' which contains technical data about the parent flock and the quantity and quality of the delivered eggs. This form is supplied by the farmer. The driver of the delivery truck completes the data on transport conditions.
2. When the eggs are received check the egg ID code and number of eggs and verify with order specifications. Report deviations to the farmer.
3. Remove all eggs not suitable for hatching before placing them in setter trays. Eggs not suitable for hatching include floor eggs and poor quality eggs (hair-line and cracked eggs, misshapen eggs and eggs with poor shell quality).
4. Supply each container with recording form 2B: 'Egg container card' on which production date, egg numbers and supplier data are listed.
5. Record a summary of the quality of each batch of eggs on recording form 2C: 'Egg quality upon receipt'.
6. Record the number of eggs from each batch that is received on recording form 2D: 'Egg stock list'. This list provides the hatchery manager with actual data on the numbers and background of eggs in stock. The hatchery manager uses this data to plan the setting of eggs which is noted on recording form 2E: 'Setter schedule'.



## 2.3 Storage of hatching eggs

### Objective:

To provide optimum conditions for eggs during storage so that losses in potential hatchability and chick quality are minimised.

### Persons responsible:

Chief and personnel assigned to receive, handle and store eggs.

### Documents:

Recording form 2D: 'Egg stock list'

Recording form 2E: 'Setter schedule'

Recording form 2F: 'Egg storage room: climate conditions'

### Definitions:

**Egg container:** trolley for transporting stacked pulp or plastic trays with eggs.

**Egg ID code:** each batch of eggs should be given a label with a batch-specific identification (ID) code, e.g. a combination of a farm number and egg production date.

**Egg storage room:** area in hatchery located near the egg receiving room. The egg storage room has equipment for conditioning the climate for the optimal storage of hatching eggs.

**'Sweating':** the condensation of water droplets on the cold egg surface when eggs are brought into a warm, humid room. Water droplets on the shell surface promote the growth of micro-organisms.

### Recommended procedure:

1. After registration on recording form 2D: 'Egg stock list' move the egg containers to the storage room and arrange them according to the egg ID code.
2. Record the expected setting date of each batch of eggs on recording form 2E: 'Setter schedule'.
3. The optimum climate settings in the storage room depend on the number of days the eggs are to be stored (see table below). Monitor the climate conditions daily and record them on recording form 2F: 'Egg storage room: climate conditions'.

### Additional notes:

- When there is only one storage room, the recommended temperature and relative humidity for the egg storage room are 15-17°C and 75-80% respectively.
- Storage times longer than 1 week are not recommended: after 3 days from production date, every day of storage decreases hatchability by approximately 0.7-1.0%. To reduce these negative effects, stored eggs need about one extra hour of incubation time for every storage day in excess of 3 days.
- If hatchery planning is such that eggs need to be stored for more than 10 days, it is advisable to store the eggs small end up and turn them every 24 hours. Eggs stored for this longer period should be pre-heated for 18 hours at 23°C and 50% relative humidity before being set.
- Eggs 'sweating' must be prevented at all times. When the environmental temperature of stored eggs suddenly increases, water may condense on the eggshell: we say the eggs are 'sweating'. This should be avoided at all times since sweating eggs provide an ideal environment for the growth of micro-organisms that may penetrate the eggshell.



Recommended climate conditions during egg storage			
Storage duration	Temperature (°C)	Relative humidity (%)	Egg orientation
0 - 3 days	18-21	75	Blunt end up
4 - 7 days	15-17	75	Blunt end up
8 - 10 days	10-12	80-88	Blunt end up
More than 10 days	10-12	80-88	Small end up: turning of the eggs every 24 hours is recommended

## 2.4 Setting eggs in setter trays and trolleys

### Objective:

To set eggs in setter trays and prepare eggs for incubation.

### Persons responsible:

Chief and personnel assigned to set and incubate eggs.

### Documents:

Procedure 2.2: 'Egg receipt'

Recording form 2D: 'Egg stock list'

Recording form 2E: 'Setter schedule'

### Definitions:

*Egg lifter*: manual or automatic equipment for transferring eggs from pulp or plastic trays to setter trays.

*Egg traying room*: area for traying eggs. The egg traying room might be the same area as the egg receiving room.

*Fumigation room*: a room specially designed for disinfecting eggs. Ideally, the room should be located between the egg traying room and the incubator room. This room functions as a sluice valve. No one should pass through! The fumigation room is separate from the setters.

*Pulp tray*: 30-egg capacity paper tray. Pulp trays with eggs can be stacked. Egg trays may also be made of plastic.

*Setter tray*: 150-egg capacity carrier designed to be placed in an incubator.

*'Sweating'*: the condensation of water droplets on the cold egg surface when eggs are brought into a warm, humid room. Water droplets on the shell surface promote the growth of micro-organisms.

*Trolley*: cart designed to set two stacks of 16 egg trays in a setter incubator. The trolley is equipped with a turning device.

### Recommended procedure:

1. Place the eggs on setter trays according to recording form 2E: 'Setter schedule'.
2. If the eggs were stored on pulp or plastic trays, use egg vacuum equipment to place the eggs on setter trays.
3. Check that all dirty eggs and eggs with cracks have been removed, otherwise remove these eggs (see procedure 2.2: 'Egg receipt').
4. Check the position of the eggs carefully: eggs must be set with the blunt end (= air cell) uppermost.
5. Provide the trolleys with an egg ID code.
6. Record the numbers of eggs that are removed from the storage room to be set on recording form 2D: 'Egg stock list'.
7. Place the loaded trolleys in the fumigation room.

### Additional notes:

- Egg 'sweating' must be prevented at all times. When the environmental temperature of stored eggs suddenly increases, water may condense on the eggshell: we say the eggs are 'sweating'. This should be avoided at all times since sweating eggs provide an ideal environment for the growth of micro-organisms that may penetrate the eggshell.
- The table below shows the relationship between temperature and humidity in the egg storage room and the egg traying room and the risk of egg sweating. Egg sweating is prevented when the temperature difference between the egg storage and egg traying rooms is small and humidity in the egg traying room is low.



Eggs will 'sweat' if the relative humidity (% RH) in the <u>egg traying room</u> is higher than:				
Temperature of storage room <sup>1</sup>	Temperature egg traying room:			
	15°C	18°C	21°C	24°C
21°C	-----	-----	-----	> 85% RH
18°C	-----	-----	> 83% RH	> 71% RH
16°C	-----	> 89% RH	> 74% RH	> 60% RH
11°C	> 74% RH	> 64% RH	> 53% RH	> 44% RH

<sup>1</sup>It is assumed that the temperature of the eggs equals the temperature of the egg storage room.

---

## 2.5 Disinfecting hatching eggs

### Objective:

To eliminate micro-organisms on the shells of hatching eggs.

### Persons responsible:

Chief and personnel assigned to set and incubate eggs.

### Documents:

Procedure 2.3: 'Storage of hatching eggs'

### Definitions:

*Crystalline paraformaldehyde*: a disinfecting powder that evaporates when it is heated electrically. The formaldehyde gas penetrates the eggshell.

*Formaldehyde pan*: an electric pan connected to a programming unit, the pan is used for the evaporation of crystalline formaldehyde.

*Fumigation room*: a room specially designed for disinfecting eggs. Ideally, the room should be located between the egg traying room and the incubator room. This room functions as a sluice valve. No one should pass through! The fumigation room is separate from the setters.

*Trolley*: cart designed to set two stacks of 16 egg trays in a setter incubator. The trolley is equipped with a turning device.

### Recommended procedure:

1. Place trolleys with trayed eggs in the fumigation room. Ideally, trolleys should be moved in via the egg receiving/storage room only!
2. Place crystalline paraformaldehyde in an electric pan at the rate of 7 grams per m<sup>3</sup> of fumigation room.
3. Close all doors and fan shafts!
4. Keep both sides of the fumigation room closed and set the correct temperature and humidity (21-25 °C and 65-75% RH) for a maximum of 20 minutes.
5. Leave the fumigation room and close the doors.
6. Start the program. The electric pan is heated and the evaporated formaldehyde gas disinfects the eggs. After 20 minutes the extraction fan and ventilation system are switched on automatically.
7. Neutralise the formaldehyde gas with ammonia.
8. Open the door at the setter room side and move the trolleys into the setter room. Leave the door at the egg traying room side closed!

### Additional notes:

- The temperature should be 21-25°C but no higher than 25°C and the relative humidity should be 65-75% to prevent egg sweating (see procedure 2.3: 'Storage of hatching eggs'). If the eggs were stored below 15°C, pre-warm the eggs for 12 hours in an egg traying room at 18°C and 60-70% relative humidity.
- In order to avoid re-infection and cross-contamination, fumigated and non-fumigated eggs should never be placed next to one another.
- If there is no fumigation room, there is a possibility to fumigate in the setter.

