



# Coordinated European Animal Welfare Network (EUWelNet)

## Sub Deliverable 3.4.2.

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### **Title**

Standard operating procedures (SOPs) for the waterbath stunning of poultry and the valid and reliable assessment of unconsciousness following mechanical stunning in bovines, electrical stunning in ovines, water bath electrical stunning in poultry and gas stunning in pigs.

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## **Abstract**

Regulation (EC) 1099/2009 requires a qualified Animal Welfare Officer (AWO) in each slaughterhouse to ensure compliance with the Regulation. The AWO should report to the business operator, ensure that the slaughterhouse personnel carry out any remedial actions necessary to ensure compliance, be responsible for developing standard operating procedures (SOPs) for effective stunning and its assessment, and keep a record of remedial actions.

The objective of this task is to design and implement standard operating procedures (SOPs) to overcome the difficulties previously identified and to guide AWOs and OVs in the understanding, monitoring and improvement of these problems in implementation.

## 1. Introduction

Regulation (EC) N° 1099/2009 requires a qualified Animal Welfare Officer (AWO) in each slaughterhouse to ensure compliance with the Regulation. The AWO should report to the business operator, ensure that the slaughterhouse personnel carry out any remedial actions necessary to ensure compliance, be responsible for developing standard operating procedures (SOPs), and keep a record of remedial actions.

According to Regulation (EC) N° 1099/2009, business operator shall carry out the killing of the animals and every related operation according to standard operating procedures (SOPs) in order to spare any avoidable pain, distress or suffering (Art 3 & 6). These SOPs shall be made available to competent authority upon request (Art 6.4)

“Standard operating procedures” means a set of written instructions aimed at achieving uniformity of the performance of a specific function (Art 2.i).

Regarding stunning (Art 6.2), SOPs shall especially:

- a) Take into account manufacturers’ recommendations.
- b) Define the key parameters ensuring effectiveness of stunning.
- c) Specify the corrective actions to be taken when it appears that an animal is not properly stunned.

SOPs may be based on Guide to Good Practices (GGP) referred to in Article 13 of the Regulation. Such GGP are developed by organisations of business operators and shall be reviewed according to specific requirements, in particular having regard and being subject to scientific opinion.

In this context, this project, limited in time, intends to produce some guidelines, dedicated especially to the monitoring of stun efficiency that could help business operators to develop their SOPs

SOPs are an important tool to assure compliance with the assessment of the effectiveness of the stunning procedures and the maintenance of unconsciousness until death. Effective introduction and implementation of SOPs requires commitment and skill by the operators and AWOs at the slaughter plant. Therefore, adequate training of operators and AWOs in how to set their SOPs should be a key requirement.

The AWOs have a central role in safeguarding animal welfare at the slaughter plant. Monitoring the practise of operators is one of their tasks. It is advised that the AWOs are trained by external trainers in developing the SOPs and in management of the operators.

Operators at the slaughter plant shall have a certificate of competence delivered after an independent examination. Basic requirements in this training should be the comprehension of the SOPs, understanding the context of the SOPs and how to apply the SOPs in their every day work.

Monitoring the implementation of the SOPs in practice is a role for the AWOs and should be audited on a regular base.

## **2. Material and Methods**

Building on the results of Subtask 3.4.2 the network discussed possible ways of solving non-compliance with the legislative requirements and the development of model SOPs for the two issues highlighted by the project. These SOPs included recommendations on the objectives, responsibilities, control measures, monitoring procedures, corrective actions and records.

The SOPs were transferred to the AWOs and OV's for implementation. The SOPs were presented to the Animal Welfare Officer (AWO) mainly through face-to-face meetings which included a brief on-site demonstration of the methodology in order to make the implementation easier. 1 or 2 slaughterhouses per specie were visited in each country, collecting data of a total of 24 slaughterhouses (6 of cattle stunned with captive bolt, 7 of sheep electrically stunned, 6 of pigs stunned with gas and 5 of poultry stunning with waterbath).

The SOPs were also sent to the advisory Board for comments. The comments from the stakeholders have been discussed and when appropriate included in the new version of the SOPs. The SOPs originally presented to and used by the slaughterhouses can be found in Annex 1, and the final version of the SOPs after inclusion of improvements based on comments of the Advisory Board and comments from the OV's and AWOs in Annex 2.

## **3. Results and discussion**

Initially, the SOP aimed to monitor unconsciousness in animals. However, in all of the key stages, monitoring is carried out to identify animals that are improperly stunned and therefore the attention is focused on the indicators of consciousness. Therefore, the major interest is to detect the negative or undesired outcome, namely the presence of consciousness, i.e. animals that have not been correctly stunned. Therefore, following the EFSA opinion on monitoring procedures at slaughter, the indicators of unconsciousness of the initial SOPs were modified to indicators of consciousness or recovery. As a result, the SOPs encouraged AWOs and OV's to assess indicators of consciousness, because it is with these cases that corrective actions have to be taken.

Other suggestions proposed by the stakeholders were:

- Adaptation of the wording used by CE 1099/200 Regulation. (i.e. monitoring instead of assessment)
- Define the sample size for the monitoring based on the species and the slaughtering throughput.

- Definition of some indicators of consciousness. The definition of the indicators is referred to the EFSA opinions on monitoring procedures at slaughterhouses.

#### 4. References

The following organisations and individuals have returned comments on the draft SOPs produced by the network:

- Directorate General Health and Consumer Protection (European Commission)  
Denis Simonin
- Humane Slaughter Association in UK  
Nathan Rhys Williams (Technical Officer)
- Animalia  
ElisivTolo
- Food and Veterinary Office:  
Vasco Antunes (SANCO)  
Patrick Caruana (SANCO)  
Demond Maguire (SANCO)
- Finish Food Safety Evira  
Taina Mikkonen
- Compassion in World Farming (CIWF)  
Vicky Bond
- Eurogroup for Animals:  
VéroniqueSchmit (Executive Officer Policy)
- Czech Republic State Veterinarian Administration:  
Miroslava Lutzová (DVM)
- David Morton
- Department of Environment, Food and Rural Affairs  
Rebeca García Pinillos

## 5. Annex 1–SOPs use for the implementation on the slaughterhouses

### ASSESSMENT OF UNCONCIOUSNESS IN POULTRY AFTER ELECTRICAL WATERBATH STUNNING

#### Objective:

To assess unconsciousness from the stunning procedure until brain death due to either bleeding or the initiation of a cardiac arrest during stunning.

#### Responsibility:

Animal welfare officer (AWO), machine minders and manual neck cutters or the back-up personnel.

#### Procedure

The operators involved in machine minding will assess a sample of birds ( $n = \geq 50$  birds per flock) for signs of unconsciousness from the exit of the waterbath and the back-up slaughter personnel will assess for signs of unconsciousness in all birds (100%), immediately after stunning and until brain death occurs.

The AWO will assess the state of unconsciousness in 20 birds from each flock processed, preferably in the beginning of each flock. The assessment should be from bird entry into the waterbath (pre-stun shocks), conveyance through the waterbath (head immersion) and from the exit of the waterbath until brain dead (no signs of recovery). Brain death is brought about either due to bleeding or through cardiac arrest.

#### Control measures

By the operators (involved as machine minders or manual neck cutters and back-up slaughter personnel)

1. *The signs of a stunned bird that is **alive** (stun-to-stun, simple stunning) post stun:*

The signs of a stunned bird post stun are:

- No breathing movements within  $\leq 8$  s of leaving the waterbath;
- Neck arched with head directed vertically;
- Open eyes;
- Wings held close to the body;
- Rigidly extended legs and constant body tremors.

2. *The signs of a bird that has been **killed** (stunning) in the stunner is:*

- Completely limp carcass;
- No breathing (look for abdominal movements in the vent area);
- Loss of nictitating membrane (3<sup>rd</sup> eyelid) reflex;
- Dilated pupil.

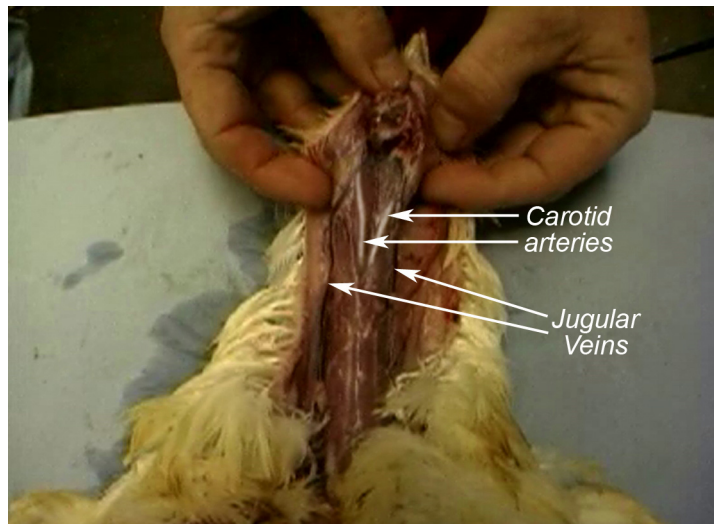
The difficulty in assessing the effectiveness of electrical waterbath stunning in the processing plant is due to:

- The often applied high line speed, which leaves little time for monitoring each bird after stunning.
- Waterbath stunning leads to the abolition of rhythmic breathing, but not necessarily to the abolition of the corneal reflex
- Lack of breathing does not equivocally relate to unconsciousness as it could be due to muscle tetanus induced by the flow of electric current through the body of the bird
- Bird size variability is the main factor behind birds missing the electric waterbath and the neck cutting equipment
- Birds with ventral neck cut had a lower incidence of spontaneous and evoked reflexes compared to the same in the unilateral neck cut.

### By the AWO

Assessment of the following procedures:

- Bird entry into the waterbath (pre-stun shocks)
- Head immersion in the waterbath (visual assessment)
- The effectiveness of the stunning treatment The blood vessels severed at neck cutting (see diagram below)
- Implementation of the SOP by the operator, and the skill and aptitude of the back-up operator in assessing unconsciousness and neck cutting.
- The records of the operation of the waterbath stunner and neck cutter.





## **Corrective action**

### Back-up slaughter operator

Any bird not showing one or more signs of unconsciousness:

- Should be casualty slaughtered.
- Both the stunning equipment and the neck cutting procedure should be revised once the cause of ineffective stunning has been identified.

### AWO

If one or more signs of unconsciousness are missing, and have not been detected by the back-up operator, or although being detected by the operator not corrective actions have been taken:

- Ask the back-up operator to casualty slaughter the bird/s (immediately).
- Check stunning parameters (short-term).
- Retrain operator in the application of the SOP.
- Internal Audit (long-term).

## **Records**

### Back-up operator:

- Birds not showing signs of unconsciousness.
- Corrective measures taken.

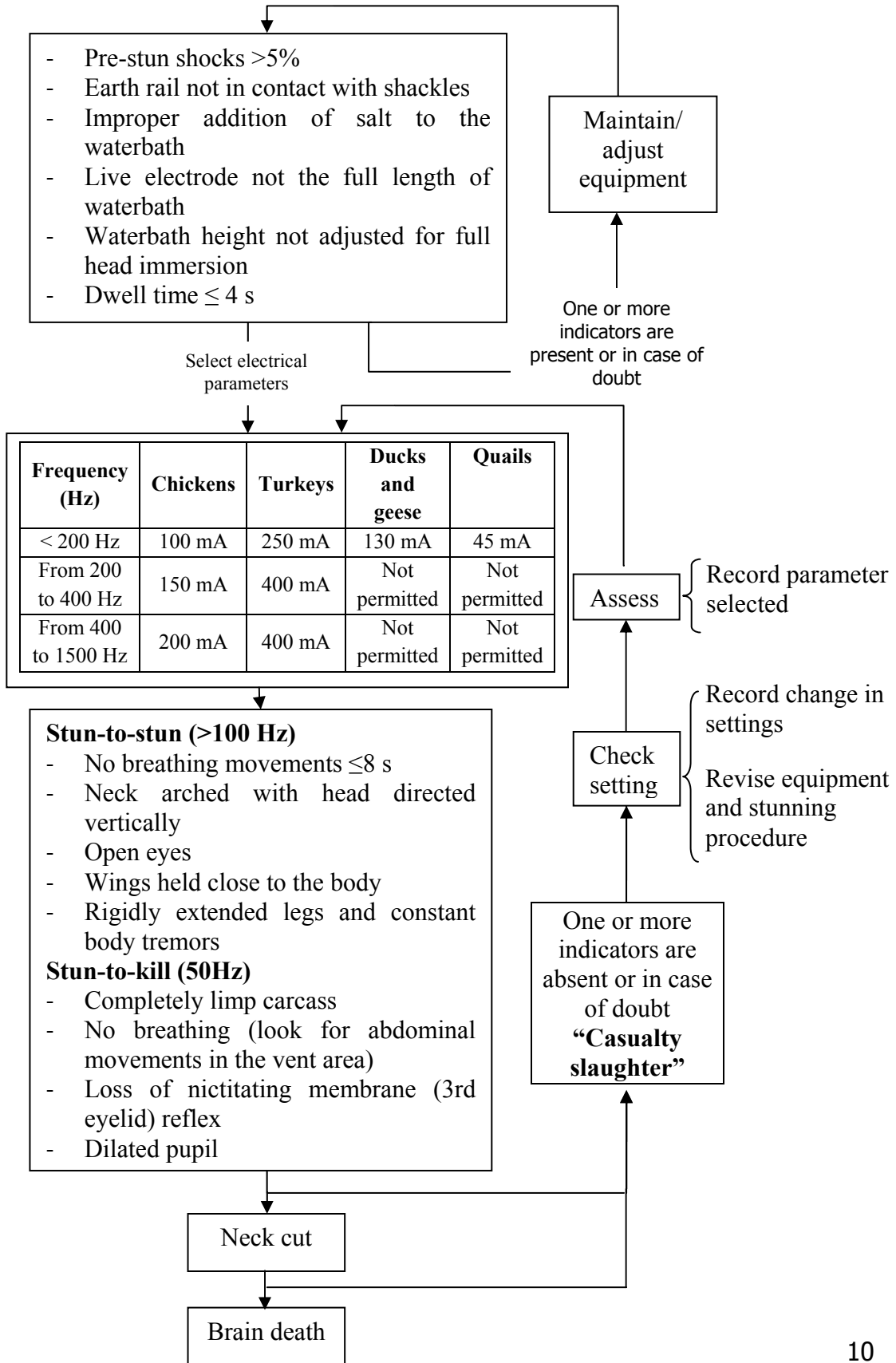
### AWO:

- Number of ineffectively stunned birds.
- Number of ineffectively stunned birds not detected by the operator.
- Corrective action taken by the operator.
- Number of uncut birds not detected by the back-up operator.

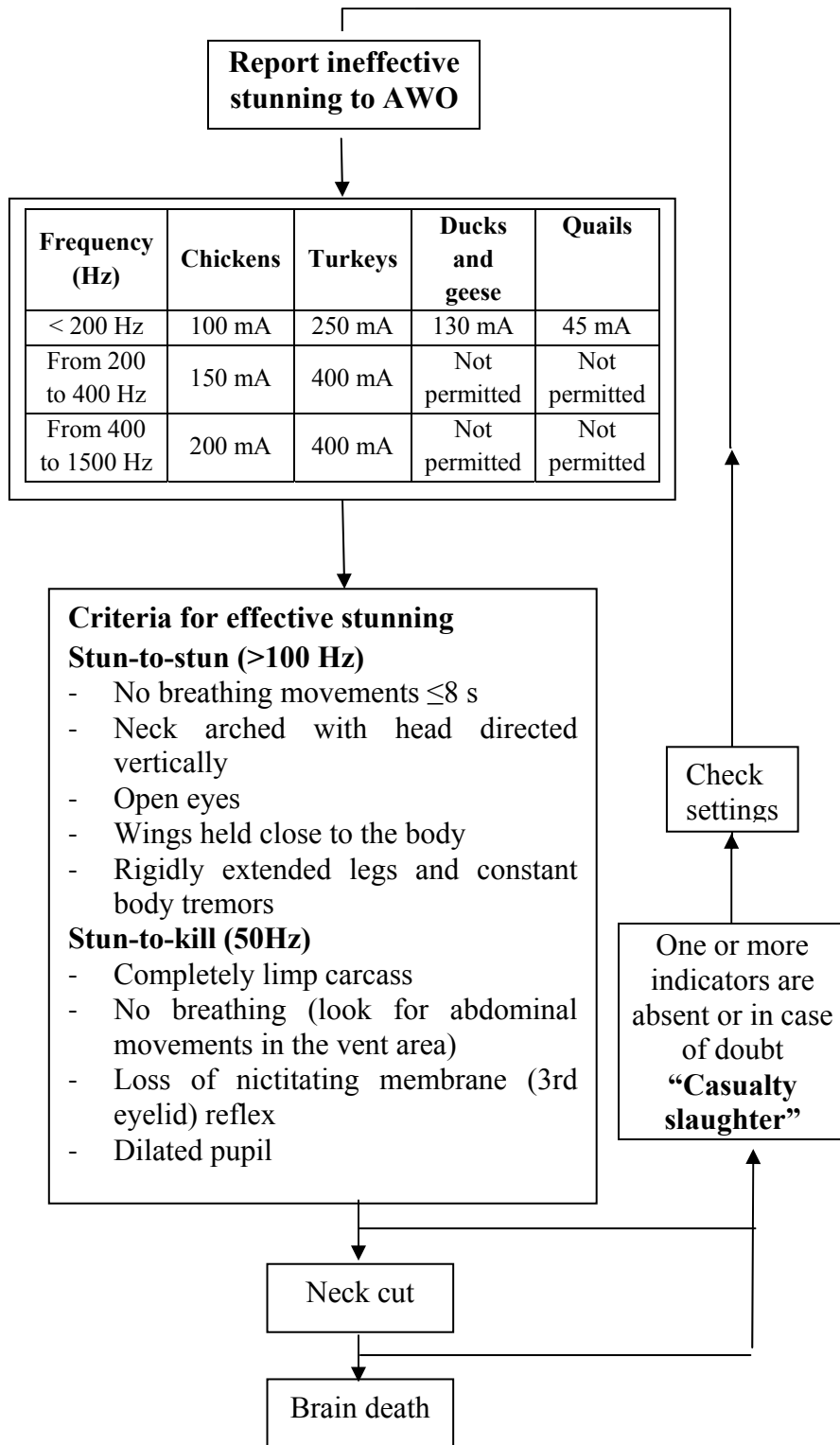
## **Neck Cutting**

Identifying the blood vessels severed at neck cutting: First remove the skin and tease apart the trachea and oesophagus severing these tissues just below the beak. When the trachea and oesophagus are retracted the jugular veins either side of the neck, joined by a crossbar high on the neck can be seen. It is this crossbar of the jugular vein that is cut when birds are bled 'per-os' (cut within the beak). The carotid arteries can be seen as white shiny vessels (light reflection from connective tissue sheath) that arise from the muscle ventral to the neck high on the neck. EC Regulation (1099/2009) requires the severance of both carotid arteries.

**ANIMAL WELFARE OFFICER DECISION TREE**



## BACK-UP OPERATOR DECISION TREE



## **ASSESSMENT OF THE OPERATION OF A POULTRY ELECTRICAL WATERBATH STUNNER**

### **Objective:**

To ensure the selection of the correct electrical parameters and the physical set-up of a poultry electrical waterbath stunner to result in the effective stunning of poultry.

### **Responsibility:**

Animal welfare officer (AWO), operators and machine minders working on the stunning, bleeding and back-up slaughter procedures.

### **Background**

Waterbath stunning systems are, at present, constant voltage by design. A constant voltage is applied between a 'live' waterbath electrode and an earthed rail that makes contact with the shackles. On average, more than 10 birds are immersed in the waterbath and subjected to the stunning voltage at any one time. The addition of salt to the water in a waterbath stunner has been used to improve the conductivity of the water. However it has been shown that the use of salt is counterproductive to bird welfare because if it is applied at the start of a shift when the voltage is adjusted to deliver sufficient current to stun, within 20 – 30 minutes the conductance of the water will be reduced and the current can be reduced to below the required level. Therefore, unless the salinity of the waterbath can be continuously maintained the addition of salt to the waterbath should not be practiced.

In order to ensure that birds are effectively stunned it is important to prevent part of the bird, e.g. a leading wing, from entering the electrically live water before the head, as this will result in a pre-stun shock. Pre-stun shocks are a welfare concern and will also increase the level of downgrading. The prevention of pre-stun shocks with electrical stunning of broilers can be achieved by careful control over bird entry. Two stages are required:

- The installation of an insulated ramp that isolates the entry ramp from any electrical contact with the waterbath stunner.
- The design of the entry ramp should enable birds to be held back by the top lip of the ramp such that when they are conveyed over the lip, they enter the electrically live water in one clean movement, preventing the incidence of pre-stun shocks.

## Control measures

1. **Pre-stun shocks:** Pre-stun shocks can be identified by observing bird entry into the waterbath stunner. Those birds that demonstrate more than one contraction i.e. bouncing in response to make and break contact with the electrically live water, experience a pre-stun shock but those birds that enter cleanly, demonstrating a single contraction as they enter the 'electrically live' water have not received a pre-stun shock. If the incidence of pre-stun shocks  $\geq 5\%$  (n = 50 birds) adjustment of the entry ramp is required to reduce the incidence.
2. **Live-electrode:** EC Regulation (1099/2009) requires that the electrode, which is immersed in the water, extends the length of the waterbath. It is also important that the electrode extends the full width of the waterbath to reduce the variation in resistance from the live electrode through the birds to the earthed rail.
3. **Earth-rail:** In addition to assessment of pre-stun shocks contact with the earth rail should be inspected visually (n = 50 birds) and maintained on a daily basis. A dual earth rail mounted either side of the shackle line should be used to make physical contact with the shackles for the full length of the waterbath stunner.
4. **Depth of immersion:** It is essential that the height of the waterbath is adjusted so that all birds have their heads fully immersed in the water. Given the normal range in bird size, this will result in the larger birds being immersed to the base of their wings or beyond, which will not adversely affect the initiation of an effective electrical stun. Variability in bird size is the main factor behind birds missing the electric waterbath and the neck cutting equipment.
5. **Dwell time:** The dwell time within the waterbath should be adjusted to give a minimum dwell time of 4 s at the fastest line speed employed (EC Regulation 1099/2009).
6. **Electrical parameters:** The applied voltage should be adjusted to meet the following legislative requirements, where the average value per bird (mA) should be multiplied by the number of birds in the waterbath to give the total applied current:

Electrical requirements for waterbath stunning equipment (AC)  
(average values per bird)

Frequency (Hz)	Chickens	Turkeys	Ducks and geese	Quails
< 200 Hz	100 mA	250 mA	130 mA	45 mA
From 200 to 400 Hz	150 mA	400 mA	Not permitted	Not permitted
From 400 to 1500 Hz	200 mA	400 mA	Not permitted	Not permitted

Alternating current (AC) is calibrated in terms of true RMS (Root Mean Square) current, which is the equivalent to the heating effect of an AC voltage when compared to a DC voltage. Most low cost instrumentation and signal converters (for example handheld multimeters of the sort used by maintenance engineers) carry out this conversion by filtering the signal into an average value and applying a correction factor. The voltmeter and ammeter display on the waterbath control panel require regular calibration (6 monthly) by a qualified electrician using a factory-calibrated multimeter. The use of pulsed direct current (DC) has been actively discouraged (EC Regulation 1099/2009) as the waveform may result in electro-immobilisation i.e. paralysis rather than effective stunning.

### Assessment of the effectiveness of waterbath stunning

A sample of 50 birds should be assessed from the exit of the waterbath, and if more than 2% **do not** meet the following criteria, the voltage should be increased and the above control measures tested.

3. *The signs of a stunned bird that is **alive** (stun-to-stun, simple stunning) post stun:*

- No breathing movements within  $\leq 8$  s of leaving the waterbath;
- Neck arched with head directed vertically;
- Open eyes;
- Wings held close to the body;
- Rigidly extended legs and constant body tremors.

4. *The signs of a bird that has been **killed** (stunning) in the stunner is:*

- Completely limp carcass;

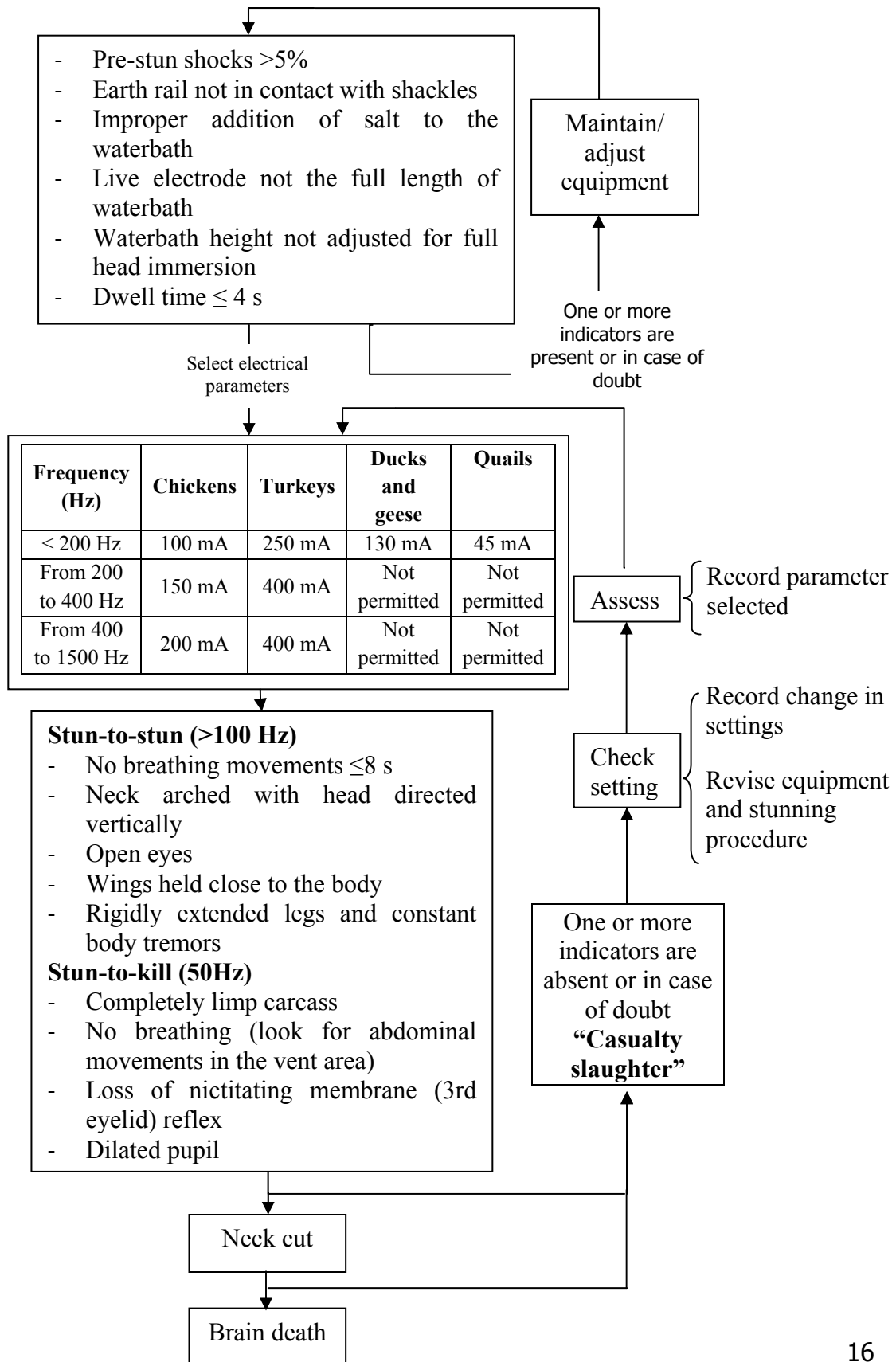
- No breathing (look for abdominal movements in the vent area);
- Loss of nictitating membrane (3<sup>rd</sup> eyelid) reflex;
- Dilated pupil.

### **Monitoring and recording procedures**

Business operators shall draw up a record of maintenance. They shall keep those records for at least one year and shall make them available to the competent authority upon request.

Until 8 December 2019, these requirements shall only apply to new equipment, which have not entered into operation before 1 January 2013: Waterbath stunning equipment shall be fitted with a device, which displays and records the details of the electrical key parameters used. These records shall be kept for at least one year.

## AWO/OPERATOR DECISION TREE





# ASSESSMENT OF UNCONCIOUSNESS IN CATTLE AFTER CAPTIVE BOLT STUNNING

## **Objective:**

To assess unconsciousness from the stunning procedure until brain death due to bleeding.

## **Responsibility:**

Animal welfare officer (AWO) and operators working on the stunning, hoisting and bleeding procedures.

## **Procedure**

The operators involved in the stunning procedure, hoisting and bleeding will assess signs of unconsciousness in all animals (100%), immediately after stunning, before hoisting and before and during bleeding.

The AWO (or the person designated by the AWO with certified knowledge on the assessment of unconsciousness) will assess the unconsciousness of at least 10 animals each day, divided in two intervals. The assessment should last from the stunning application until brain death due to bleeding.

## **Control measures**

### By the operator

5. *Just after stunning and before being released from the box:*
  - Immediate collapse
  - Absence of righting reflex
  - Absence of vocalizations
  - Absence of rhythmic breathing
  
6. *Immediately before and during hoisting:*
  - Absence of righting reflex
  - Absence of vocalizations
  - Absence of rhythmic breathing
  - Absence of eye movements
  
7. *Immediately before and during bleeding*
  - Absence of righting reflex
  - Absence of vocalizations
  - Absence of rhythmic breathing
  - Absence of eye movements

By the AWO (or the person designated by the AWO with certified knowledge on assessment of unconsciousness)

Assessment of the following procedures:

- a) Signs of unconsciousness from stunning application until brain death using the following indicators.
  - Immediate collapse
  - Absence of righting reflex
  - Absence of vocalizations
  - Absence of rhythmic breathing
  - Absence of eye movements
  - Absence of positive corneal reflex
  - Absence of nose pinching response
  
- b) Implementation of the SOP by the operator, and the skill and aptitude of the operator in assessing unconsciousness.
  
- c) The records of the operators regarding insufficient stunning effect / re-stunning.

### **Corrective action**

#### Operator

Any animal not showing one or more signs of unconsciousness:

- The animal should be re-stunned immediately, using a back-up gun, a higher strength cartridge, 10 mm higher and 5 mm lateral from the correct shooting position (if it was correct) or in the correct shooting position, before reassessment and release from the stunning box, hoisting or bleeding.
  
- The ineffective gun should be checked if it needs maintenance before further use.

#### AWO

If one or more signs of unconsciousness are absent, and have not been detected by the operator, or although being detected by the operator no corrective action has been taken:

- Ask the operator to re-stun (immediately) using the above protocol.
- Assess stunning procedures.
- Retrain operator in the application of the SOP.
- Internal Audit (long-term).

**Records** (a written record should be maintained of the effectiveness of the stunning method)

Operator:

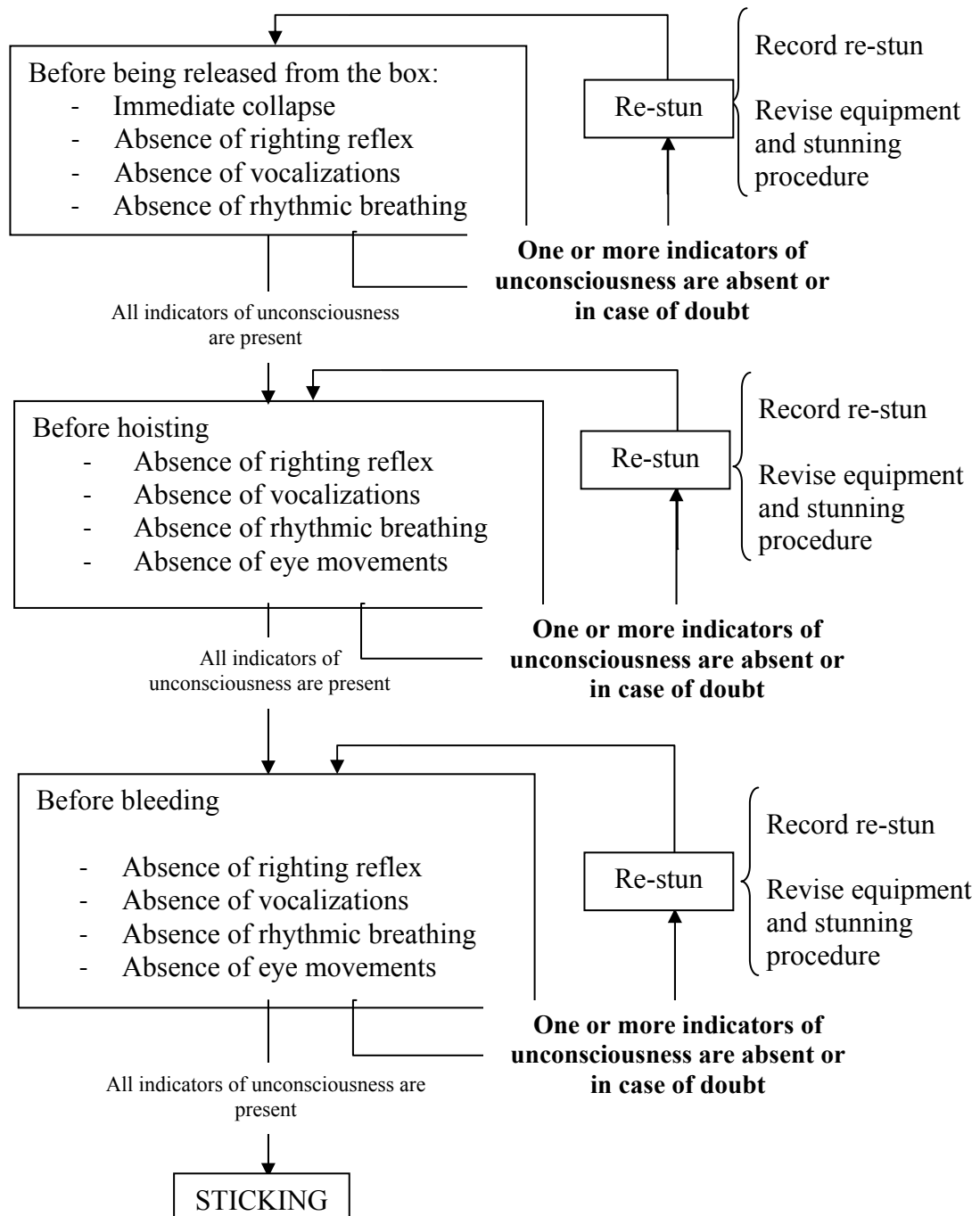
- Animals not showing signs of unconsciousness.
- Corrective measures taken.
- Records of regular gun maintenance

AWO:

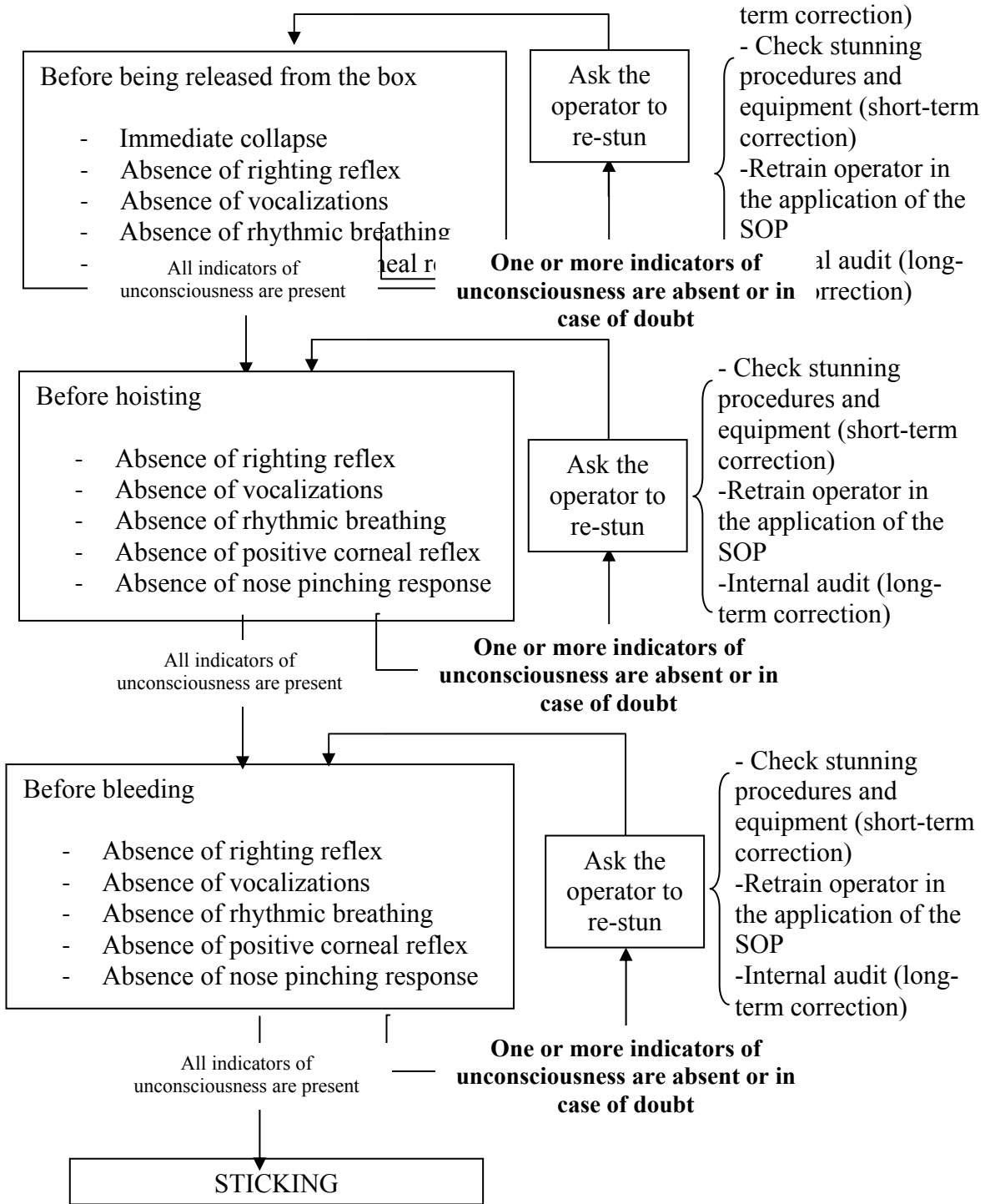
From the at least 10 animals assessed daily:

- Number of ineffectively stunned animals.
- Number of ineffectively stunned animal not detected by the operator.
- In addition the number of double stuns recorded by the stunning operator should be verified by an assessment of the double stuns on the skinned heads by the AWO.

## OPERATOR DECISION TREE



**ANIMAL WELFARE OFFICER DECISION TREE**



# ASSESSMENT OF UNCONCIOUSNESS IN PIGS AFTER GAS STUNNING

## **Objective:**

To assess unconsciousness from the stunning procedure until brain death due to bleeding.

## **Responsibility:**

Animal welfare officer (AWO) and operators working on the stunning, hoisting and bleeding procedures.

## **Procedure**

The operators involved in the stunning procedure, hoisting and bleeding will assess signs of unconsciousness in all animals (100%), immediately after stunning, before hoisting and before and during bleeding.

The AWO (or the person designated by the AWO with certified knowledge on the assessment of unconsciousness) will assess the unconsciousness of at least 10 animals each day, divided in two intervals. The assessment should last from the stunning application until brain death due to bleeding.

## **Control measures**

### By the operator

#### *8. Just after stunning:*

- Absence of righting reflex
- Absence of vocalizations
- Absence of rhythmic breathing
- Absence of eye movements

#### *9. Immediately before and during hoisting:*

- Absence of righting reflex
- Absence of vocalizations
- Absence of rhythmic breathing
- Absence of eye movements

#### *10. Immediately before and during bleeding*

- Absence of righting reflex
- Absence of vocalizations
- Absence of rhythmic breathing
- Absence of eye movements

By the AWO (or the person designated by the AWO with certified knowledge on assessment of unconsciousness)

Assessment of the following procedures:

- a) Signs of unconsciousness from stunning application until brain death using the following indicators.
  - Absence of righting reflex
  - Absence of vocalizations
  - Absence of rhythmic breathing
  - Absence of eye movements
  - Absence of responses to nose prick or ear pinch
- d) Implementation of the SOP by the operator, and the skill and aptitude of the operator in assessing unconsciousness.
- e) The records of the operators regarding insufficient stunning effect / re-stunning.

### **Corrective action**

#### Operator

Any animal not showing one or more signs of unconsciousness:

- The animal should be re-stunned immediately, using back-up equipment, before reassessment and release from the stunning box, hoisting or bleeding.
- The stunning procedure (gas concentration and exposure time) should be checked before further use.

#### AWO

If one or more signs of unconsciousness are absent, and have not been detected by the operator, or although being detected by the operator and no corrective action has been taken:

- Ask the operator to re-stun (immediately) using the above protocol.
- Assess stunning procedures.
- Retrain operator in the application of the SOP.
- Internal Audit (long-term).

**Records** (a written record should be maintained of the effectiveness of the stunning method)

Operator:

- Animals not showing signs of unconsciousness.
- Corrective measures taken.

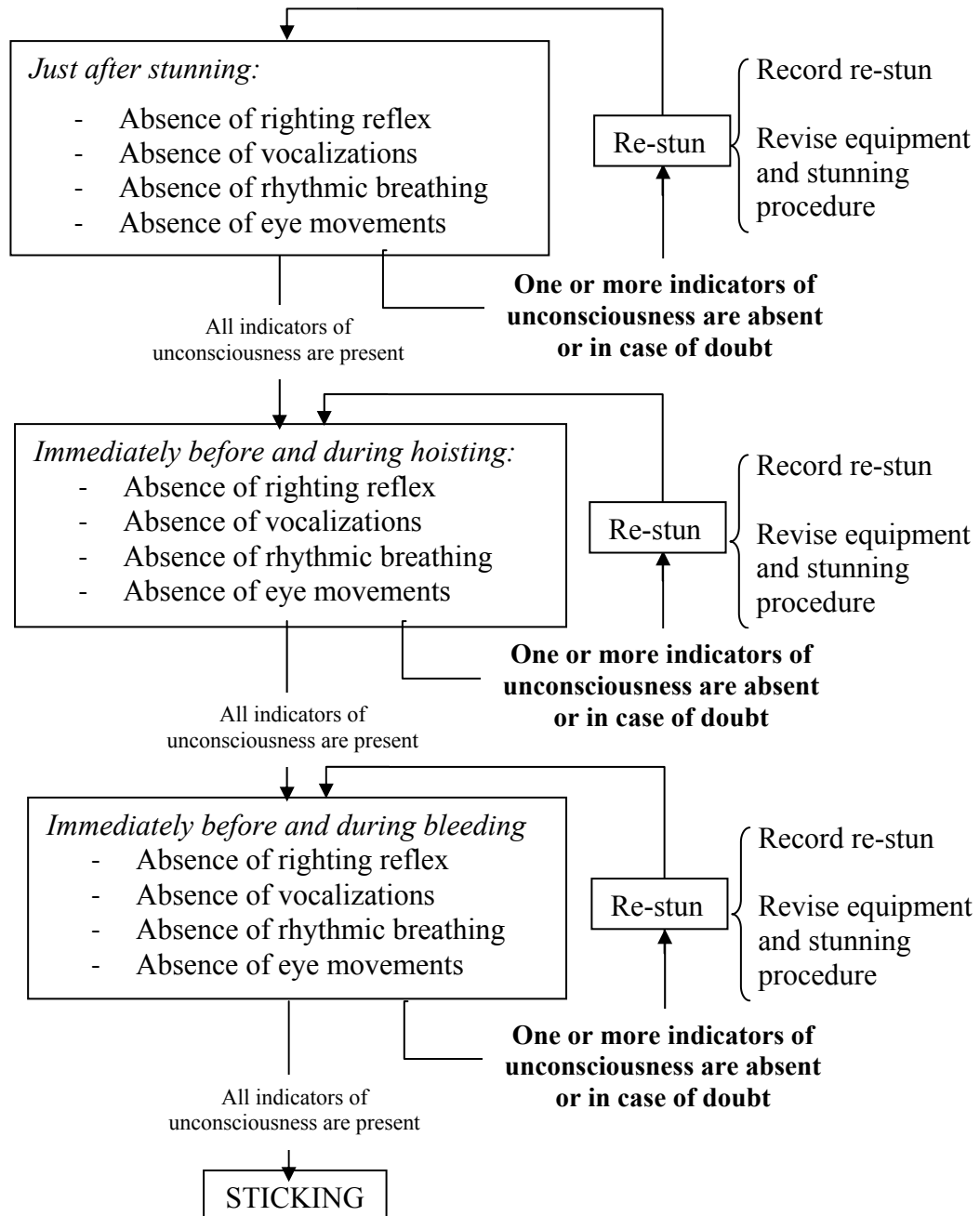
AWO:

From the at least 10 animals assessed daily:

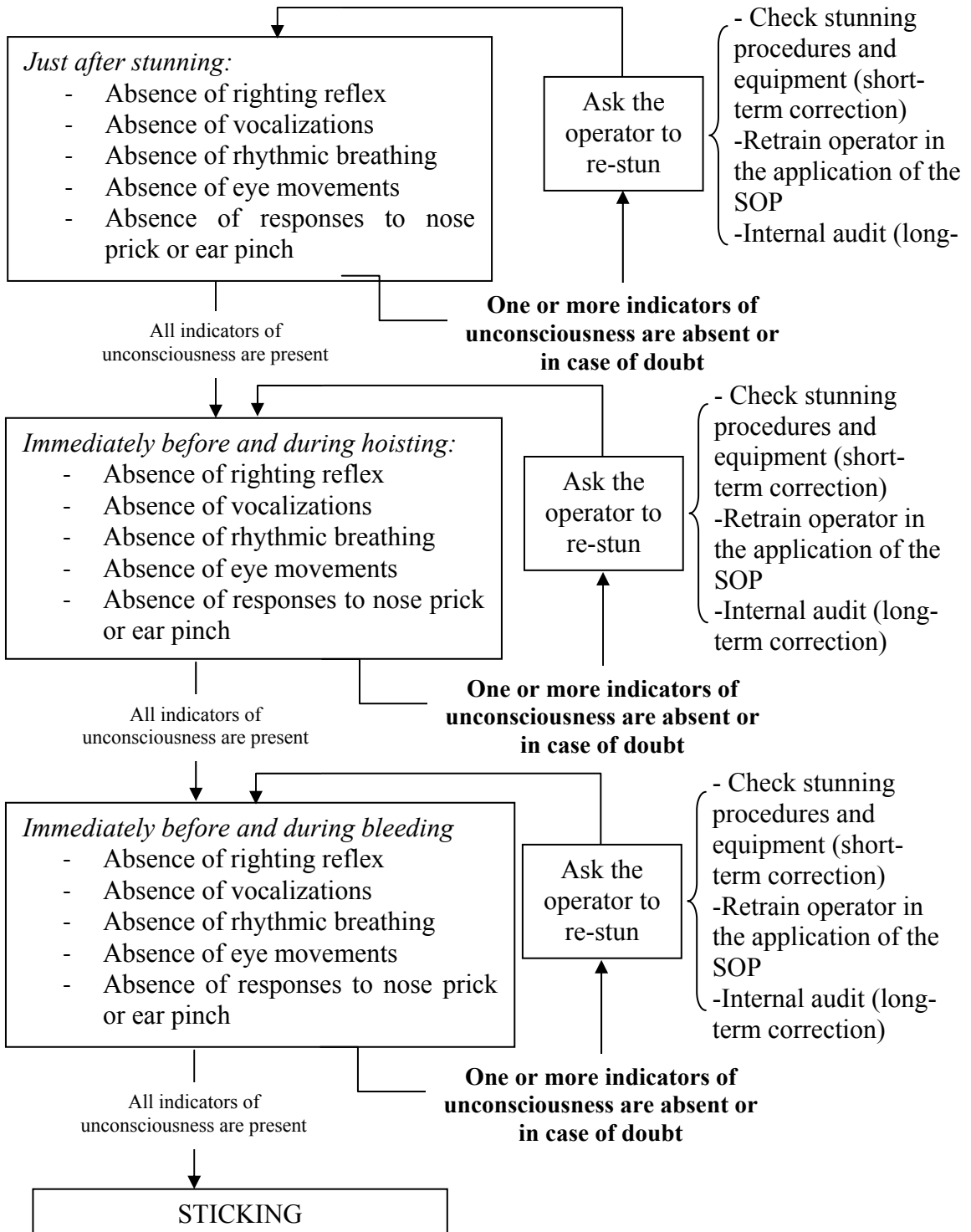
- Number of ineffective stunned animals.
- Number of ineffective stunned animal not detected by the operator.



## OPERATOR DECISION TREE



**ANIMAL WELFARE OFFICER DECISION TREE**



# ASSESSMENT OF UNCONCIOUSNESS IN SHEEP AFTER ELECTRICAL STUNNING

## **Objective:**

To assess unconsciousness from the stunning procedure until brain death due to bleeding.

## **Responsibility:**

Animal welfare officer (AWO) and operators working on the stunning, hoisting and bleeding procedures.

## **Procedure**

The operators involved in the stunning procedure, hoisting and bleeding will assess signs of unconsciousness in all animals (100%), immediately after stunning, before hoisting and before bleeding.

The AWO (or the person designated by the AWO with certified knowledge on the assessment of unconsciousness) will assess the unconsciousness of at least 10 animals each day, divided in two intervals. The assessment should last from the stunning application until brain death due to bleeding.

## **Control measures**

### By the operator

#### *11. Just after stunning:*

- Tonic seizure
- Immediate collapse
- Absence of righting reflex
- Absence of vocalizations
- Absence of rhythmic breathing

#### *12. Immediately before and during hoisting:*

- Tonic-clonic seizure
- Absence of righting reflex
- Absence of vocalizations
- Absence of rhythmic breathing

#### *13. Immediately before and during bleeding*

- Absence of righting reflex
- Absence of vocalizations
- Absence of rhythmic breathing

By the AWO (or the person designated by the AWO with certified knowledge on assessment of unconsciousness)

Assessment of the following procedures:

- a) Signs of unconsciousness from stunning application until brain death using the following indicators.
  - Tonic-clonic seizure
  - Immediate collapse
  - Absence of righting reflex
  - Absence of rhythmic breathing
  - Absence of vocalizations
  - Absence of response to nose prick or ear pinch
- f) Implementation of the SOP by the operator, and the skill and aptitude of the operator in assessing unconsciousness.
- g) The records of the operators regarding insufficient stunning effect / re-stunning.

### **Corrective action**

#### Operator

Any animal not showing one or more signs of unconsciousness:

- The animal should be re-stunned immediately using back-up equipment where necessary, before reassessment and release from the stunning box, hoisting or bleeding.
- The stunning equipment (electrodes, current) should be checked to determine if it needs maintenance before further use.

#### AWO

If one or more signs of unconsciousness are absent, and have not been detected by the operator, or although being detected by the operator no corrective action has been taken:

- Ask the operator to re-stun (immediately) using the above protocol.
- Assess stunning procedures
- Retrain operator in the application of the SOP.
- Internal Audit (long-term).

**Records** (a written record should be maintained of the effectiveness of the stunning method)

Operator:

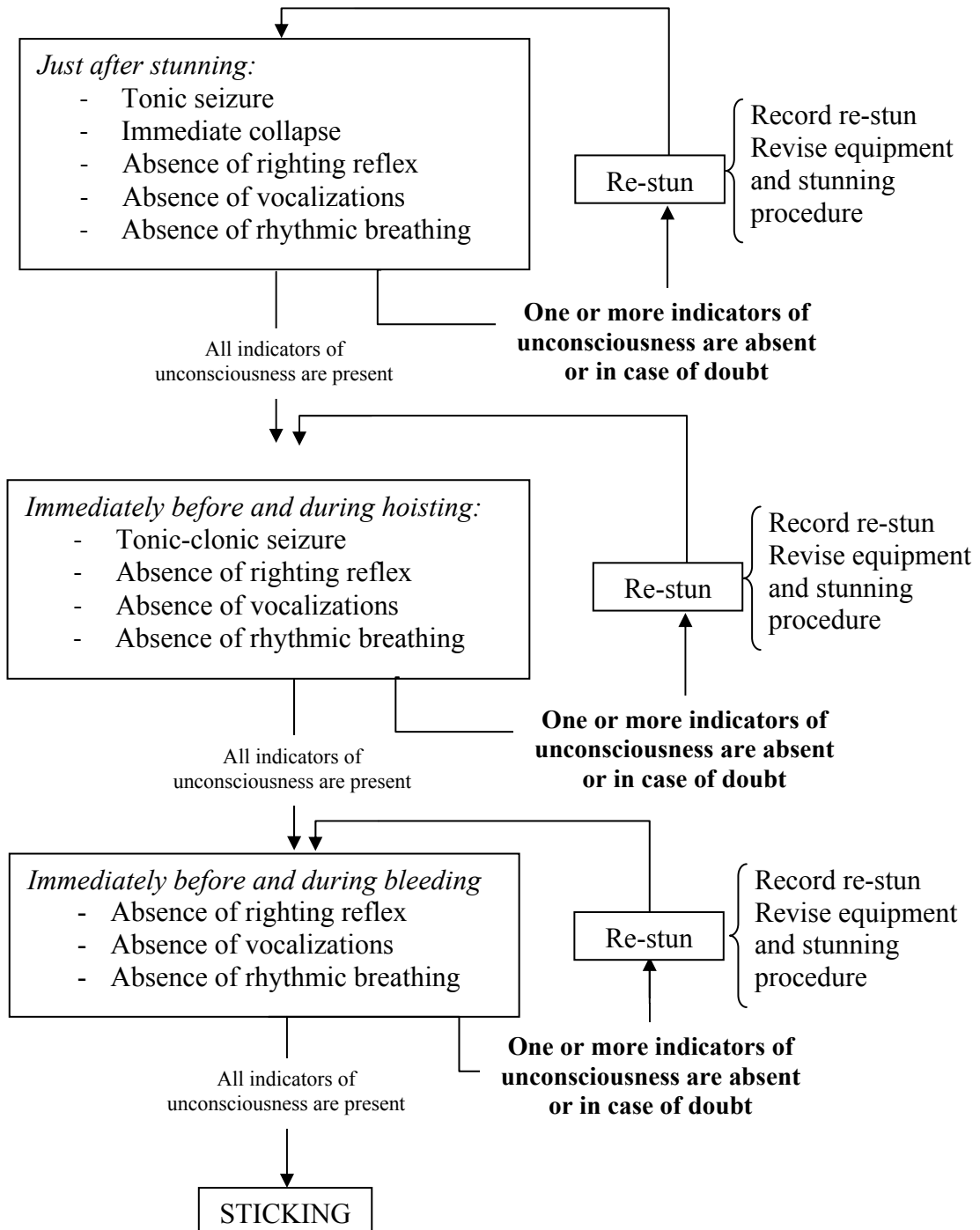
- Animals not showing signs of unconsciousness.
- Corrective measures taken.
- Records of regular gun maintenance

AWO:

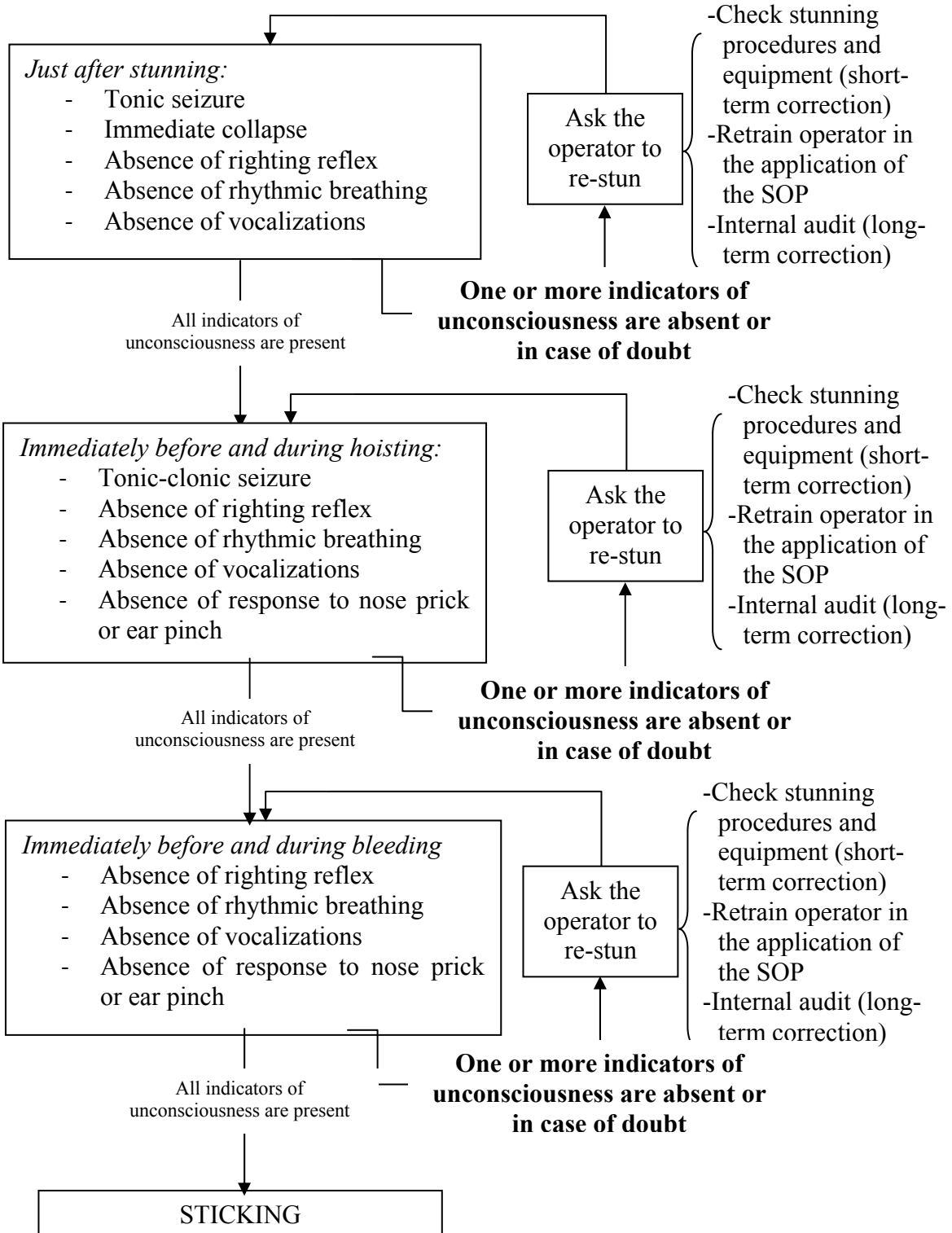
From the at least 10 animals assessed daily:

- Number of ineffective stunned animals.
- Number of ineffective stunned animal not detected by the operator.

## OPERATOR DECISION TREE



**ANIMAL WELFARE OFFICER DECISION TREE**



## 6. Annex 2 - Final version of SOPs after the incorporation of the Advisory Board's comments

### ASSESSMENT OF UNCONCIOUSNESS IN POULTRY AFTER ELECTRICAL WATERBATH STUNNING

#### Objective:

To assess unconsciousness from the stunning procedure until brain death, due to either bleeding or the initiation of a cardiac arrest during stunning.

#### Responsibility:

Animal welfare officer (AWO), machine minders and manual neck cutters or the back-up personnel.

#### Procedure

The operators involved in machine minding will assess a sample of birds ( $n = \geq 50$  birds per flock) for signs of unconsciousness from the exit of the waterbath, and the back-up slaughter personnel will assess for signs of unconsciousness in all birds (100%), immediately after stunning and until brain death occurs.

The AWO will assess the state of unconsciousness in 20 birds from each shed processed, preferably at the beginning of each shed. The effectiveness of the stunning procedure can be affected by variations in bird size; therefore, it is particularly important for the AWO to monitor birds when a change in bird size occurs. The assessment should be from bird entry into the waterbath (pre-stun shocks), conveyance through the waterbath (head immersion) and from the exit of the waterbath until brain dead (no signs of recovery). Brain death is brought about either due to bleeding or through cardiac arrest.

#### Control measures

By the operators (involved as machine minders or manual neck cutters and back-up slaughter personnel)

14. *The signs of a stunned bird that is **alive** (stun-to-stun, simple stunning) post stun:*

The signs of a stunned bird post stun are:

- No rhythmic breathing within at least the first 8 seconds of leaving the bath;
- Neck arched with head directed vertically;
- Open eyes;
- Wings held close to the body;
- Rigidly extended legs and constant body tremors.

15. *The signs of a bird that has been **killed** (stunning) in the stunner is:*

- Completely limp carcass;



- No breathing (look for abdominal movements in the vent area);
- Loss of nictitating membrane (3<sup>rd</sup> eyelid) reflex;
- Dilated pupil.

The difficulty in assessing the effectiveness of electrical waterbath stunning in the processing plant is due to:

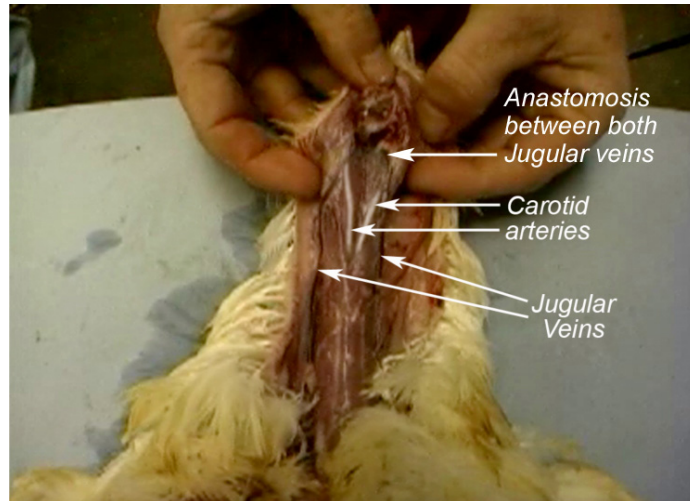
- The (often applied) high line speed, which leaves little time for monitoring each bird after stunning.
- Waterbath stunning leads to the abolition of rhythmic breathing, but not necessarily to the abolition of the corneal reflex
- Lack of breathing does not equivocally relate to unconsciousness as it could be due to muscle tetanus induced by the flow of electric current through the body of the bird
- Bird size variability is the main factor behind birds missing the electric waterbath and the neck cutting equipment
- Birds with ventral neck cut had a lower incidence of spontaneous and evoked reflexes compared to the same in the unilateral neck cut.

#### By the AWO

Assessment of the following procedures:

- Bird entry into the waterbath to ensure birds are not receiving pre-stun shocks
- Head immersion in the waterbath to ensure the head of each bird is fully immersed (visual assessment)
- The effectiveness of the stunning treatment (as described above)
- Both carotid arteries are severed at neck cutting (see diagram below)
- Implementation of the SOP by the operator, and the skill and aptitude of the back-up operator in assessing unconsciousness and neck cutting.
- The records of the operation of the waterbath stunner and neck cutter.

Figure 1 Dissection of the neck of a chicken showing the location of the major blood vessels.



### **Corrective action**

#### Back-up slaughter operator

Any bird not showing one or more signs of unconsciousness:

- Must be humanely killed or re-stunned and neck-cut without delay.
- The cause of ineffective stunning should be investigated without delay and appropriate and effective remedial action taken.

#### AWO

If one or more signs of unconsciousness are missing, and were not detected by the back-up operator, or they were detected by the operator but no corrective actions were taken:

- Ask the back-up operator to humanely kill or re-stun the bird/without delay.
- Without delay, investigate the cause of the ineffective stun, including checking the stunning parameters (short-term), and take remedial action to effectively address the issue.
- Retrain operator in the application of the SOP.
- Internal Audit (long-term).

### **Records**

#### Back-up operator:

- Number of birds showing signs of consciousness.
- Corrective measures taken.

#### AWO:

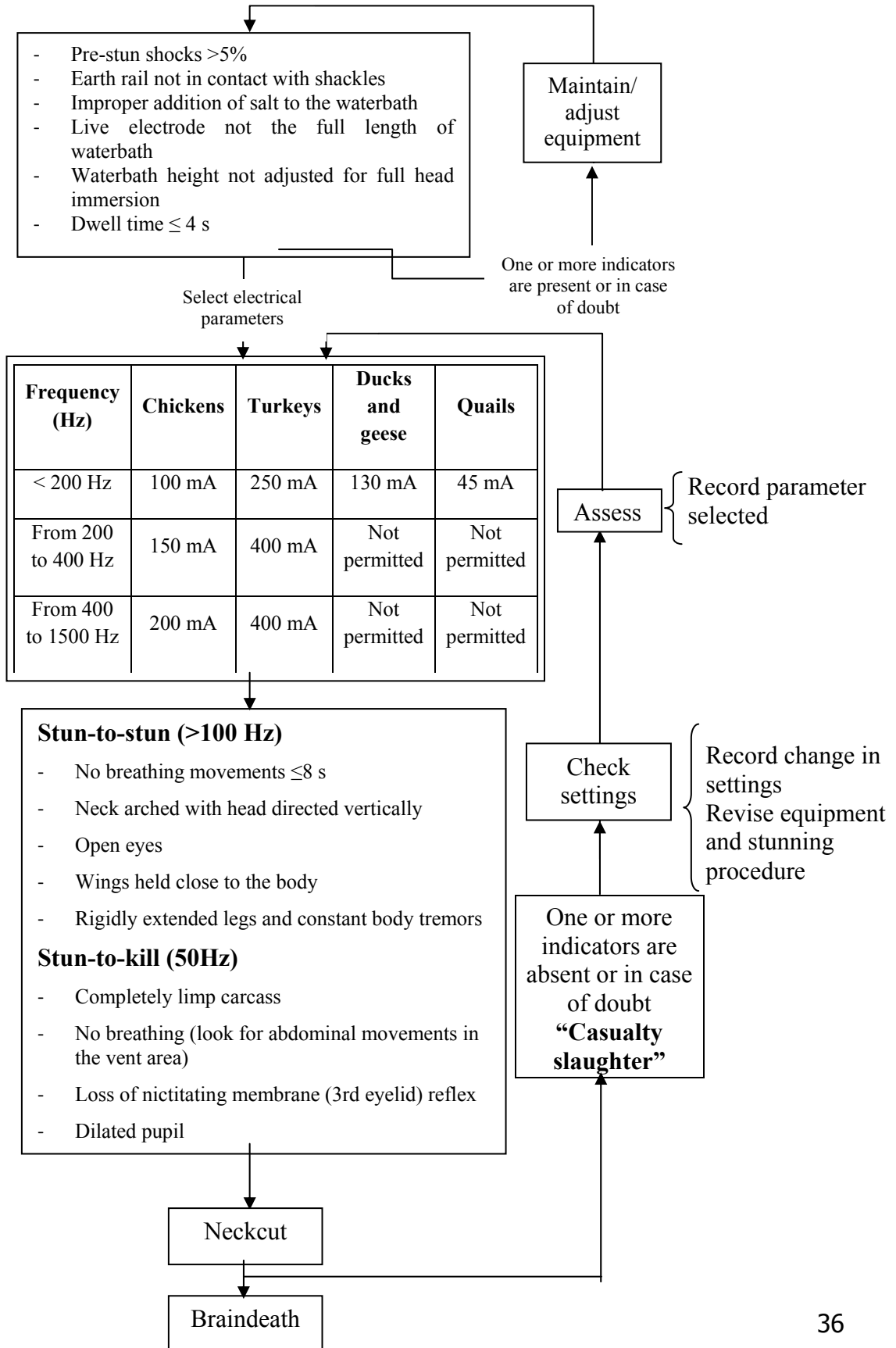
- Number of ineffectively stunned birds.
- Number of ineffectively stunned birds not detected by the operator.

- Corrective action taken by the operator.
- Number of uncut and ineffectively cut birds not detected by the back-up operator.

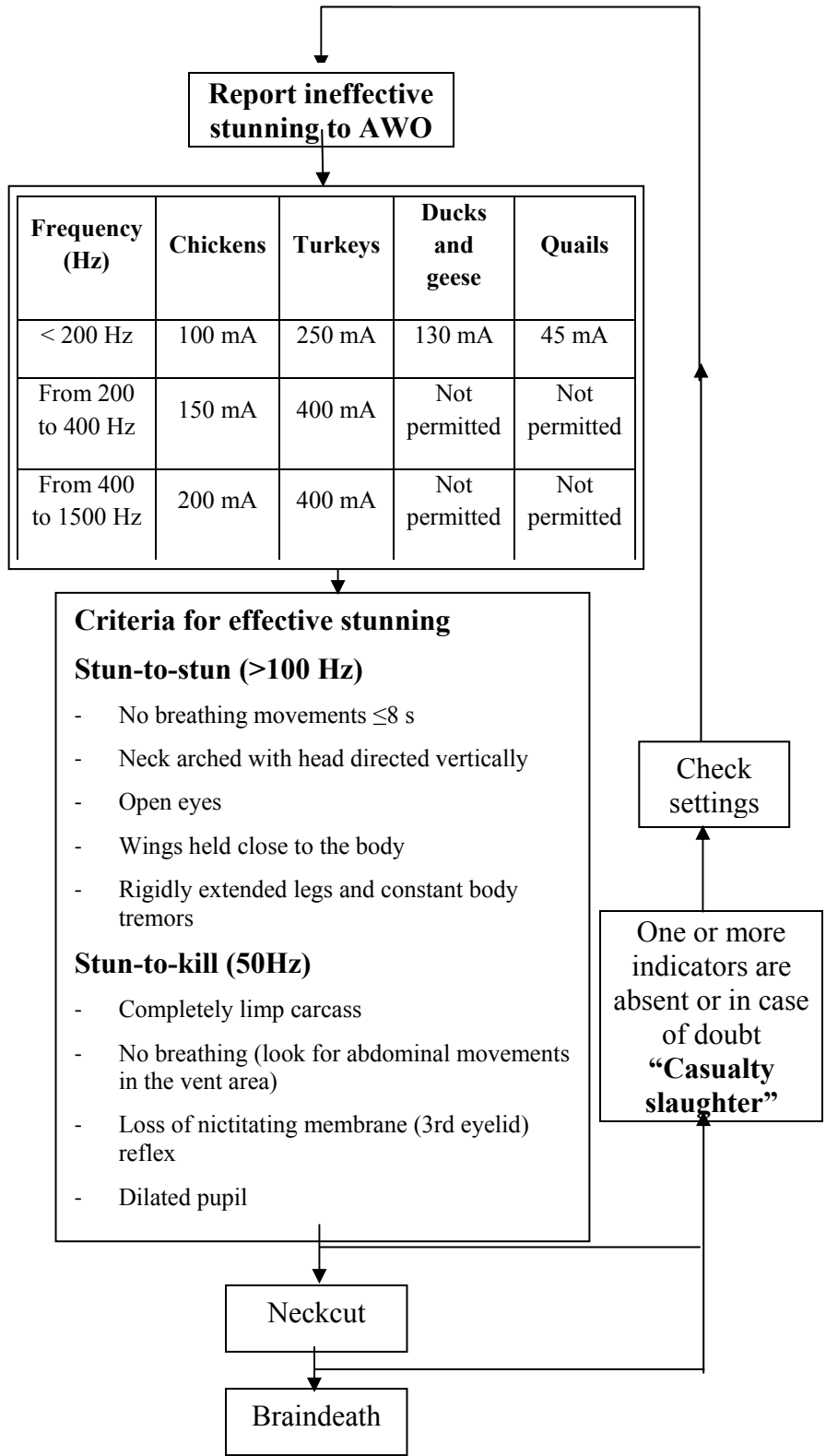
### **Neck Cutting**

Identifying the blood vessels severed at neck cutting: First remove the skin and tease apart the trachea and oesophagus severing these tissues just below the beak. When the trachea and oesophagus are retracted the jugular veins either side of the neck, joined by an anastomosis high on the neck, can be seen. It is this anastomosis of the ?which is cut when birds are bled 'per-os' (cut within the beak). The carotid arteries can be seen as white shiny vessels (light reflection from connective tissue sheath) that arise from the muscle ventral to the neck high on the neck. EC Regulation (1099/2009) requires the severance of both carotid arteries.

## ANIMAL WELFARE OFFICER DECISION TREE



**BACK-UP OPERATOR DECISION TREE**



## **ASSESSMENT OF THE OPERATION OF A POULTRY ELECTRICAL WATERBATH STUNNER**

### **Objective:**

To ensure the selection of the correct electrical parameters and the physical set-up of a poultry electrical waterbath stunner to result in the effective stunning of poultry.

### **Responsibility:**

Animal welfare officer (AWO), operators and machine minders working on the stunning, bleeding and back-up slaughter procedures should carry out the following checks when birds from a new shed are delivered; particularly when birds of a different size are processed and at the beginning of each shed.

### **Background**

Waterbath stunning systems are, at present, constant voltage by design. A constant voltage is applied between a 'live' waterbath electrode and an earthed rail that makes contact with the shackles. On average, more than 10 birds are immersed in the waterbath and subjected to the stunning voltage at any one time. The addition of salt to the water in a waterbath stunner has been used to improve the conductivity of the water. However, it has been shown that the use of salt is counterproductive to bird welfare because if it is applied at the start of a shift when the voltage is adjusted to deliver sufficient current to stun, within 20 – 30 minutes the conductance of the water will be reduced and the current can be reduced to below the required level. Therefore, unless the conductivity of the water is particularly low or the waterbath electrode does not run the full length of the waterbath and the salinity can be continuously maintained, the addition of salt to the waterbath should not be practiced.

In order to ensure that birds are effectively stunned it is important to prevent part of the bird, e.g. a leading wing, from entering the electrically live water before the head, as this will result in a pre-stun shock. Pre-stun shocks are a welfare concern and will also increase the level of downgrading. The prevention of pre-stun shocks with electrical stunning of broilers can be achieved by careful control over bird entry. Two stages are required:

- The installation of an insulated ramp that isolates the entry ramp from any electrical contact with the waterbath stunner.
- The design of the entry ramp, including the height of the shackle line in relation to the ramp, should enable birds to be held back by the top lip of the ramp such that when they are conveyed over the lip, they enter the electrically live water in one clean movement, preventing the incidence of pre-stun shocks.

## Control measures

7. **Breast comforter:** EC Regulation (1099/2009) requires the fitting of a breast comforter, which is in contact with the breast of the birds and built from the point of shackling until the birds enter the waterbath stunner, in order to calm them down. It is important that the breast comforter maintains contact with the breast of the birds until they exit the entry ramp and enter the electrically live water.
8. **Wet shackles:** Research has demonstrated that provided the shackles are wet prior to hang-on, i.e. through the positioning of the shackle washer or, through the use of a shackle spray prior to hang-on, there is no added benefit to be gained through the use of a shackle/leg spray. The use of a shackle/leg spray could stimulate birds to flap and/or result in a wet bird and have implications for effective electrical stunning. Wet birds require significantly higher stunning currents than dry birds to produce an effective stun. Processors should ensure that shackles are dripping wet before birds are hung-on the shackle line.
9. **Bends:** Tight bends in the line, close to the entry to the waterbath stunner, can initiate wing flapping. Tight bends may also cause temporary loss of physical contact with the breast comforter or loss of visual contact between neighbouring birds, which has been shown to increase wing flapping. It is important that birds are settled prior to entry to the waterbath to prevent pre-stun shocks and promote effective stunning.
10. **Pre-stun shocks:** Pre-stun shocks can be identified by observing bird entry into the waterbath stunner. Those birds that demonstrate more than one contraction i.e. bouncing in response to make and break contact with the electrically live water, experience a pre-stun shock but those birds that enter cleanly, demonstrating a single contraction as they enter the 'electrically live' water, have not received a pre-stun shock. If the incidence of pre-stun shocks  $\geq 5\%$  ( $n = 50$  birds) adjustment of the entry ramp is required to reduce the incidence.
11. **Live-electrode:** EC Regulation (1099/2009) requires that the electrode, which is immersed in the water, extends the length of the waterbath. It is also important that the electrode extends the full width of the waterbath to reduce the variation in resistance from the live electrode through the birds to the earthed rail.
12. **Earth-rail:** In addition to assessment of pre-stun shocks, contact with the earth rail should be inspected visually ( $n = 50$  birds) and maintained on a daily basis. A dual earth rail mounted either side of the shackle line should be used to make physical contact with the shackles for the full length of the waterbath stunner.
13. **Depth of immersion:** It is essential that the height of the waterbath is adjusted so that all birds have their heads fully immersed in the water. Given the normal range in bird size, this will result in the larger birds being immersed to the base of their wings or beyond, which will not adversely affect the initiation of an effective electrical stun. Variability in bird size is the main factor behind birds missing the electric waterbath and the neck cutting equipment.
14. **Dwell time:** The dwell time within the waterbath should be adjusted to give a minimum dwell time of 4 s at the fastest line speed employed (EC Regulation

1099/2009).

**15. Electrical parameters:** The applied voltage should be adjusted to meet the following legislative requirements, where the average value per bird (mA) should be multiplied by the number of birds in the waterbath to give the total applied current:

Electrical requirements for waterbath stunning equipment (AC)  
(average values per bird)

Frequency (Hz)	Chickens	Turkeys	Ducks and geese	Quails
< 200 Hz	100 mA	250 mA	130 mA	45 mA
From 200 to 400 Hz	150 mA	400 mA	Not permitted	Not permitted
From 400 to 1500 Hz	200 mA	400 mA	Not permitted	Not permitted

Alternating current (AC) is calibrated in terms of true RMS (Root Mean Square) current, which is the equivalent to the heating effect of an AC voltage when compared to a DC voltage. Most low cost instrumentation and signal converters (for example, handheld multimeters of the sort used by maintenance engineers) carry out this conversion by filtering the signal into an average value and applying a correction factor. The voltmeter and ammeter display on the waterbath control panel require regular calibration (6 monthly) by a qualified electrician using a factory-calibrated multimeter. The use of pulsed direct current (DC) has been actively discouraged (Raj, et al, 2006)) as the waveform may result in electro-immobilisation i.e. paralysis rather than effective stunning.

#### **Assessment of the effectiveness of waterbath stunning**

A sample of 50 birds should be assessed from the exit of the waterbath, and if more than 2% do not meet the following criteria, the voltage should be increased and the above control measures tested.

16. *The signs of a stunned bird that is **alive** (stun-to-stun, simple stunning) post stun:*

- No rhythmic breathing within at least the first 8 seconds of leaving the bath;
- Neck arched with head directed vertically;
- Open eyes;
- Wings held close to the body;
- Rigidly extended legs and constant body tremors.

17. *The signs of a bird that has been **killed**(stunning) in the stunner is:*

- Completely limp carcass;



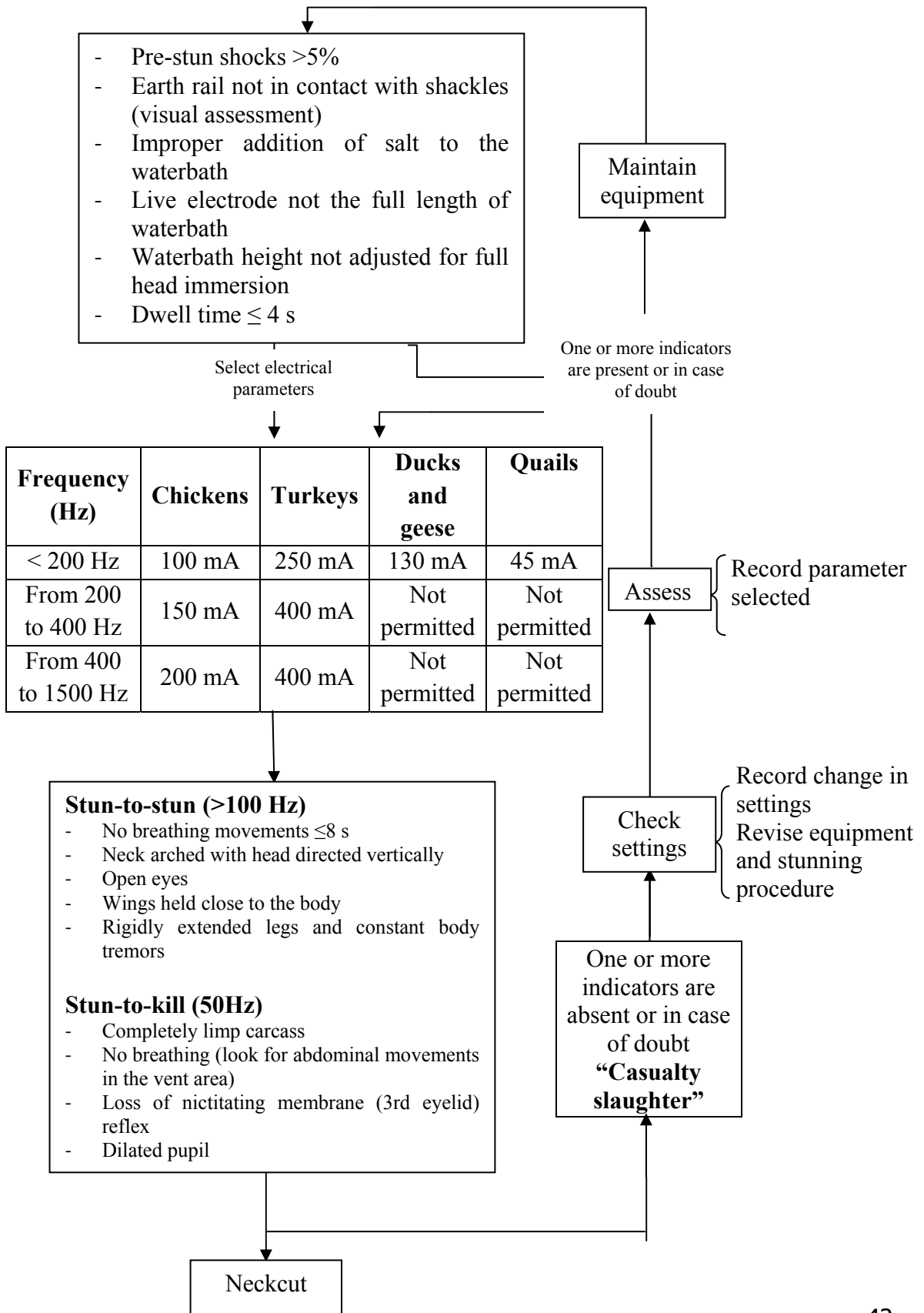
- No breathing (look for abdominal movements in the vent area);
- Loss of nictitating membrane (3<sup>rd</sup> eyelid) reflex;
- Dilated pupil.

### **Monitoring and recording procedures**

Business operators shall draw up a record of maintenance. They shall keep those records for at least one year and shall make them available to the competent authority upon request.

Until 8 December 2019, these requirements shall only apply to new equipment, which have not entered into operation before 1 January 2013: Waterbath stunning equipment shall be fitted with a device, which displays and records the details of the electrical key parameters used. These records shall be kept for at least one year.

## AWO/OPERATOR DECISION TREE



## **MONITORING STUNNING EFFECTIVENESS IN CATTLE AFTER PENETRATIVE CAPTIVE BOLT USE**

### **Objective:**

To monitor stunning effectiveness by assessing indicators of consciousness before the animal do not present any signs of life.

### **Responsibility:**

Animal welfare officer (AWO) and operators working on the stunning, hoisting and bleeding procedures.

### **Procedure**

The operators involved in the stunning procedure, hoisting and bleeding will assess signs of consciousness in all animals (100%), immediately after stunning, before hoisting and before and during bleeding.

The AWO should ensure that each day at least 5 % of the throughput is regularly checked. This should include a minimum of 10 animals (and regardless of slaughterhouse size, no more than 50 animals per day are required), a sample which should include each size of animals killed, and be carried out in such a way that each operator is regularly checked. The number of animals checked by the AWO may have to be increased on a risk basis (related to e.g. changes of operator, animal type or equipment). The assessment should last from the stunning application until death due to bleeding.

### **Control measures**

#### By the operator(s)

#### *18. Just after stunning and before being released from the box:*

- Remain standing or resume standing posture.
- Righting reflex
- Vocalizations
- Rhythmic breathing

#### *19. Immediately before and during hoisting:*

- Righting reflex
- Vocalizations
- Rhythmic breathing
- Eye movements

#### *20. Immediately before and during bleeding*

- Righting reflex
- Vocalizations

- Rhythmic breathing
- Eye movements

By the AWO (or the person designated by the business operator with a certificate of competence on the assessment of consciousness).

Assessment of the following procedures:

- a) Signs of consciousness from stunning application until death using the following indicators.
  - Maintenance of posture or resume standing posture
  - Righting reflex
  - Vocalizations
  - Rhythmic breathing
  - Eye movements
  - Positive corneal reflex
  - Nose pinching response
- h) Implementation of the SOP by the operator, and the skill and aptitude of the operator in assessing consciousness.
- i) The records of the operators regarding ineffective stunning and corrective action.

### **Corrective action**

#### Operator

Any animal showing any sign of consciousness:

- The animal should be re-stunned immediately. This can be done by: using the back-up stunning method, using the proper cartridge strength indicated by the manufacturer (if the previous cartridge used was not of the correct strength for the size of animal being stunned), repeating the shot 10 mm higher and 5 mm lateral from the correct shooting position (if previous shooting position was according to the manufacturer's instructions) or in the correct shooting position (if the previous shooting position was not according to the manufacturer's instructions), before reassessment and release from the stunning box, hoisting or bleeding.
- The ineffective gun and cartridges should be checked to verify if it needs maintenance before further use.

#### AWO

If one or more signs of consciousness are present, and have not been detected by the operator, or although being detected by the operator no corrective action has been taken:

- Ask the operator to re-stun (immediately) using the above protocol.
- Assess stunning procedures.
- Retrain operator in the application of the SOP.
- Internal Audit (long-term).

**Records** (a written record should be maintained of the effectiveness of the stunning method): Ineffective stunning should be recorded.

Operator:

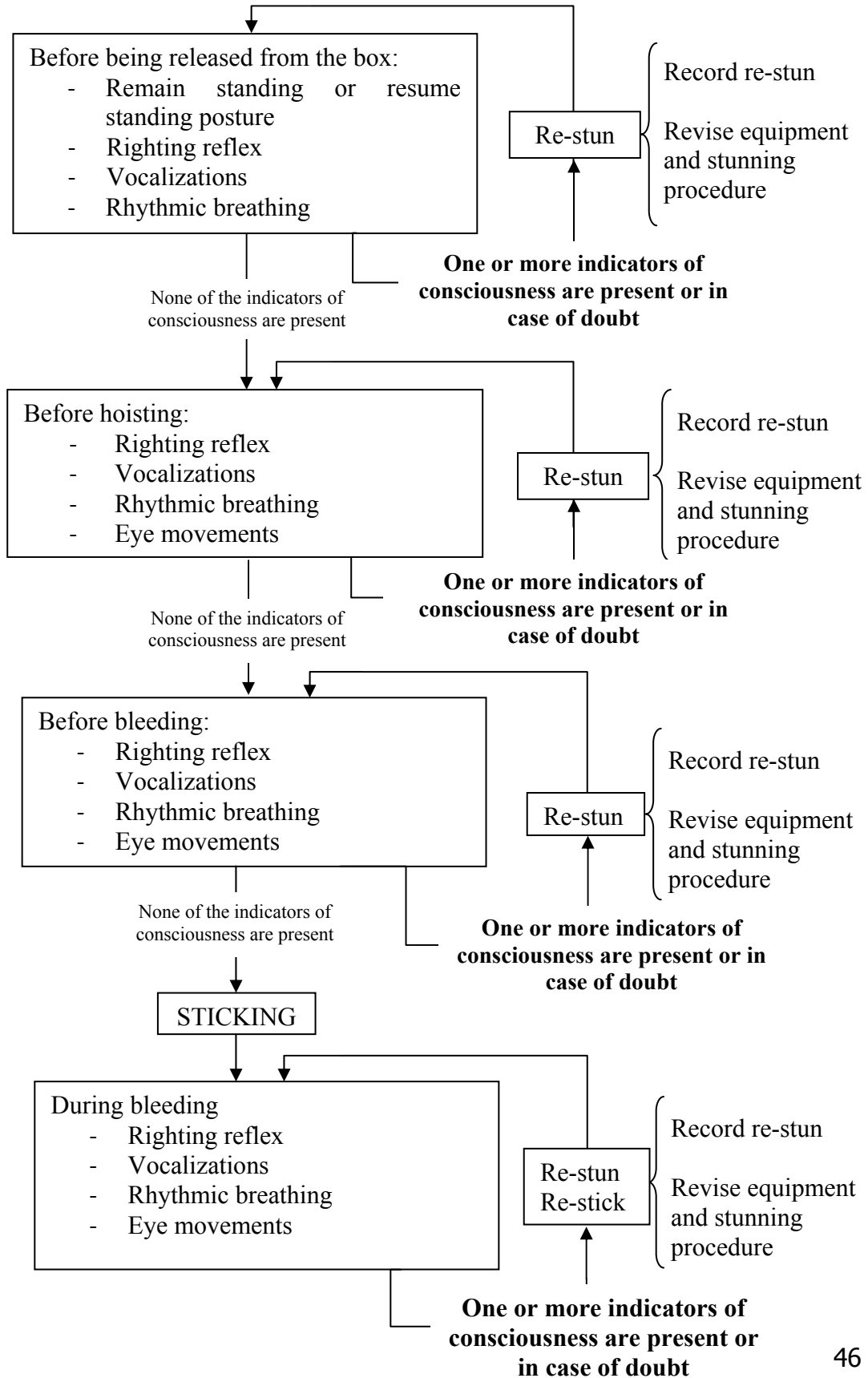
- Animals showing signs of consciousness.
- Corrective measures taken.
- Records of regular gun maintenance and the use of suitable cartridges

AWO:

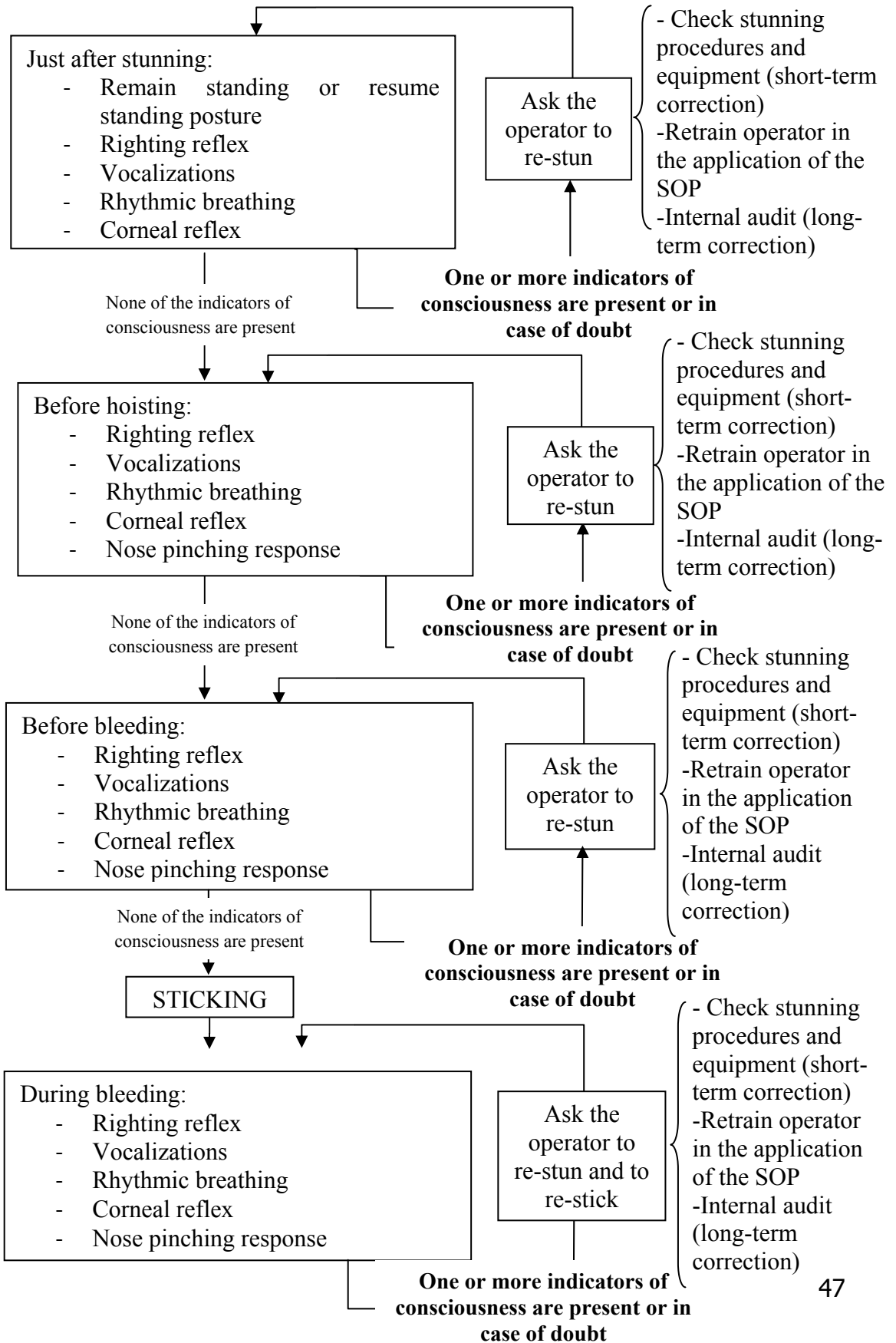
From the animals assessed daily, the following records should be kept:

- Number of animals checked.
- Number of ineffectively stunned animals.
- Number of ineffectively stunned animal not detected by the operator.
- The number of double stuns recorded by the stunning operator should be verified by an assessment of the double stuns on the heads by the AWO.

## OPERATOR(S) DECISION TREE



**ANIMAL WELFARE OFFICER DECISION TREE**



## **MONITORING STUNNING EFFECTIVENESS IN PIGS AFTER GAS STUNNING EQUIPMENT USE**

### **Objective:**

To monitor stunning effectiveness by assessing indicators of consciousness before death.

### **Responsibility:**

Animal welfare officer (AWO) and operators working on the stunning, hoisting and bleeding procedures.

### **Procedure**

The operators involved in the stunning procedure, hoisting and bleeding will assess signs of consciousness in all animals (100%), immediately after stunning, before hoisting and before and during bleeding.

The AWO should ensure that each day at least 5 % of the throughput is regularly checked. This should include a minimum of 10 animals (and regardless of slaughterhouse size, no more than 50 animals per day are required), a sample which should include each size of animals killed, and be carried out in such a way that each operator is regularly checked. The number of animals checked by the AWO may have to be increased on a risk basis (related to e.g. changes of operator, animal type or equipment). The assessment should last from the stunning application until death due to bleeding.

### **Control measures**

#### By the operator

1. *Just after stunning:*
  - Remain standing or resume standing posture
  - Righting reflex
  - Vocalizations
  - Rhythmic breathing
  - Eye movements
  
2. *Immediately before and during hoisting:*
  - Righting reflex
  - Vocalizations
  - Rhythmic breathing
  - Eye movements
  
3. *Immediately before and during bleeding*
  - Righting reflex
  - Vocalizations



- Rhythmic breathing
- Eye movements

By the AWO (or the person designated by the business operator with a certificate of competence on the assessment of consciousness).

Assessment of the following procedures:

- a) Signs of consciousness from stunning application until death using the following indicators.
  - Maintenance of posture or resume standing posture
  - Righting reflex
  - Vocalizations
  - Rhythmic breathing
  - Eye movements
  - Positive corneal reflex
  - Nose pinching response
- b) Implementation of the SOP by the operator, and the skill and aptitude of the operator in assessing consciousness.
- c) The records of the operators regarding ineffective stunning effect / re-stunning.

### **Corrective action**

#### Operator

Any animal showing any sign of consciousness:

- The animal should be re-stunned immediately. This can be done by: using the back-up stunning method, before reassessment and release from the stunning box, hoisting or bleeding.
- The ineffective stunning equipment should be checked if it needs maintenance before further use.
- The ineffective stunning equipment should be checked if it needs maintenance before further use.

## AWO

If one or more signs of consciousness are present, and have not been detected by the operator, or although being detected by the operator no corrective action has been taken:

- Ask the operator to re-stun (immediately) using the above protocol.
- Assess stunning procedures.
- Retrain operator in the application of the SOP.
- Internal Audit (long-term).

**Records** (a written record should be maintained of the effectiveness of the stunning method): Ineffective stunning should be recorded.

### Operator:

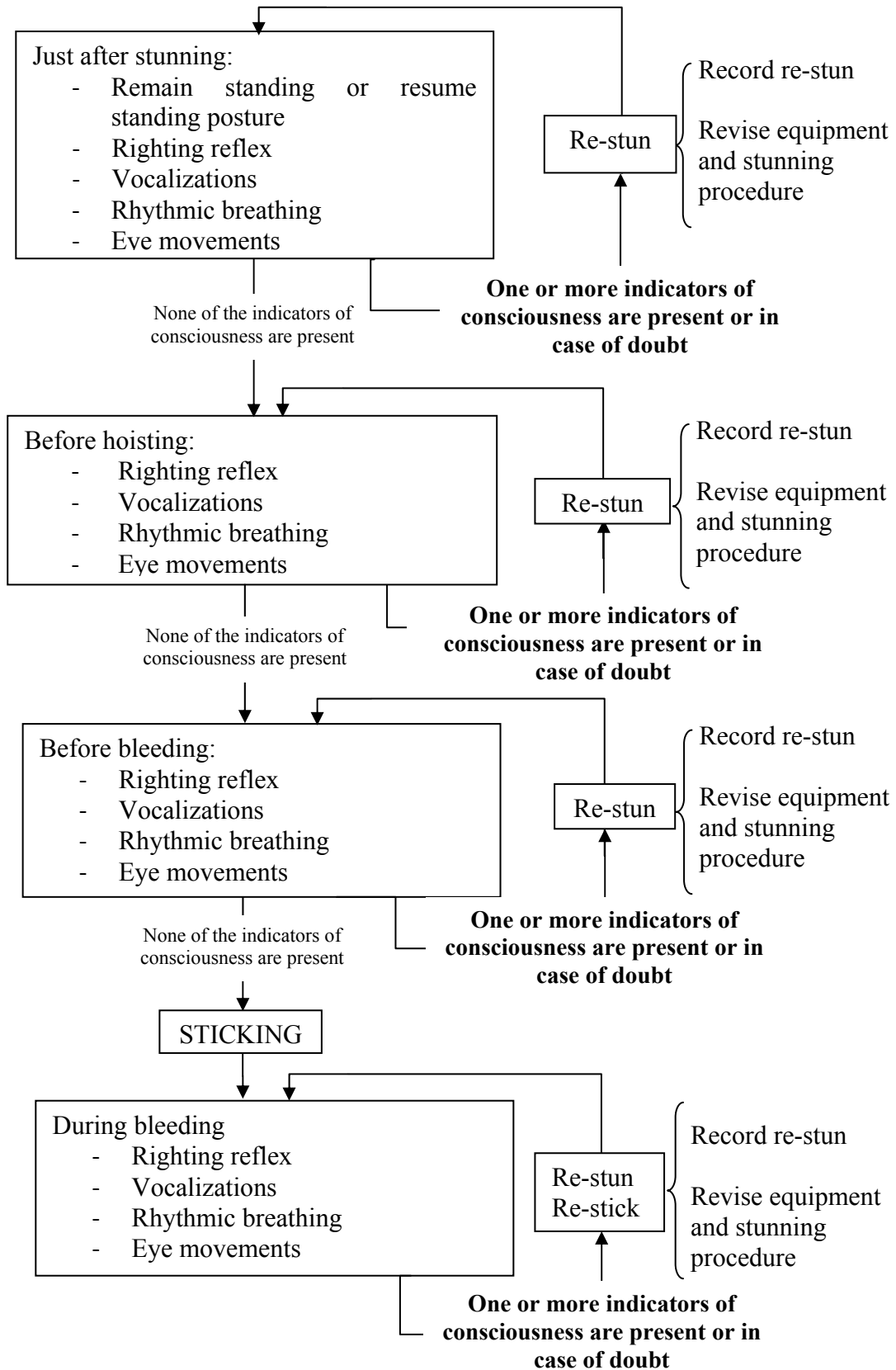
- Animals showing signs of consciousness.
- Corrective measures taken.
- Records of regular gun maintenance.

### AWO:

From the animals assessed daily:

- Number of animals checked.
- Number of ineffectively stunned animals.
- Number of ineffectively stunned animal not detected by the operator.

## OPERATOR(S) DECISION TREE





## **MONITORING STUNNING EFFECTIVENESS IN SHEEP AFTER ELECTRICAL STUNNING EQUIPMENT USE**

### **Objective:**

To monitor stunning effectiveness by assessing indicators of consciousness before death.

### **Responsibility:**

Animal welfare officer (AWO) and operators working on the stunning, hoisting and bleeding procedures.

### **Procedure**

The operators involved in the stunning procedure, hoisting and bleeding will assess signs of consciousness in all animals (100%), immediately after stunning, before hoisting and before and during bleeding.

The AWO should ensure that each day at least 5 % of the throughput is regularly checked. This should include a minimum of 10 animals (and regardless of slaughterhouse size, no more than 50 animals per day are required), a sample which should include each size of animals killed, and be carried out in such a way that each operator is regularly checked. The number of animals checked by the AWO may have to be increased on a risk basis (related to e.g. changes of operator, animal type or equipment). The assessment should last from the stunning application until death due to bleeding.

### **Control measures**

#### By the operator

1. *Just after stunning:*
  - Tonic seizure
  - Remain standing or resume standing posture
  - Righting reflex
  - Vocalizations
  - Rhythmic breathing
  
2. *Immediately before and during hoisting:*
  - Tonic-clonic seizure
  - Righting reflex
  - Vocalizations
  - Rhythmic breathing
  
3. *Immediately before and during bleeding*
  - Righting reflex
  - Vocalizations
  - Rhythmic breathing

By the AWO (or the person designated by the business operator with a certificate of competence on the assessment of consciousness).

Assessment of the following procedures:

- a) Signs of unconsciousness from stunning application brain death using the following indicators.
  - Tonic-clonic seizure
  - Maintenance of posture or resume standing posture
  - Righting reflex
  - Rhythmic breathing
  - Vocalizations
  - Nose pinching response
- j) Implementation of the SOP by the operator, and the skill and aptitude of the operator in assessing consciousness.
- k) The records of the operators regarding ineffective stunning effect / re-stunning.

#### Operator

Any animal showing any sign of consciousness:

- The animal should be re-stunned immediately. This can be done by: using the back-up stunning method, before reassessment and release from the stunning box, hoisting or bleeding.
- The ineffective tongs should be checked if it needs maintenance before further use.

#### AWO

If one or more signs of consciousness are present, and have not been detected by the operator, or although being detected by the operator no corrective action has been taken:

- Ask the operator to re-stun (immediately) using the above protocol.
- Assess stunning procedures.
- Retrain operator in the application of the SOP.
- Internal Audit (long-term).

**Records** (a written record should be maintained of the effectiveness of the stunning method): Ineffective stunning should be recorded.

#### Operator:

- Animals showing signs of consciousness.
- Corrective measures taken.

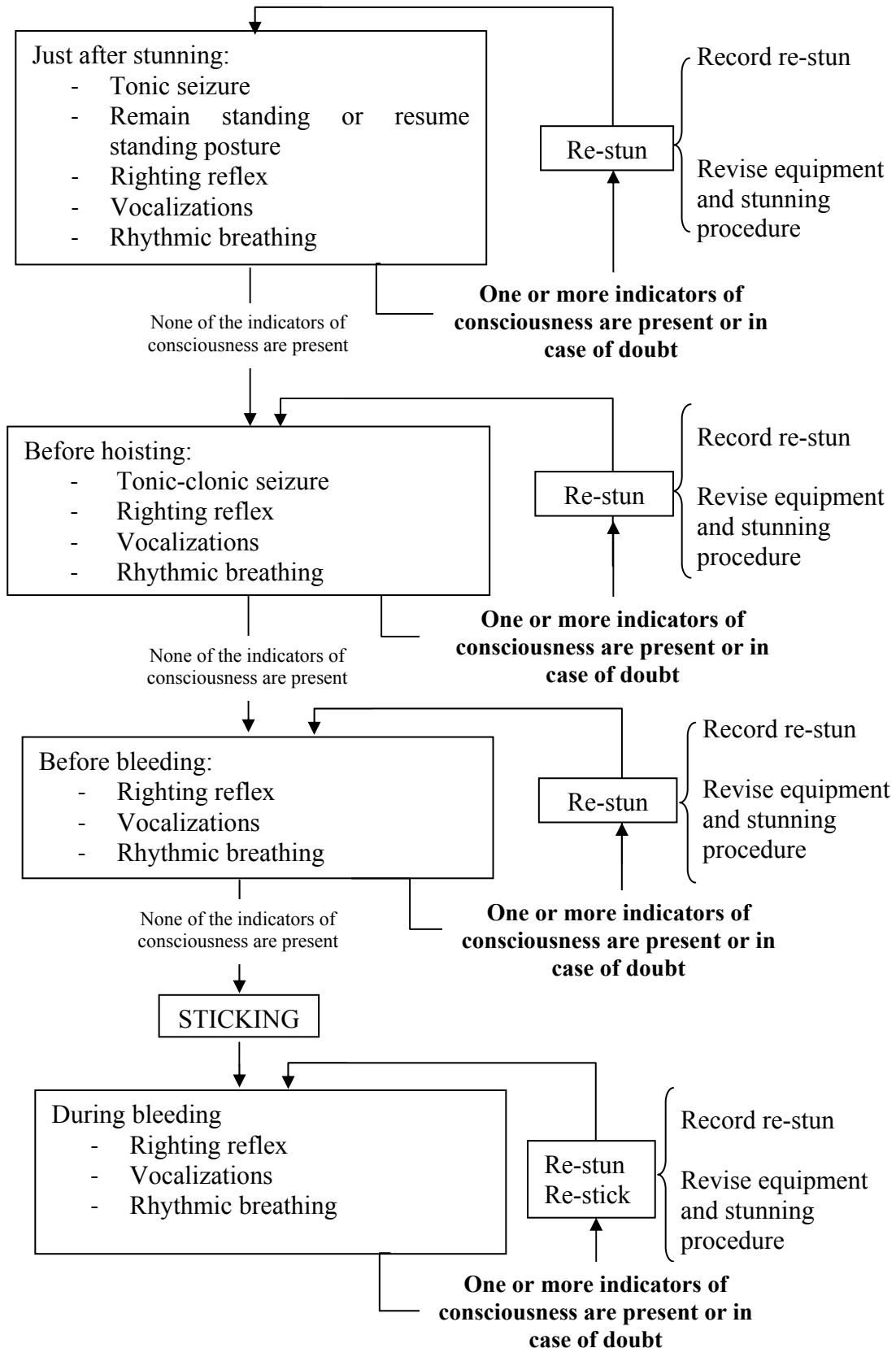
- Records of regular gun maintenance.

AWO:

From the animals assessed daily, the following records should be kept:

- Number of animals checked.
- Number of ineffectively stunned animals.
- Number of ineffectively stunned animal not detected by the operator.

## OPERATOR(S) DECISION TREE





**ANIMAL WELFARE OFFICER DECISION TREE**

