

DELIVERABLE

D2.2.1: LIST AND DESCRIPTION OF IMPROVED METHODS FOR THE ASSESSMENT OF WELFARE

Table of Contents

Background	3
Objectives	3
Part 1: Identification of methods which are the most difficult to implement	4
Procedures	4
Results	5
Discussion	12
Part 2: Proposal of alternative methods of animal welfare assessment	14
List and description of improved methods for assessment of welfare	15
Acknowledgements	15
Appendix 1: Selected legal requirements used during interviews of animal welfare inspectors	16

Background

When official veterinarians perform animal welfare inspections on farms or at slaughterhouses, they follow a checklist tied to the EU and/or national legal requirements, often specified for the specific species and stage of production. During such an animal welfare inspection, different parameters are chosen as indicators of animal welfare, and the sum of those is considered the overall welfare status of the flock.

To estimate the level of each welfare indicator, a method is used. For example, a legal requirement in the broiler directive specifies that the level of ammonia has to be below 20 ppm in the barn. The welfare indicator used here could be NH₃ concentration. The associated method would be a description of how to measure the NH₃ concentration in the barn.

This document regards the methods used during official animal welfare inspections on broiler farms, in alternative systems for laying hens and in slaughterhouses applying waterbath stunning.

Objectives

In 2020, the aim of sub-activity 2.2 was to develop and/or coordinate the development and improvement of methods for the assessment of the level of animal welfare. Specifically, we wanted:

- To identify the requirements where the associated methods for assessing compliance are found to be difficult, problematic or non-existing (**Part 1**).
- To propose alternative methods of animal welfare assessment (in terms of validity, reliability and/or feasibility) for those most difficult to implement (**Part 2**).
 - List and description of improved methods for the assessment of welfare.

This was done in relation to the three priority areas: welfare of broilers on farm (Directive 98/58/EC), welfare of laying hens in alternative systems (Directive 1999/74/EC) and loss of consciousness during waterbath stunning of broilers and turkeys during slaughter (EC No 1099/2009).

Part 1: Identification of methods which are the most difficult to implement

Procedures

Data collection

First, the members of EURCAW-Poultry-SFA selected the legal requirements within the three priority areas that, based on experience and knowledge, were most likely to be problematic to verify compliance with during animal welfare inspections. This resulted in the following number of selected requirements: broiler farms $n = 14$, laying hens in alternative systems $n = 11$ and waterbath stunning $n = 6$ (see Appendix 1). To find out which of the associated methods that the competent authorities (CAs) find difficult, problematic or non-existing, CAs were asked for their opinion on whether and why the selected legislative requirements are found difficult to assess during official controls. This was done using two approaches: 1) during the workshops held at the 1st EURCAW-Poultry-SFA meeting where CAs from the Member States participated and 2) during 1:1 interviews where partners of EURCAW-Poultry-SFA interviewed inspectors in different Member States.

Workshop: Three workshops, one for each priority area, were held the 17th September 2020 during the 1st EURCAW-Poultry-SFA meeting. Due to time restrictions for the workshops, a subsample of the initially selected legal requirements was selected (broiler farms $n = 7$, laying hens = 8, waterbath stunning $n = 4$). For each of the selected requirements, the participants were asked to answer a number of questions using the questionnaire app “Mentimeter”. During the broiler and laying hen workshops, the questions asked for each of the requirements were identical, whereas the questions asked during the waterbath session were different and varied between the legal requirements. The number of participants in the workshops were: broiler $n = 10$, laying hens $n = 10$, waterbath stunning $n = 13$. However, not all participants answered every question posed in the questionnaire. The question asked that was relevant to the present subactivity was: Which difficulties do you find when verifying compliance of the requirement? The participants could choose one or more of several options, which in the broiler and laying hen sessions included “None”, “Lack of validated method for assessment” or “It requires considerable amount of time”. In the waterbath session, the option “Lack of practical method” was included and found relevant for this subactivity.

Interviews: To recruit inspectors for the 1:1 interviews, 17 of the EU Member States were approached by email. The selection criterion was that the contact person on the official list of CAs collected by EURCAW-Poultry-SFA had participated in the 1st EURCAW-Poultry-SFA meeting. This was to gain an efficient dialogue and data collection as these contact persons already were informed about the interviews and the overall purpose of the Centre. The CAs were asked to recruit inspectors in their home country that were experienced in performing animal welfare inspections in the three priority areas. When inspectors had accepted to be interviewed, they were approached by EURCAW-Poultry-SFA members. The inspectors were advised about the topics for discussion prior to the interview, but he/she was not specifically

asked to prepare anything. During the interview, the list of selected legal requirements was discussed, one legal requirement at a time. The inspector was asked to describe how he/she verifies compliance for each of the legal requirements, including which indicators that he/she uses and how these are measured/assessed, i.e. which method is used. The inspector was asked to focus on the methods, but as these depend on the indicators applied, it was also necessary to gather some information on the indicators used. For each of the legal requirements, the inspector was also encouraged to tell if he/she experiences any challenges during inspections. If the inspector had anything else to add, it was noted. Furthermore, the inspector's number of years of experience in animal welfare inspections was noted.

Data analysis

Workshop: For each legal requirement, the percentage of participants choosing a statement was calculated based on the number of participants voting specifically in that part of the session.

Interviews: The interviews were compiled for each legal requirement. Based on the statements from the inspectors, requirements were then categorised as:

- 1) “method posing problems”: at least one inspector expressed concerns regarding the validity/reliability/feasibility of the method associated to the requirement.
- 2) “method considered acceptable, but other concerns exist”: a general consensus that the method associated to the requirement was valid/reliable/feasible, but other concerns related to the requirement were expressed. For example, in the requirement regarding perches in alternative systems for laying hens, the inspectors found the method for assessing compliance with the requirement valid/reliable/feasible, but concerns were expressed regarding lack of a definition of “adequate” perches and which material, diameter, height, etc. that should be accepted.
- 3) “no problems experienced”: a general consensus that the method associated to the requirement was valid/reliable/feasible and no other concerns were raised.

Results

Workshop

The results gained in the broiler workshop are presented in Table 1. All but one of the legal requirements were found to lack a validated method of assessment by at least one of the participants. The three legal requirements that were found by most participants to lack a validated method of assessment were dust level (62.5% of the participants), light intensity (60.0%) and sound level (55.6%).

Table 1. Proportion of CAs (%) finding a range of statements regarding the selected legal requirements in the broiler directive (Directive 98/58/EC) to be true. The questionnaire was performed in Mentimeter during the workshop at the 1st EURCAW-Poultry-SFA meeting (17–18th September 2020). Only the short names of the legal requirements are listed – for the full descriptions see Appendix 1.

Legal requirement	None (%)	Lack of knowledge or definition (%)	Lack of validated method of assessment (%)	Access to facilities (%)	Need of additional equipment (%)	Lack of threshold (%)	Lack of training (%)	It requires considerable amount of time (%)	Others (%)
Dust	12.5	25.0	62.5	0.0	0.0	37.5	0.0	0.0	0.0
Temp, humidity & ventilation	10.0	10.0	40.0	0.0	60.0	70.0	30.0	20.0	10.0
Gas	20.0	10.0	20.0	0.0	60.0	10.0	30.0	10.0	10.0
Noise	0.0	44.4	55.6	0.0	77.8	55.6	44.4	11.1	0.0
Light intensity	30.0	0.0	60.0	10.0	70.0	10.0	30.0	0.0	0.0
Mortality	60.0	0.0	0.0	10.0	10.0	30.0	10.0	20.0	0.0
Post mortem	30.0	10.0	10.0	0.0	20.0	10.0	60.0	40.0	0.0

Participants: N = 6–10, depending on legal requirement

The results gained in the laying hen workshop are presented in Table 2. All of the legal requirements were found to lack a validated method of assessment by at least one of the participants. The three requirements that most participants voted as lacking a validated method of assessment were the ones on dust level (85.7%), temperature & humidity (50.0%) and ventilation (85.7%). Surprisingly, although nearly all participants found that there is a lack of a validated method for assessing the dust level, none found assessment of this requirement problematic. Presumably, this was due to the CAs finding dust levels to be of no important significance to the welfare of laying hens in alternative systems.

Table 2. Proportion of CAs (%) finding a range of statements regarding the selected legal requirements in the directive for laying hens in alternative systems (Directive 1999/74/EC) to be true. The questionnaire was performed in Mentimeter during the workshop at the 1st EURCAW-Poultry-SFA meeting (17–18th September 2020). Only the short names of the legal requirements are listed – for the full descriptions see Appendix 1.

Legal requirement	None (%)	Lack of knowledge or definition (%)	Lack of validated method of assessment (%)	Access to facilities (%)	Need of additional equipment (%)	Lack of threshold (%)	Lack of training (%)	It requires considerable amount of time (%)	Others (%)
Gas	0.0	77.8	33.3	0.0	33.3	33.3	11.1	0.0	0.0
Light	11.1	55.6	44.4	0.0	33.3	33.3	0.0	11.1	0.0
Twilight	22.2	55.6	22.2	0.0	0.0	44.4	11.1	0.0	0.0
Perches	55.6	11.1	22.2	0.0	0.0	0.0	11.1	22.2	11.1
Litter	75.0	12.5	12.5	0.0	0.0	0.0	0.0	12.5	0.0
Dust	0.0	85.7	85.7	0.0	14.3	28.6	28.6	0.0	0.0
Temperature & humidity	50.0	25.0	50.0	0.0	25.0	25.0	25.0	0.0	0.0
Ventilation	14.3	28.6	85.7	0.0	14.3	0.0	14.3	0.0	0.0

Participants: N = 4–9, depending on legal requirement

In the waterbath workshop, the legal requirement that was found by most participants to lack a validated or practical method of assessment was “sample size and frequency of checks” (62.5%; Table 3). However, one requirement did not include these questions, and one requirement combined “Lack of validated method of assessment” with “Lack of or not appropriate SOP”. The latter was indicated by 75.0% of the participants.

Table 3. Proportion of CAs (%) finding a range of statements regarding the selected legal requirements in the regulation regarding unconsciousness of broilers during slaughter (EC No 1099/2009) to be true. The questionnaire was performed in Mentimeter during the workshop at the 1st EURCAW-Poultry-SFA meeting (17–18th September 2020). Only the short names of the legal requirements are listed – for the full descriptions see Appendix 1.

	None	Lack of knowledge or definition	Lack of practical method	Lack of back up method	Lack of validated method of assessment	Lack of or not appropriate SOP	Access to facilities	Lack of training	It requires considerable amount of time	Not able to distinguish unconscious bird from conscious but paralysed bird	Line speed is too fast	Birds are shackled too close to each other	Others
Unconsciousness	16.7	8.3	.	.	.	.	50.0	16.7	0.0	58.3	41.7	8.3	16.7
Sample and frequency of checks	12.5	87.5	62.5	.	.	.	.	25.0	62.5	.	.	.	0.0
Action when not properly stunned	0.0	.	.	22.2	11.1	22.2	66.7	33.3	11.1	.	77.8	44.4	11.1
Frequency in relation to different parameters	0.0	62.5	.	.		75.0	.	37.5	.	.	.	.	0.0

Participants: N = 4–7, depending on legal requirement

Interviews

The responses from the Member States to the invitation for interviews are shown in Table 4. No response was obtained from four Member States. Four Member States were unable to participate for various reasons (no time available (n = 3), lack of English skills (n = 1)). The remaining nine countries participated in the interviews, although one country only participated in the interview regarding broiler farms due to lack of time available. Furthermore, one of the nine participating countries participated by filling in the questionnaires themselves due to lack of confidence in speaking English. The mean (range) years of experience of the participating inspectors were 16.3 (1.5–35) years for the inspectors of the broiler farms, 17.8 (1.5–35) years for the inspectors of the laying hens in alternative systems and 14 (2–35) years for the inspectors of waterbath stunning.

Table 4. Member States approached and their responses in terms of possibility of interviewing inspectors regarding animal welfare inspections in broiler farms (BF), alternative systems for laying hens (LH) and during waterbath stunning (WB).

Member States approached	Response		
	None	Not able to participate	Participated
Austria		X ¹	-
Belgium	X		
Croatia			X
Denmark		X ²	X (only BF)
Estonia			X
Finland			X
France			X
Greece			X
Italy			X
Latvia		X ³	
Luxembourg		X ⁴	
Malta	X		
Poland	X		
Slovak Republic/ Slovakia	X		
Slovenia		X	
Spain			X
Sweden			X

¹No time available in the period of interviews.

²Huge work load due to corona in mink => no interviews regarding LH and WB.

³English barriers.

⁴Too few inspectors to be able to set off time for interviews.

Most of the requirements selected in the three priority areas were considered by the inspectors to be posing problems (Tables 5, 6 and 7). Importantly, a general impression from the interviews was that there is a lot of variation in the methodology applied when assessing compliance, even when the same welfare indicators are used. For a specific welfare indicator, this could be the number of spots in the barn inspected, the areas selected for inspections, etc.

Table 5. Broiler farms: Conclusions on the inspectors' opinion on the methods used when assessing compliance with the selected legal requirements inspected. The conclusions are based on the compilation of the opinions of the inspectors gained during 1:1 interviews and are divided into three categories: 1) No problems experienced and no other concerns exist, 2) Method considered acceptable, but other concerns exist and 3) Method posing problems. Only the short names of the legal requirements are listed – for the full descriptions see Appendix 1.

Legal requirements	Conclusion	Comment
Number of staff	No problems experienced	-
Training	Method considered acceptable, but other concerns exist	Considered suboptimal that it is only a requirement for the owner, but not for the staff actually caring for the birds.
Litter	No problems experienced	-
Feeding equipment	No problems experienced	-
Watering equipment	No problems experienced	-
Temperature	Method posing problems	Difficult making parallels with the outdoor temperature
Humidity	Method posing problems	Often not measured, usually due to lack of measuring device. For that reason, most do not have a method for how to measure.
Ventilation	Method posing problems	Mainly reported problematic by those that do not use animal-based indicators.
Gas	Method posing problems	Measuring devices are either not available, not feasible or not reliable.
Dust	Method posing problems	Highly variable if and how dust level is measured.
Light intensity	Method posing problems	Highly variable if and how light intensity is measured. Measuring devices are either not available or not reliable.
Light program	Method posing problems	Relies on the farmers' programming in the control system. However, organic producers do not have the same level of automation.
Sound	Method posing problems	General uncertainty about how to measure sound level and which device to use.
Stocking density	Method considered acceptable, but other concerns exist	Collecting the correct figures can be very complicated

Table 6. Alternative systems for laying hens: Conclusions on the inspectors' opinion on the methods used when assessing compliance with the selected legal requirements inspected. The conclusions are based on the compilation of the opinions of the inspectors gained during 1:1 interviews and are divided into three categories: 1) No problems experienced, 2) Method considered acceptable, but other concerns exist and 3) Method posing problems. Only the short names of the legal requirements are listed – for the full descriptions see Appendix 1.

Legal requirements	Conclusion	Comment
Gas	Method posing problems	Uncertainty about where to measure, especially in multitier systems, and the reliability of the device used.
Light	Method posing problems	Relies on the farmers' programming in the control system. However, organic producers do not have the same level of automation. Other concerns: No threshold for light intensity.
Twilight	Method considered acceptable, but other concerns exist	Relies on the farmers' programming in the control system. However, organic producers do not have the same level of automation. Lack of definition of twilight and sufficient duration.
Perches	Method considered acceptable, but other concerns exist	Lack of definition of "adequate" perches and which material, diameter, height, etc. should be accepted.
Litter	Method considered acceptable, but other concerns exist	Lack of definition of which materials should be used, quality, frequency of renewal and depth. Unclear if the space occupied by structures (e.g. feeders) should be subtracted from the total littered area.
Dust	Method posing problems	All of the methods mentioned are considered insufficiently validated and/or insufficiently standardised for them to be reliable.
Temperature & humidity	Method posing problems	Humidity often not assessed per se. Other concerns: Lack of thresholds. Lack of measuring device for humidity.
Ventilation	Method posing problems	Mainly reported problematic by those that do not use animal-based indicators.
Flooring design	Method posing problems	Lack of definition of a slatted floor that "adequately" supports the foot (materials, dimensions). Lack of guideline to assess footpad lesions in laying hens.
Multitier systems	Method considered acceptable, but other concerns exist	Some uncertainty whether the floor level is counted in as one of the tiers.
Nests	Method considered acceptable, but other concerns exist	Lack of proper definitions of a nest (materials, adequate type of floor, etc.) and of adequate individual nest dimensions. Unclear whether access to nests should be permanent.

Table 7. Waterbath stunning: Conclusions on the inspectors' opinion on the methods used when assessing compliance with the selected legal requirements in regards to inspection. The conclusions are based on the compilation of the opinions of the inspectors gained during 1:1 interviews and are divided into three categories: 1) No problems experienced, 2) Method considered acceptable, but other concerns exist and 3) Method posing problems. Only the short names of the legal requirements are listed – for the full descriptions see Appendix 1.

Legal requirements		Comment
Unconsciousness	Method posing problems	Facility design hinders inspection (access to the animals, low light intensity, too high line speed, etc.). More training in using animal-based indicators is needed.
Checks – sample size and frequency	Method posing problems	Extreme inconsistency in sample size and frequency between slaughterhouses, which seems to lead to uncertainty in how inspectors should assess compliance.
Insufficient stunning	Method posing problems	Often reported that the line speed is too fast for any of the methods used to be valid.
Checks – frequency	Method posing problems	Other concerns: Lack of education and thresholds.
Electrical key parameters	Method considered acceptable, but other concerns exist	Other concerns: No appropriate equipment to verify if the waterbath stunning equipment is properly calibrated or to measure exactly the level of current each bird receives.
Electrodes and waterbath layout	Method posing problems	Mainly reported problematic due to facility design and line speed hindering inspection (simple solution: transparent waterbath, stop the line).

Discussion

Surprisingly, the methods used for most of the legal requirements posed problems to one or more CAs answering the questionnaire and by the inspectors interviewed. In Part 2, we propose better methods for some of the requirements found problematic and a list of legal requirements for which better methods should be developed. EURCAW-Poultry-SFA proposes to include the latter in the next work programme.

A reflection on the two different approaches to data collection is that both have benefits and disadvantages. The interviews with animal welfare inspectors resulted in very detailed information on performance of animal welfare inspections, including the methods used for assessment. It also allowed the interviewer to ask for clarification and further information on specific topics addressed. However, it was quite hard for the interviewers to ensure that the inspectors would stick to the topic, i.e. the methods used for assessment. Thus, a lot of the information gained was not necessarily useful for the present sub-activity, but it is likely to be useful in the future work in EURCAW-Poultry-SFA. The data collection using the

questionnaires during the workshops at the 1st EURCAW-Poultry-SFA meeting was much more time-efficient but with the disadvantage of being more superficial, bringing more an overview than detailed information. Furthermore, the purpose of the questions posed in the questionnaire at the workshop did not only target the present sub-activity but also other activities of the Centre, thus being a compromise between different tasks. The two approaches also targeted different people with different areas of responsibility in relation to animal welfare inspections, as the CAs participating in the 1st EURCAW-Poultry-SFA meeting were mainly superiors to the inspectors. Thus, combining the two approaches of data collection is recommended for future work in EURCAW-Poultry-SFA.

Part 2: Proposal of alternative methods of animal welfare assessment

A summary of all the requirements found in Part 1 to be difficult to implement due to methods for assessment being difficult, problematic or lacking can be seen in Table 8. Furthermore, Table 8 shows for which legal requirements methods have been developed for in this work programme (4 methods published online), which that will be developed in the next work programme (D.2.2.2) and which that are not prioritised for the present and coming work programmes. The latter category may be followed up on in future work programmes.

The decisions on which of the three categories to place each of the methods in were partly based on how problematic a method was found by inspectors and CAs in Part 1 and partly based on the availability of alternative methods that could be considered as improvements compared to the methods used presently by some Member States. To identify the latter, we made use of existing literature, including scientific literature and guidelines/recommendations already in use in some Member States. Where no better alternative methods were found, proposals for scientific and technical studies were made for the following work programmes.

Table 8. Overview of the legal requirements for which improved methods of assessment are delivered in the present work programme (D.2.2.1), as part of the next work programme (D.2.2.2) or not prioritised. The legal requirements belong to the three priority areas: broiler farms, alternative systems for laying hens and waterbath stunning. Only the short names of the legal requirements are listed – for the full descriptions see Appendix 1.

Legal requirement	Priority area			Improved methods		
	Broiler	Laying hens	Water-bath	2020 (D.2.2.1)	Next WP (D.2.2.2)	Not prioritised
Temperature	X	X				X
Humidity	X	X				X
Ventilation	X	X				X
Gas	X	X		X		
Dust	X	X			X	
Light/ Light intensity /light program	X	X		X		
Sound	X					X
Flooring design		X				X
Unconsciousness			X		X	
Checks – sample size and frequency			X		X	
Insufficient stunning			X			X
Checks – frequency			X		X	
Electrodes and waterbath layout			X			X

List and description of improved methods for assessment of welfare

Contained in the 2020 work programme, improved methods of assessment are reported for the following legal requirements:

1. The legal requirement on gas concentrations (NH₃ and CO₂) in broiler farms
[Method for assessing gas concentrations in broiler farms.](#) (Online document)
2. The legal requirement on gas concentrations (NH₃ and CO₂) in alternative systems for laying hens.
[Method for assessing gas concentrations in alternative systems for laying hens.](#) (Online document)
3. The legal requirement on light intensity in broiler farms.
[Method for assessing light intensity in broiler farms.](#) (Online document)
4. The legal requirement on light intensity in alternative systems for laying hens.
[Method for assessing light intensity in alternative systems for laying hens.](#) (Online document)

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Appendix 1: Selected legal requirements used during interviews of animal welfare inspectors

Broiler farms

1. Number of staff

Legal requirement: “*Animals shall be cared for by a sufficient number of staff.*” (Directive 98/58/EC, Annex, Paragraph 1)

2. Training

Legal requirement: “*Member States shall ensure that keepers who are natural persons have received sufficient training in their tasks and that appropriate training courses are available. Member States shall ensure that a system is established for the control and approval of training courses. The keeper of the chickens shall hold a certificate which is recognised by the competent authority of the Member State concerned, attesting to the completion of such a training course or to having acquired experience equivalent to such training.*” (Directive 2007/43 EC, Article 4)

3. Litter

Legal requirement: “*All chickens shall have permanent access to litter which is dry and friable on the surface.*” (Directive 2007/43 EC, Annex I, Paragraph 3)

4. Feeding equipment

Legal requirement: “*Feeding equipment must be designed, constructed and placed so that contamination of food and the harmful effects of competition between the animals are minimised.*” (Directive 98/58 EC, Annex, Paragraphs 14, 15 and 17)

5. Watering equipment

Legal requirement: “*Watering equipment must be designed, constructed and placed so that contamination of water and the harmful effects of competition between the animals are minimised.*” (Directive 98/58 EC, Annex, Paragraphs 16 and 17)

6. Temperature

Legal requirement: “*[...] temperature [...] must be kept within limits which are not harmful to the animals.*” (Directive 98/58 EC, Annex, Paragraph 10 - Directive 2007/43 EC, Annex I, Paragraph 4)

Legal requirement: “*[...]; (b) the inside temperature, when the outside temperature measured in the shade exceeds 30° C, does not exceed this outside temperature by more than 3° C.*” (Directive 2007/43 EC, Annex II, Paragraph 3)

7. Humidity

Legal requirement: “*[...]; relative air humidity [...] must be kept within limits which are not harmful to the animals.*” (Directive 98/58 EC, Annex, Paragraph 10 - Directive 2007/43 EC, Annex I, Paragraph 4)

Legal requirement: “*[...] (c) the average relative humidity measured inside the house during 48 hours does not exceed 70 % when the outside temperature is below 10° C.*” (Directive 2007/43 EC, Annex II, Paragraph 3)

8. Ventilation

Legal requirement: “*Ventilation shall be sufficient to avoid overheating and, where*

necessary, in combination with heating systems to remove excessive moisture.” (Directive 98/58 EC, Annex, Paragraph 10 - Directive 2007/43 EC, Annex I, Paragraph 4)

9. Gas

Legal requirement: “[...] *gas concentrations must be kept within limits which are not harmful to the animals.*” (Directive 98/58 EC, Annex, Paragraph 10)

Legal requirement: “[...] *(a) the concentration of ammonia (NH₃) does not exceed 20 ppm and the concentration of carbon dioxide (CO₂) does not exceed 3000 ppm measured at the level of the chickens’ heads.*” (Directive 2007/43 EC, Annex II, Paragraph 3)

10. Dust

Legal requirement: “[...] *dust levels must be kept within limits which are not harmful to the animals.*” (Directive 98/58 EC, Annex, Paragraph 10)

11. Light intensity

Legal requirement: “*All buildings shall have lighting with an intensity of at least 20 lux during the lighting periods, measured at bird eye level and illuminating at least 80% of the usable area. A temporary reduction in the lighting level may be allowed when necessary following veterinary advice.*” (Directive 2007/43 EU, Annex I, Paragraph 6)

12. Light program

Legal requirement: “*Animals kept in buildings must not be kept either in permanent darkness or without an appropriate period of rest from artificial lighting. Within seven days from the time when the chickens are placed in the building and until three days before the foreseen time of slaughter, the lighting must follow a 24-hour rhythm and include periods of darkness lasting at least six hours in total, with at least one uninterrupted period of darkness of at least four hours, excluding dimming periods.*” (Directive 98/58 EU, Annex, Paragraph 11 - Directive 2007/43 EU, Annex I, Paragraph 7)

13. Sound

Legal requirement: “*The sound level shall be minimised. Ventilation fans, feeding machinery or other equipment shall be constructed, placed, operated and maintained in such a way that they cause the least possible amount of noise.*” (Directive 2007/43 EU, Annex I, Paragraph 5)

14. Stocking density

Legal requirement: “*Criteria for the use of increased stocking density (up to 42 kg/m²): Criteria: (a) the monitoring of the holding carried out by the competent authority within the last two years did not reveal any deficiencies with respect to the requirements of this Directive, and (b) the monitoring by the owner or keeper of the holding is carried out using the guides to good management practice referred to in Article 8, and (c) in at least seven consecutive, subsequently checked flocks from a house the cumulative daily mortality rate was below 1 % + 0,06 % multiplied by the slaughter age of the flock in days.*” (Directive 2007/43 EC, Annex V, Paragraph 1)

Legal requirement: “*In the case of stocking densities higher than 33 kg/m², the documentation accompanying the flock shall include the daily mortality rate and the cumulative daily mortality rate calculated by the owner or keeper and the hybrid or breed of the chickens. [...] These data as well as the number of broilers dead on arrival shall be recorded, indicating the holding and the house of the holding.*” (Directive 2007/43 EC, Annex III, Paragraph 1)

Alternative systems for laying hens

1. Gas concentrations

Legal requirement: “[...]gas concentrations must be kept within limits which are not harmful to the animals” (Directive 98/58 EC, Annex, Point 10)

2. Light

Legal requirement: “All buildings shall have light levels sufficient to allow all hens to see one another and be seen clearly, to investigate their surroundings visually and to show normal levels of activity. After the first days of conditioning, the lighting regime shall be such as to prevent health and behavioural problems. Accordingly it must follow a 24-hour rhythm and include an adequate uninterrupted period of darkness lasting, by way of indication, about one third of the day, so that the hens may rest and to avoid problems such as immunodepression and ocular anomalies.” (Directive 1999/74/EC, Annex, Point 3)

3. Twilight

Legal requirement: “A period of twilight of sufficient duration ought to be provided when the light is dimmed so that the hens may settle down without disturbance or injury.” (Directive 1999/74/EC, Annex, Paragraph 3)

4. Perches

Legal requirement: “Adequate perches, without sharp edges and providing at least 15 cm per hen. Perches must not be mounted above the litter and the horizontal distance between perches must be at least 30 cm and the horizontal distance between the perch and the wall must be at least 20 cm” (Directive 1999/74/EC, Article 4)

5. Litter

Legal requirement: “At least 250 cm² of littered area per hen, the litter occupying at least one third of the ground surface” (Directive 1999/74/EC, Article 4)

6. Dust

Legal requirement: “[...] dust levels must be kept within limits which are not harmful to the animals” (Directive 98/58 EC, Annex, Point 10)

7. Temperature and humidity

Legal requirement: “[...] temperature, relative air humidity [...] must be kept within limits which are not harmful to the animals. ” (Directive 98/58 EC, Annex, Point 10)

8. Ventilation

Legal requirement: “Ventilation shall be sufficient to avoid overheating and, where necessary, in combination with heating systems to remove excessive moisture” (Directive 98/58 EC, Annex, Point 10)

9. Flooring design

Legal requirement: “The floors of installations must be constructed so as to support adequately each of the forward-facing claws of each foot” (Directive 1999/74/EC, Article 4)

10. Multitier systems

Legal requirement: “(a) if systems of rearing are used where the laying hens can move

freely between different levels, (i) there shall be no more than four levels; (ii) the headroom between the levels must be at least 45 cm; (iii) the drinking and feeding facilities must be distributed in such a way as to provide equal access for all hens; (iv) the levels must be so arranged as to prevent droppings falling on the levels below” (Directive 1999/74/EC, Article 4)

11. Nests

Legal requirement: *“At least one nest for every seven hens. If group nests are used, there must be at least 1 m² of nest space for a maximum of 120 hens” (Directive 1999/74/EC, Article 4)*

Waterbath stunning

1. Unconsciousness

Legal requirement: *“The loss of consciousness and sensibility shall be maintained until the death of the animal.” (COUNCIL REGULATION No 1099/2009, Article 4, Paragraph 1)*

2. Checks – sample size and frequency

Legal requirement: *“Those checks shall be carried out on a sufficiently representative sample of animals and their frequency shall be established taking into account the outcome of previous checks and any factors which may affect the efficiency of the stunning process.” (COUNCIL REGULATION No 1099/2009, Article 5, Paragraph 2.)*

3. Insufficient stunning

Legal requirement: *“When the outcome of the checks indicates that an animal is not properly stunned, the person in charge of stunning shall immediately take the appropriate measures as specified in the standard operating procedures drawn up in accordance with Article 6(2)” (COUNCIL REGULATION No 1099/2009, Article 5, Paragraph 3.)*

4. Checks – frequency

Legal requirement: *“The frequency of the checks shall take into account the main risk factors, such as changes regarding the types or the size of animals slaughtered or personnel working patterns and shall be established so as to ensure results with a high level of confidence.” (COUNCIL REGULATION No 1099/2009, Article 16, Paragraph 4)*

5. Electrical key parameters

Legal requirement: *“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.” (COUNCIL REGULATION No 1099/2009, Annex II, Point 5.10.)*

6. Electrodes and waterbath layout

Legal requirement: *“The electrodes in waterbath stunning equipment shall extend the full length of the waterbath. The waterbath shall be designed and maintained in such a way that when the shackles pass over the water they are in continuous contact with the earthed rubbing bar.” (COUNCIL REGULATION No 1099/2009, Annex II, Point 5.7.)*