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Dear Sue

SPACE ALLOWANCES IN SLAUGHTERHOUSE LAIRAGE

“Government should issue guidance on minimum space allowances based on existing knowledge. These should be published as a matter of urgency. Research should be conducted to establish optimum stocking densities for all species applied across a range of circumstances” (FAWC. 2003, p. 16)

“Animals are required to have sufficient space to stand up, lie down and turn around without difficulty when penned (FAWC 2003, p. 16)

1. FAWC’s Welfare at Killing Standing Committee was asked by Defra to consider the issue of slaughterhouse lairage space allowances. To this end, we have reviewed the literature on optimal, recommended and practiced space allowances in slaughterhouse lairages for animals that are not held in transport crates while awaiting slaughter, have compared existing space allowance specifications as employed by a range of organisations and operators and make below a series of recommendations.
2. There are currently no statutory minimum (or maximum) space allowances for different categories of animals for lairages at slaughterhouses. Council Regulation (EC) No. 1099/2009 on the protection of animals at the time of killing requires facilities to display plaques on lairage pens indicating maximum numbers of animals to be kept (Annex III, 2.3). A number of major retailer standards already require the posting of their own specified space allowances on slaughterhouse lairage pens.
3. As Weeks (2008) points out, there is some confusion in the terminology. ‘Stocking density’, she argues, should be used to express the weight of the animal per unit of floor area (for example, in kg/m²), while ‘stocking rate’ should be the number of animals per unit area. Other bodies use ‘space allowance’ for space per animal (m²/head) or ‘capacity’ (maximum number of animals in a specific pen). ‘Space allowance’ scales in the opposite direction compared to ‘stocking density’, i.e. for space allowance high is generally good and for stocking density high is bad.

Switching back and forward between terms can be confusing. We will use space allowance, as the most frequently used measure in farm assurance and other specifications, unless quoting another author.

4. FAWC has recently submitted advice to GB governments on the use of allometric principles for determining space allowances for farm animals during transport by road (FAWC, 2013). The area occupied by an animal does not change linearly as it grows in weight. The relationship can be described by the equation: $\text{area} = \text{a constant (K)} \times \text{weight}^{0.67}$. FAWC recognises the benefit of the allometric approach for scaling recommended space allowances across different weights of a given type of animal but called for more research aimed at applying the principle in practice. This research might include lairage space allowance calculations as well as those for transport.

I. Welfare principles at lairage

5. The primary function of lairage at slaughterhouses is to manage the arrival, temporary penning and throughput of animals into the slaughterhouse itself. From a welfare perspective, it is generally considered best if animals are sent straight to slaughter on arrival at the slaughterhouse. The unfamiliar environment, the presence and close proximity of people and other animals and species (both familiar and unfamiliar), the strange smells, the noise, the movement and machinery are all factors likely to stress animals in lairage. Overnight lairage may create additional welfare issues such as thirst, poor access to limited resources, reduced rest from overcrowding, proximity of unfamiliar animals and so on.

6. Certain animals (notably pigs) may benefit from a period of recovery if stressed or dehydrated following transport and unloading (Brown et al. 1999; Warriss et al, 1998; Warriss, 2003) with possible implications for meat quality (Milligan et al. 1998; Lammens et al. 2006), but, in general, time spent by animals in lairage has a number of significant negative welfare implications. Hence, slaughterhouses should seek to minimise the time animals spend in lairage before slaughter.

II. Welfare issues at lairage

7. There are a number of parameters that can affect the welfare of farm animals while in a lairage. These include: the length of time in lairage, lairage space allowance, lairage design, construction and barrier materials, flooring, bedding, ventilation, temperature, ammonia levels, human presence and activity, easy access to clean water, and so on. Although we have been asked to look specifically at space allowance, as Weeks (2006) has argued:

“Stocking density cannot be considered in isolation – other important aspects for animal welfare and the responses of animals to different stocking densities include group size and sex, group constitution, of which the most important factor is whether the other animals are familiar or unfamiliar, pen design, and climatic or environmental conditions. In addition, the needs of animals for space will change over time. The longer they are in lairage the more space they require, in order to be able to rise and lie down and to rest undisturbed by congeners while lying” (Weeks, 2006, p. 3).

8. Pressure on slaughterhouses to increase throughput increases pressure on lairage space allowances. Deliveries of animals should be carefully scheduled to match lairage capacity and enable animals to be unloaded without delay.
9. Specific welfare issues stated in the literature that have been associated with reduced or limited space allowances during animals' period in lairage include:
- The interaction between pigs that are mixed prior to transport or in lairage, produces a significant increase in aggressive behaviour and reduced meat quality (Beattie, et al, 2000);
 - Stress and aggressive behaviour in pigs due to over-crowding (Moss, 1978; Geversink, 1996);
 - Constrained ability to rest in sheep through reduced space allowance and/or improved ability to rest with increased space allowance (Kim et al. 1994; Jarvis et al. 1995; Boe et al, 2006);
 - Greater ability amongst bulls to lie down and relax with increased space allowance (Gygax et al. 2007);
 - Increases in heat stress at higher stocking density amongst pigs (Weeks 2008);
 - Ability of cattle to 'settle down' improves with lower lairage stocking densities (Cockram, 1990);
 - Negative effects of high ammonia levels (and other airborne contaminants due to poor ventilation) from animal waste resulting from high stocking rates (Kirstensen and Wathes, 2000; Weeks, 2008; Phillips et al. 2010).
10. While these welfare problems are all associated with lower space allowances in lairage, a number of researchers have also identified behaviours likely to reduce the welfare of animals resulting from space allowances that are considered too high. Examples include aggressive behaviour in pigs, which has been associated with both low and high space allocations (Weeks 2008; Faucitano, 2010).

III. The regulatory context.

11. Council Regulation (EC) No. 1099/2009 on the protection of animals at the time of killing requires that slaughterhouse operators specify the maximum capacity for each lairage area (Article 14.2.c), although no maximum limit is set by the Regulation. Article 3.2.c & f require that animals are handled and housed taking into consideration their normal behaviour; and are prevented from avoidable interaction with other animals that could harm their welfare. Annex II of Regulation 1099/2009 sets out requirements for the layout, construction and equipment of slaughterhouses, including that pens, (along with passageways and races) are designed and constructed to "allow the animals to move freely in the required direction using their behavioural characteristics and without distraction". Annex III additionally requires that, for example:

"1.2 Animals shall be unloaded as quickly as possible after arrival and subsequently slaughtered without undue delay.

Mammals, except rabbits and hares, which are not taken directly upon arrival to the place of slaughter, shall be lairaged.

2.1. Each animal shall have enough space to stand up, lie down and, except for cattle kept individually, turn around.

2.2. Animals shall be kept securely in the lairage and care shall be taken to prevent them from escaping and to protect them from predators.

2.3. For each pen it shall be indicated with a visible sign the date and time of arrival and, except for cattle kept individually, the maximum number of animals to be kept.”

12. The current draft domestic legislation intended to implement Council Regulation 1099/2009 in England and also apply National Rules that existed prior to the Council Regulation also provides that:

“5. The business operator must ensure that—

- (a) a sufficient number of pens is provided at the slaughterhouse for adequate lairaging of the animals with protection from the effects of adverse weather conditions; and
- (b) a lairage has—
 - (i) adequate ventilation to ensure that temperature, air relative humidity and ammonia levels are kept within limits that are not harmful to an animal, taking into account the extremes of temperature and humidity which may be expected; and
 - (ii) racks, mangers or other equipment adequate in number and size for the feeding of animals confined in the lairage, fixed where practicable, and constructed and placed so that they are easily accessible to the animals, can readily be filled and cannot readily be fouled.”

“16. The business operator and any person engaged in the lairaging of an animal must ensure that—

- (c) food is provided in a way which will permit the animals to feed without unnecessary disturbance; and
- (d) an animal which is lairaged untethered is able to turn around without difficulty.”

Similar legislation will be applied in the other UK territories.

IV. Minimum space allowances emerging from research and currently specified by assurance schemes and retailers

13. In her review of research, Weeks (2008) identifies a series of housing or transport allowances for different animal species that she felt could be applicable to lairage in the absence of more definitive research-based or regulatory standards (see Table 1), while acknowledging that these would, in practice, be adjusted in response to variations in climatic conditions.

Table 1. Possible minimum space allowances (m²/head) in slaughterhouse lairages

Space allowance (m ² / head)	Finished cattle (up to 700 kg)	Sheep/lambs (up to 1 year old)	Pigs (90-100 kg)
Short lairage	1.70	0.56	0.42
Long lairage (> 3 hours)	3.60	0.80 to 1.00	0.66

After Weeks, 2008 – citing as sources British Standard 5502 (1990), Randall (1993), MLC (1974), Defra (2003), Kim et al (1994), SCAHAW (2002) and based on transport allowances for short lairage and housing lying area allowances for long lairage.

14. A number of bodies, retailers, NGOs and assurance schemes do specify required lairage space allowances at abattoirs and, on occasion seek different rates

for day and overnight lairage. An example is the RSPCA's Freedom Foods scheme which, for pigs, cattle and sheep, applies minimum bedded lying areas and total areas in m² per animal as set out in the RSPCA welfare standards (see Table 2). The Soil Association sets no required minimum space allowances (SA Standard 42.7.6). A number of retailers include lairage space allowances in their supplier standards (see Figures 1-4 below).

Table 2: 'Freedom Food' Lairage minimum space allowances

Cattle		Pigs		Sheep		
Weight (kg)	Minimum bedded area (m ² per animal)	Weight (kg)	Total area (m ² per animal)	Weight (kg)	Overnight Straw bedded area (m ² per animal)	Shorter periods Straw bedded area (m ² per animal)
<100	1.5	10	0.15	Ewes 45-60	1.1-1.2	0.74-0.81
101-250	2.5	20	0.225	Ewes 60-90	1.2-1.4	0.81-0.94
251-350	3.5	30	0.3	Hoggets 20-30	0.7	0.47
351-450	4.5	40	0.4	Hoggets 30-40	0.8	0.54
451-550	5.0	50	0.47	Hoggets 40-50	1.0	0.67
551-600	5.5	60	0.55	Rams	1.5-2.0	1.0-1.34
601-650	6.0	70	0.61			
651-700	6.25	80	0.675			
>700	6.5	90	0.715			
		100	0.75			
		110	0.80			

Source: RSPCA welfare standards

15. The UK's Red Tractor scheme sets down a series of recommended lairage space allowances (see Tables 3 and 4). These are in line with space allowances for animal transport as a suitable point of reference in the absence of legal or advisory lairage space allowances from government. However, the intention is that the space allowances are the absolute minimum for a short stay. The assessor should make a judgement in line with other requirements of the standard as well as space allowed (Red Tractor scheme Information sheet AW 20):

- "Livestock must be penned at appropriate stocking densities to ensure the lairage environment is not overcrowded. There must be sufficient space in the pens to allow all livestock to lie down simultaneously, rise without difficulty and turn around.
- Space allowances must be increased as a result of humidity, heat and length of stay.
- Pigs must be penned at a density of no greater than 235 kg/m².
- Recommended maximum (short stay) cattle and sheep space allowances are outlined in the relevant appendix."

Table 3: Red Tractor recommended minimum lairage space allowances (Sheep)

SHEEP

Category	Weight (kg)	Area in m ² /animal
Shorn sheep and lambs of 26kg and over	<55	0.20 to 0.30
	>55	>0.30
Unshorn Sheep	<55	0.30 to 0.40
	>55	>0.40

Source: Red Tractor scheme Information Sheet AW. 20

Table 4: Red Tractor recommended minimum lairage space allowances (Cattle)

CATTLE		
Category	Approx. weight (kg)	Area in m ² /animal
Small Calves	55	0.30 to 0.40
Medium-sized Calves	110	0.40 to 0.70
Heavy Calves	200	0.70 to 0.95
Medium-sized Cattle	325	0.95 to 1.30
Heavy Cattle	550	1.30 to 1.60
Very Heavy Cattle	>700	(>1.60)

Source: Red Tractor scheme Information Sheet AW. 20

16. Our own comparative research into current space allowances in slaughterhouse lairage recommended by a sample of retailers and assurance scheme providers (cases A to G) is displayed in Figures 1-4. Some data were provided to FAWC in confidence.

Figure 1. Comparative lairage space allowances (in m² per animal) recommendations for Cattle

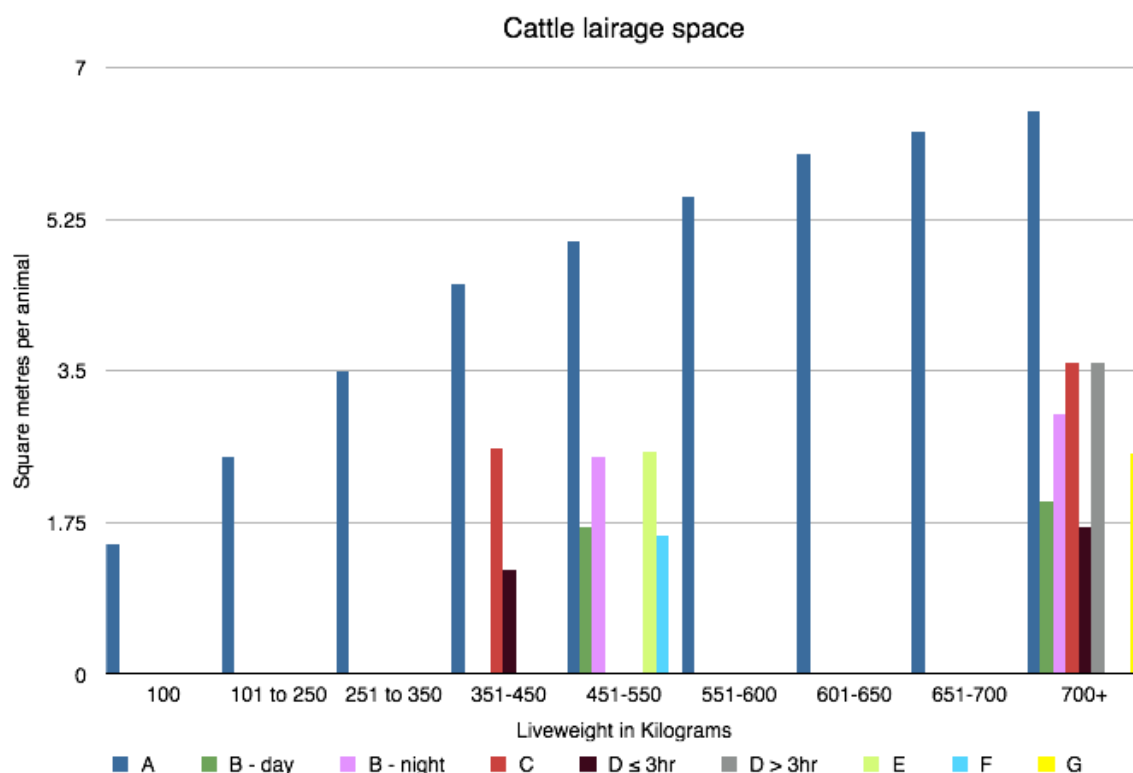


Figure 2. Comparative lairage space allowance recommendations for Pigs

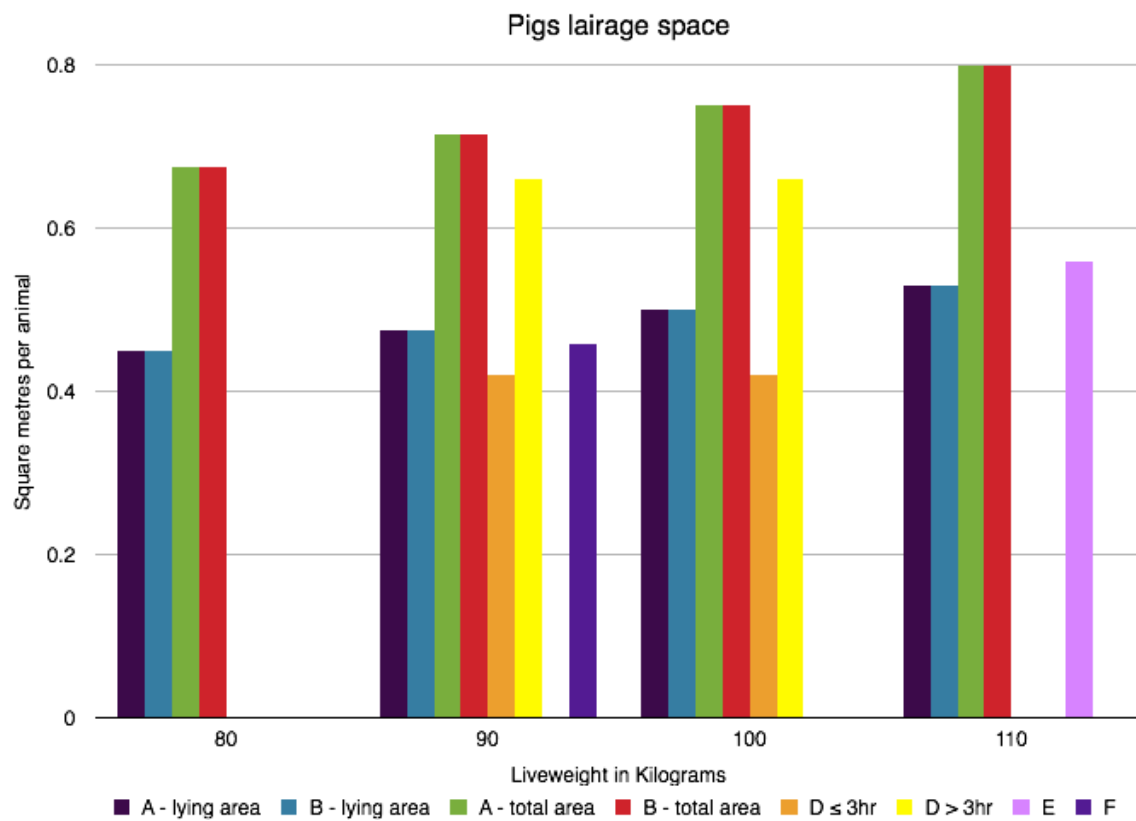


Figure 3. Comparative lairage space allowance recommendations for Sheep during daytime

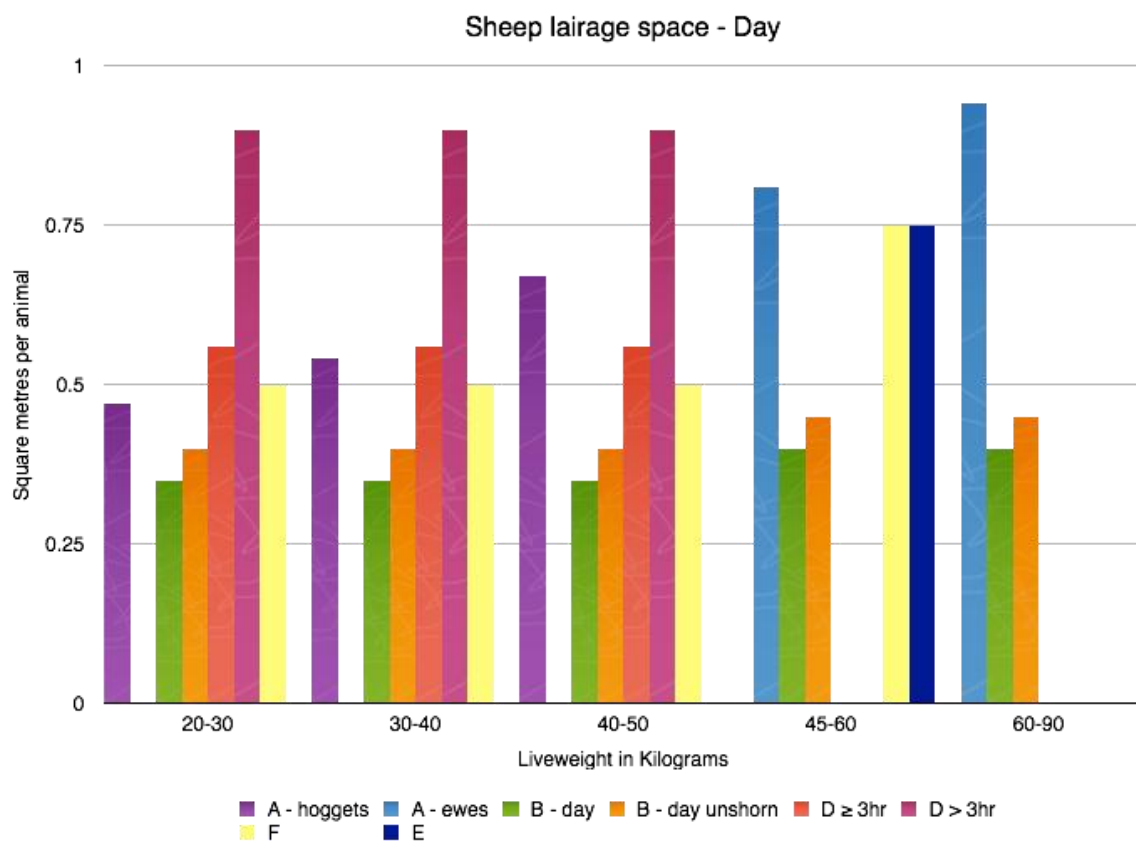
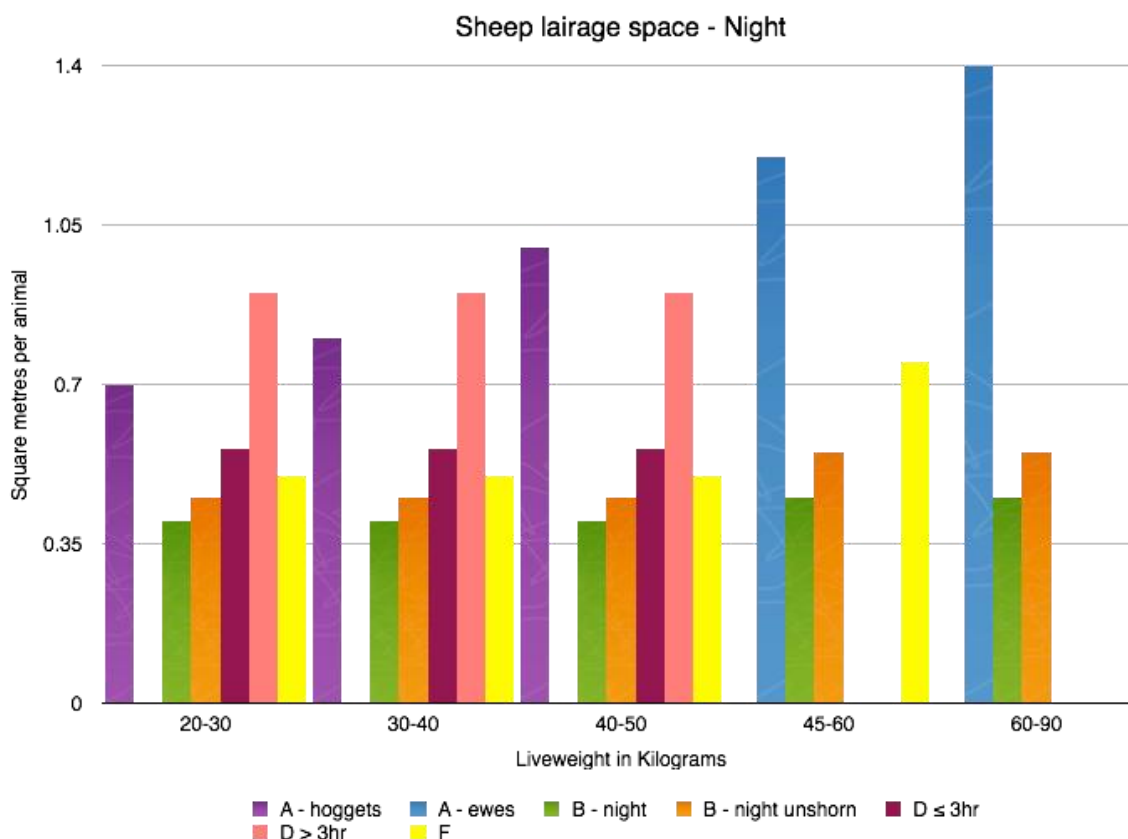


Figure 4. Comparative lairage space allowance recommendations for sheep overnight



V. Examples from current practice

17. In the light of the Regulation 1099/2009 requirement that animals in lairage have enough space to stand up, lie down and turn around, the recent Food Standards Agency (FSA) Welfare Report (of a survey of Official Veterinarians (OVs) in their allocated slaughterhouses) reveals a high apparent level of compliance with this basic requirement (see Table 5).

Table 5. Lairage capacity

45	Do you consider that all animals have the space to stand up, lie down and turn round without difficulty while lairaged?					
	Yes	GB	England	Scotland	Wales	
	246	97.2%	195	28	23	
	No	7	2.8%	7	0	0

Source: FSA Annual Welfare Report, question 45, 2012.

18. Drawing on the recorded space allowances from a survey of 36 UK slaughterhouses undertaken in 2006 (see Table 6 below), Weeks reports:

“On average these were acceptable and close to recommended and advisory levels in all pig and most cattle lairages but stocking rates higher than recommended were found

in the majority of sheep lairages. The lowest space allowances seen (m²/head) were 1.38 for cattle, 0.23 for sheep and 0.42 for pigs” (2006, p. 6).

Table 6. Observed space allowance (SA) (m²/animal). Figures in brackets refer to space allowances suggested by various authorities (BS – British Standard 5502, 1990; MLC – Meat and Livestock Commission, 1974; SCAHAW – Scientific Committee on Animal Health and Animal Welfare, 2002)

m ² /animal	Median * of lowest SA	Mean * of lowest SA	Range (between lairages)
Cattle (BS 1990)	2.13	2.22 (3.0)	1.38 - 3.57
Sheep (MLC 1974)	0.36	0.32 (0.56)	0.23 - 0.43
Pigs (SCAHAW 2002)	0.45	0.48 (0.45)	0.42 - 0.83

* Median and means derived from the most tightly stocked pen (i.e. lowest space allowance) observed during the visit to each abattoir lairage

Source: Derived from Weeks, 2008

19. Weeks also reports from this survey, undertaken before Council Regulation 1099/2009 was passed, that ‘advisory space allowances’ were posted for 75% of the pig, 58% of the cattle and 64% of the sheep lairages.

20. Because lairage space allowances are driven by the need for slaughterhouses to maintain a sufficient throughput, there may often be occasions when pens are over stocked in order to increase throughput, particularly at pressured times (for example, when suppliers arrive together). Difficulties arise when slaughterhouses cannot properly anticipate live animal deliveries. This has clear welfare implications when space allowances are diminished.

VI. Issues

21. A number of key points are raised by this review:

- Appropriate space allowances should allow and facilitate viable throughput and yet also assure suitable levels of animal rest and welfare.
- Considerably higher lairage space allowances than are currently the case would not be considered possible in many facilities, without expensive new build.
- Recent research and survey results do not find that space allowances in lairages are problematically low in general.
- However, a relatively small number of animals makes a large difference. One extra beef animal can significantly alter the welfare and comfort of penned animals in lairage. In lairage terms there is no ‘half animal’. The single animal is the lowest unit for calculation.

- In general, animals kept in lairage overnight are given greater space allowances than in the daytime. However, there is a wide range of space allowances at lairage.
- One element to providing a good lairage environment is the control and management of arrivals and throughput rates. Others include environmental management methods. In particular the slurry stores beneath sheep lairages should be managed to control the level of emissions of noxious gases such as ammonia.
- Space allowances in lairages are generally set by number of animals, not by weight. Establishing appropriate allowances based upon weight is a major issue for improvements in space allowance recommendations. With sheep, there can also be large variations in animal size, particularly between shorn sheep and sheep with fleece. Many premises will base maximum lairage size on average animal size.
- The setting of appropriate space allowance minima should be accompanied by a practice of sensible lairage filling techniques to avoid animals crowding at one end and also to avoid frequently moving animals past those resting.

VII. Recommendations

22. We recommend that appropriate space allowances, set in guidance by Government¹ and industry, should assure suitable levels of animal welfare as well as allowing and facilitating viable throughput.

23. We recommend that further research be undertaken by Government and industry into the welfare implications of lairage design and management, lairage space allowances and lairage time, to further inform the requirements under Council Regulation (EC) No. 1099/2009 for the maximum number of animals to be kept (Annex III, 2.3) to be posted on each pen. This could include the use of the allometric principle.

24. All abattoirs should have a written stated target and minimum space allowance in their standard operating procedures.

25. Abattoirs should have sufficient lairage for the highest likely day's throughput.

26. Abattoirs should have a contingency plan for when throughput is significantly delayed.

¹ Where we refer to "Government" we are addressing ourselves to the Department for Environment, Food and Rural Affairs in England, the Scottish Government and the Welsh Government, and other responsible Government Departments and Agencies.

With kind regards,

Yours sincerely

A handwritten signature in black ink on a light blue background. The signature is cursive and appears to read 'Peter Jinman'.

Peter Jinman
Chairman, Farm Animal Welfare Committee

cc Food Standards Agency
 Scottish Government
 Welsh Government
 Department for Agriculture and Rural Development, Northern Ireland
 FAWC Secretariat

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