Federation of European Laboratory Animal Science Associations

EUROGUIDE

On the accommodation and care of animals used for experimental and other scientific purposes

BASED ON THE REVISED APPENDIX A OF THE EUROPEAN CONVENTION ETS 123

Published in conjunction with

The European Partnership for Alternative Approaches to Animal Testing

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On the accommodation and care of animals used for experimental and other scientific purposes

(Based on the revised Appendix A of the European Convention ETS 123)

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FOREWORD

It is with great pleasure that I introduce FELASA's *Euroguide*, the abbreviated version of the revised Appendix A of the *European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes* (ETS 123).

It was in 1997, when I was chairman of the Working Party of the Council of Europe in Strasbourg, that the Member States decided to revise Appendix A of the Convention. The Working Party met on average twice a year and I chaired the group until my retirement from the Dutch government service in 2002. The Working Party continued to progress the work and the revised version was finally agreed by a Multilateral Consultation in June 2006. It gives me great pleasure to know that the work is completed and I congratulate the Member States of the Council of Europe on the revised Appendix A.

At the meetings of the Working Party, representatives of the Observer organizations were consulted on various aspects. The outcome of these consultations contributed to the final conclusion of the Working Party. The participation of these representatives was essential in achieving a consensus on the minimum standards for the accommodation and care of laboratory animals. The inclusion of animals which were not included in the original Convention should be seen as a step towards recognizing our responsibility for all vertebrates used for experimental purposes as indicated in Appendix A. Although the result will certainly not meet the expectations of all the groups involved – since it was reached by a process of debate and consensus – it should be considered as a significant step forward in a continuing process. One of my pleasant memories of the meetings in Strasbourg is that the discussions took place in an atmosphere of mutual respect despite the, occasional, strong differences in views.

The FELASA Working Group has done a very good job in producing this *Euroguide* on the accommodation and care of animals used for experimental purposes. The guide facilitates scientists to obtain, in a user-friendly way, the core aspects of the care of laboratory animals set out in the revised Appendix A. I am certain that easy access to this information will encourage scientists to follow these standards.

I hope that the revised Appendix A will be taken into account in the updating of the European Union Directive 86/609/EEC.

'*Good animal care results in good animal experimentation.*'

Paul de Greeve
Chairman of the Working Party, 1997–2002

PREAMBLE

How to use the Euroguide

The intended purpose of this book is to provide an abbreviated version of the revised Appendix A of the *European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes* (ETS 123: http://conventions.coe.int/treaty/en/Treaties/Html/123.htm).

The Introduction to the *Euroguide* gives the reader an account of the historical background to the revision, the process by which it was done and the legislative and political framework in which it is applicable.

Appendix A of the Convention outlines minimum standards for the care, housing and welfare of animals used in laboratory-based research. The revised Appendix A includes additional animal groups to those in the original, and with effect from June 2007 these are now also afforded protection under the Convention.

In compiling the *Euroguide,* the primary consideration was to produce a concise, 'user-friendly' reference for anyone working with laboratory animals and also for those who provide services related to the animals' housing and care. The FELASA Working Group responsible for preparing the *Euroguide* was fully aware that the official, approved Appendix A would always be the definitive document that should be consulted for points of certitude on the accommodation and care of animals. They nevertheless believe that the guidebook they have produced includes all the information contained in Appendix A. The editing was intended to make the language more concise without losing meaning. For clarity, some topics have been redistributed in the text to improve continuity, and repetitious statements have been removed. The format seeks to facilitate the reader to find the topics of immediate interest easily and quickly. It should, however, be noted that all of the tables in the revised Appendix A giving details of standards of care and dimensions of animal enclosures have been reproduced here without change.

The English language version of the revised Appendix A was used for the preparation of the *Euroguide*, the FELASA Working Group being confident that any ambiguities between the French and English versions had been resolved during the considerable debate in Strasbourg.

> *'It is a prerequisite for the progress of humane technique that the law in this area should be kept fully rational and fully up to date. It cannot be too widely recognised that legislation and regulation here need constant attention, and that experimental biologists should be constantly reassessing policy in advance, in order to make the necessary recommendations without due loss of time.'*
>
> W M S Russell and R L Burch (1959)
> *The Principles of Humane Experimental Technique*

I. INTRODUCTION

The situation with Europe-wide regulations and guidance concerning the use of animals for experimental and other scientific purposes can seem somewhat confusing, as two major organizations – the Council of Europe (CoE) and the European Union (EU) – are involved. However, these organizations have different remits and operate in different ways, while fulfilling important and inter-related functions relating to animal use in this area of work.

One purpose of this introductory section to FELASA's *Euroguide* is to provide a brief explanation of the CoE's and the EU's structures, functions and methods of operation and how they can relate to national legislation using the European regulations on the protection of animals used for experimental and other scientific purposes as an example. Information is also provided of the revision process of Appendix A of CoE Convention ETS 123.

1. The European institutions: Council of Europe and European Union

What is the Council of Europe?

The CoE was established in 1949 and is Europe's oldest political organization. It currently has a wide membership of 46 Member States (MSs), with applications from a further two. There are also five observer nations (Canada, the Holy See, Japan, Mexico and the USA). It is distinct from the EU, but it is of interest to note that no country has ever joined the EU without first belonging to the CoE. The CoE is based in Strasbourg, France.

The Council was set up by the 1949 Statute of the CoE so as 'to achieve a greater unity between its Members for the purpose of safeguarding and realizing the ideals and principles which are their common heritage and facilitating their economic and social progress' (Article 1 of the Statute). Within this mission and its more detailed aims, the CoE addresses a wide range of areas of concern, including health, education, the environment, bioethics and animal welfare.

Although the CoE is an inter-governmental organization, it has no legislative power and conducts affairs by seeking cooperation between MSs on a voluntary basis. The output is therefore in the form of recommendations, agreements and conventions, which each of its MSs may or may not agree to sign and ratify. MSs may also record reservations concerning certain aspects of agreements, in other words they may agree to only a part or parts of each output. Thus, although the Committee of Ministers (see below) may approve a new convention, it will only be legally binding on those MSs that have signed and ratified it.

The bodies involved in the work of the CoE are:

- *The Committee of Ministers*: this is the decision-making body and is composed of the 46 foreign ministers or their Strasbourg-based deputies (ambassadors/permanent representatives). It is both a governmental body and a collective forum

and, in collaboration with the Parliamentary Assembly, oversees the CoE's fundamental values and monitors compliance with undertakings.
- *The Parliamentary Assembly*: this is the deliberative body, with 630 members comprising 315 representatives and 315 substitutes from the 46 national parliaments.
- *The Congress of Local and Regional Authorities*: this is the consultative body and is composed of a Chamber of Local Authorities and a Chamber of Regions. This brings together elected representatives of local and regional communities and promotes the principle of local self-government in domestic legislation.
- *An International Secretariat*: this is to ensure the functioning of the Organization.

Essential to the workings of the CoE is the way in which it involves non-governmental organizations (NGOs), such as FELASA, during the consultative stage. This was well demonstrated in the process adopted for the revision of Appendix A, in which the involvement of NGOs was integral to the outcome.

What is the European Union?

The roots of the EU lie in the European Coal and Steel Community (ECSC), established by six countries in 1951, and the European Economic Community (EEC) and European Atomic Energy Community (EURATOM), established in 1957 under the Treaties of Rome. However, the EU as it is currently recognized was formed by the Maastricht Treaty in 1992 and its membership has now expanded to 27 states. The ECSC and the EEC were both primarily concerned with trade and the economy, with the EEC aimed at removing trade barriers in Europe and forming a 'common market'. The EU's aims, by comparison, are much broader and the Maastricht Treaty established new forms of cooperation between MS governments, adding two areas (known as 'pillars') of cooperation on Justice and Home Affairs and on Foreign Common and Security Policy.

The EU has become an extremely complex organization. Unlike the CoE, the EU is a supranational organization with policy-making and legislative powers (e.g. on environment, research, competition policies). In other words, there has been some delegation of sovereignty by MSs. Although the EU does produce recommendations and opinions on topics of relevance to its aims, it mostly legislates through regulations and directives that must be implemented by the MSs. This is done by the MSs incorporating them into their national legislation.

The EU operates by what is known as an 'institutional triangle':

- The Council of the EU, also known as the Council of Ministers, is the EU's main decision-making body. It shares legislative power with the European Parliament, by means of the co-decision procedure, as well as sharing responsibility for adopting the EU budget. It comprises ministerial representatives of MS governments. (Rather confusingly, there is a further body, known as the European Council, which generally meets four times a year and is chaired by the president or prime minister of the country holding the presidency of the Council of the EU at that time. These European Council meetings may be considered European 'summits'.)
- The European Parliament currently has 785 members and is elected every five years. It is intended to represent 'the people' directly and has shared responsibility

with the Council of the EU for passing laws and adopting the EU budget. Parliamentary sessions are held in Brussels and Strasbourg.

- The European Commission comprises 27 members, one per MS, and is assisted by a civil service of 36 Directorates-General (DGs) and other services, based mainly in Brussels and Luxembourg. It is answerable to the European Parliament and the entire Commission would have to resign if Parliament passed a motion of censure against it. It is tasked with ensuring regulations and directives are put into effect and it is largely responsible for managing the common policies. The Commission is the only EU institution that may initiate proposals for new legislation.

It is clear that the EU can only operate effectively if there is a sufficient level of cooperation and trust between these three bodies as any new legislation must, in effect, be agreed by all three of them.

How do the CoE and EU interact and what is their significance with regard to national legislation on the protection of animals used for experimental and other scientific purposes?

In 1986, the CoE agreed Convention ETS 123 for the protection of vertebrate animals used for experimental and other scientific purposes. Nineteen Parties (MSs) subsequently signed and ratified the Convention. A further four signed but have not ratified. This topic, and therefore the Convention itself, is in accord with the CoE's Statute, which states 'for his own well-being, man may, and sometimes must, make use of animals, but he has a moral obligation to ensure, within reasonable limits, that the animal's health and welfare is in each case not unnecessarily put at risk'. The Convention comprises the text, an explanatory report, and Appendices A and B, with Appendix A providing guidance on the care and accommodation of animals covered by the Convention. It is incumbent on the Parties to the Convention to recommend this guidance to those in their countries who are responsible for the care and use of such animals.

Also in 1986, the EU adopted Directive 86/609/EEC on the approximation of laws, regulations and administrative provisions of the MSs regarding the protection of animals used for experimental and other scientific purposes. As this was and is a text with legislative power, all MSs are required to have in place national legislation which transposes at least the minimum requirements laid down in the Directive. Annex II to the Directive, concerning guidelines for accommodation and care of animals, repeats the provisions of Appendix A of the Council of Europe Convention. As a result, although these are 'recommendations' within the Directive, they have a level of legislative 'muscle', as MSs are bound by the Directive to 'pay regard' to these guidelines when implementing the provisions of its Article 5 (on care and accommodation).

At the present time, Directive 86/609/EEC is undergoing revision. It is anticipated that the current Annex II will be replaced and that the complete revised text of the CoE Convention's Appendix A will be published as at least a Commission Recommendation. What is not yet decided, however, is whether some or all elements of these revised provisions could be made binding minimum requirements.

2. The revision of Appendix A

Historical aspects

The European Convention for the protection of vertebrate animals used for experimental and other scientific purposes (ETS 123) was agreed in 1986 and entered into force on 1 January 1991. In 1987, the Committee of Ministers approved proposals for monitoring the implementation of this Convention. The proposals included the convening of a Multilateral Consultation (MC) of the Contracting Parties every five years; the MCs held in 1992, 1993 and 1997 were devoted to the monitoring of ETS 123.

At the third of these MCs on ETS 123, in 1997, the Parties agreed to revise Appendix A to the Convention, which contains housing and care guidelines for animals used for experimental and other scientific purposes. In the Resolution adopted at this meeting, the Parties considered that:

- the guidelines for accommodation and care of animals presented in Appendix A of the Convention had proved to be very useful and widely applied; and
- scientific knowledge and experience had moved on since 1986.

In directing that Appendix A should be revised, they specifically considered that 'the volume of cages (floor area, height) should take into account the specific needs of the different species, the social composition of the group, the age of the individual, the use of animals (breeding, stock, research and the nature and duration of the scientific procedure), and the need for enrichment' (Resolution on the accommodation and care of laboratory animals, adopted by the MC on 30 May 1997).

The process

Following the 1997 MC, a Working Party was established to progress the revision of Appendix A. This Working Party comprised experts from the Parties to ETS 123 and its meetings were attended also by expert representatives from Observer organizations (NGOs), including FELASA (see below for list of Observer organizations).

The Working Party set up groups of experts in order to draft proposals for a revised Appendix A. Members of these Expert Groups were drawn from the Observer organizations but without any representation from the Parties (although a representative did coordinate the work of the Expert Groups). At this initial stage, four Expert Groups were established, on Rodents and rabbits, Cats and dogs, Non-human primates, and Minipigs. In addition to their work on their assigned species, the four groups worked in conjunction to prepare proposals for a new general section to Appendix A, containing recommendations applicable to all species covered by the Convention.

During the Working Party meeting in 2000, FELASA suggested, and it was agreed, that the number and scope of these Expert Groups should be revised so as to address the needs of all species used under and protected by the Convention. The final list of Expert Groups therefore became as follows:

- Rodents and rabbits
- Dogs, cats and ferrets

- Non-human primates
- Birds
- Farm animals (including minipigs)
- Fish
- Amphibians and reptiles

The membership of these Expert Groups represented a broad range of interests, including organizations dealing with trade, science and animal protection. FELASA played a leading role during the discussions, being strongly represented throughout the groups and chairing two, and with its representatives attending all meetings of the Working Party.

The remit of the Expert Groups was to prepare proposals (called Parts A) based on scientific evidence, wherever possible, or on established good practice. In addition, the groups were tasked with preparing supplementary documents (Parts B) containing scientific, technical and other information in support of the proposals, with a view to facilitating their understanding and use. The groups progressed their work by face-to-face meetings and email discussions and drew in additional expertise as required.

The output of the Expert Groups was discussed in detail, and amended and agreed by the full Working Party during the course of eight meetings, the final one being held on 22–24 September 2004. At this meeting the complete final draft of the revised Appendix A was agreed for submission to an MC for adoption.

This fourth MC of Parties to Convention ETS 123 was held in Strasbourg on 15 June 2006. The draft revised Appendix A was unanimously adopted at the meeting for entry into force 12 months after its adoption, i.e. 15 June 2007, as required by Article 31 of the Convention.

A report on the process and its outcome was submitted to the CoE Committee of Ministers for their information. It had not been necessary for the Committee of Ministers to approve the revision, as a Protocol of Amendment (CETS 170) to the Convention had entered into force on 2 December 2005. This provided for a simplified procedure for the amendment of technical appendices to the Convention, with the new Article 31 of the Convention empowering the Parties themselves, without formal adoption by the Committee of Ministers, to amend Appendices of a technical nature which might require periodic revision in the light of new scientific evidence and experience, the modification of which is unlikely to have direct political consequences for the CoE.

The entering into force of the revised Appendix A on 15 June 2007 therefore represented the culmination of some 10 years of work, with input from a large number of individuals and organizations representing a great breadth of experience and expertise. Although it did not prove possible to base all of the revised Appendix A guidelines solely on scientific data, other provisions were based on expert opinion that had been subject to detailed scrutiny. There is no doubt that, as more scientific research is carried out into areas such as environmental enrichment, changes to these provisions may become necessary. Article 31 to the Convention (outlined above) can facilitate this and it is to be hoped that the CoE will remain committed to the need to keep the guidance in Appendix A under review and, when it becomes necessary, to initiate the process to consider further amendments.

Parties to Convention ETS 123

The current list of Parties to the Convention may be obtained from the CoE's Treaty Office website at www.conventions.coe.int.

Observer organizations (NGOs)

Canadian Council on Animal Care (CCAC)
Eurogroup for Animal Welfare (Eurogroup)
European Biomedical Research Association (EBRA)
European Federation of Animal Technologists (EFAT)
European Federation of Primatology (EFP)
European Federation of Pharmaceutical Industries and Associations (EFPIA)
European Science Foundation (ESF)
Federation of European Laboratory Animal Breeders Associations (FELABA)
Federation of European Laboratory Animal Science Associations (FELASA)
Federation of Veterinarians of Europe (FVE)
International Council for Laboratory Animal Science (ICLAS)
Institute for Laboratory Animal Research (ILAR)
International Society for Applied Ethology (ISAE)
World Society for the Protection of Animals (WSPA)

3. Key websites consulted

Information on the CoE and the revision of Appendix A: www.coe.int.
Information on the EU: www.europa.eu.

4. Acknowledgements

FELASA would like to thank officials of the CoE and the EU for their comments on this section.

II. GENERAL SECTION

1. The physical facilities

1.1 Function and general design

- Construction of facilities should provide a suitable environment for the species, taking into account their physiological and ethological needs.
- Facilities should prevent access by unauthorized persons and the ingress or escape of animals.
- There should be an active maintenance programme of buildings and equipment.

1.2 Holding rooms

- All necessary measures should be taken to ensure regular and efficient cleaning of the rooms and the maintenance of satisfactory hygienic standards.
- All surfaces should be resistant to the heavy wear and tear caused by the animals, the cleaning and disinfection process and heavy equipment.
- Floors should be smooth, impervious and non-slippery.
- The material should not be detrimental to the health and safety of both animals and humans.
- Special attention should be paid to junctions, including those with doors, ducts, pipes and cables.
- Where appropriate an inspection window should be fitted in the door.
- Drains, if any, should be adequately covered and fitted with a barrier, which will prevent vermin from gaining access or animals from escaping.
- In animal enclosures where animals are allowed to run freely, the surfaces of walls and floors, and any equipment or fixtures, should resist damage by the animals and the cleaning process and should not be such that they could harm or injure the animals.
- Incompatible species should not be housed in the same room. Predator and prey should not be housed within sight, sound or smell of each other.
- Holding rooms should have facilities for minor procedures and manipulations, as appropriate.

1.3 General and special purpose procedure rooms

- Breeding and supply establishments should have facilities for dispatch of animals.
- Establishments should have facilities for carrying out diagnostic work and post-mortem examinations.
- Isolation facilities for newly acquired animals should be available.
- For procedures which should not be carried out in holding rooms, general and special purpose rooms and, where necessary, facilities for aseptic procedures should be available.
- Postoperative recovery rooms and separate housing for sick animals should be provided.

1.4 Service rooms

- Design and operation of storerooms for food and bedding should safeguard their quality and should be vermin- and insect-proof.
- Separate storerooms for clean cages, instruments and equipment should be provided.
- The cleaning and washing areas should be large enough to accommodate the cleaning machines and allow separate flow of the dirty and clean equipment to avoid re-contamination. Ventilation should extract excess heat and humidity.
- Hygienic stores for animal waste and carcasses should be provided. Disposal of waste including toxic, radioactive and infectious waste should satisfy national and local regulations.
- The design and construction of circulation areas should be of the same standard as holding rooms and be wide enough for all moveable equipment.

2. The environment and its control

2.1 Ventilation

- The ventilation system in holding rooms and animal enclosures should provide sufficient fresh air of an appropriate quality and maintain an atmosphere suitable for the animals housed. The design should avoid harmful draughts and noise disturbance.
- In each room, 15–20 air changes per hour is normally adequate but can be reduced to 8–10 if stocking densities are low. Natural ventilation may suffice in some circumstances.
- Smoking in animal rooms should be forbidden.

2.2 Temperature

- Recommended ranges for adult, normal animals are detailed in the species-specific tables. Newborn, young, hairless, postoperative or sick and injured animals may need higher temperatures.
- Temperatures in holding rooms should be measured and logged daily.
- The ventilation system may need to have the capacity both to heat and cool the air supplied.
- In user establishments precise temperature control may be needed to reduce effects on metabolism and behaviour and therefore on the validity of certain scientific outcomes.
- Outdoor areas for animals cannot have strict temperature control. Animals should therefore not be restricted to such areas if distress may be caused.

2.3 Humidity

- Some species such as rats and gerbils may need strict humidity control for health or welfare purposes. Most species are more tolerant to humidity fluctuations.

2.4 Lighting

- Where the natural light/dark cycle is not appropriate, a controlled cycle should be provided for all animals and to provide a satisfactory working environment.
- Shaded areas should be provided for some animals. Albino animals are particularly sensitive.
- Windows in holding rooms, where appropriate, can provide environmental enrichment, especially for non-human primates, dogs, cats, farm animals, and other large mammals.

2.5 Noise

- High noise levels and sudden noises can disturb animals and cause stress, which may affect their welfare and influence experimental data.
- Noise levels within the animals' hearing range, which may include ultrasound, should be minimized.
- Alarm systems should sound outside the animals' hearing range where this does not conflict with their audibility to humans.
- Appropriate layout of rooms and corridors and the use of noise insulation and absorption materials will help maintain a suitable acoustic environment.

2.6 Alarm systems

- Animal facilities should have alarms to detect hazards such as fires, the intrusion of unauthorized personnel and the breakdown of essential equipment.
- There should be a stand-by system to maintain environments and essential services, including alarms, which rely on electrical or mechanical equipment.
- Heating and ventilation systems and the environment of water tanks for fish and other aquatic animals should be monitored and alarmed to ensure faults can be quickly rectified.
- Clear instructions and emergency procedures should be prominently displayed.
- Alarm systems should cause as little disturbance as possible to the animals.

3. Education and training

- All persons involved in caring for, or otherwise involved with animals being bred, held or used for experimental or other scientific purposes should be appropriately educated and trained to the standard recommended in the Resolution on education and training of persons working with laboratory animals adopted by the MC of the Parties to the Convention on 3 December 1993.

4. Care

4.1 Health

- A strategy should be in place in all establishments to ensure an appropriate health status is maintained, both safeguarding animal welfare and meeting scientific requirements, and including:

  - a microbiological surveillance programme
  - plans for dealing with health breakdowns
  - definition of health parameters
  - procedures for introduction of new animals.
- The person responsible for the establishment should ensure regular inspection of the animals and supervision of the accommodation and care by a veterinarian or other competent person.
- Inspections by trained personnel should be made at least daily to ensure sick or injured animals are identified and appropriate action taken.
- Because of the potential risk of contamination of animals and staff presented by the handling of animals, particular attention should be paid to the institution of hygiene procedures and supervision of staff health.

4.2 Capture from the wild

- Capturing from the wild should be done by competent persons using humane methods. The impact on the remaining wildlife and habitats should be minimized.
- After capture the health status of the animal should be determined by a competent person and, if necessary, the animal should be treated or humanely killed as appropriate.
- Suitable transport containers and means of transport should be available for all contingencies.
- Wild caught animals need special care in their acclimatization, quarantine, housing and husbandry.
- Their eventual fate following the conclusion of scientific procedures should be pre-determined, especially if they are to be released to the wild which may have welfare issues.

4.3 Transport of animals

- Transportation is a stressful experience for animals and should be in accordance with relevant European Conventions (ETS 65 and ETS 193), having regard to the Resolution on the acquisition and transport of laboratory animals adopted by the MC of the Parties to the Convention in May 1997.
- Both sender and recipient should agree the conditions of transport and departure and arrival times.
- The sender should ensure the animals are fit for transport before dispatch.
- Sick or injured animals should not be considered fit for transport, except:
  - in cases where transport would not cause additional suffering
  - in cases where transport is under veterinary supervision
  - following veterinary treatment
  - for experimental or other scientific purposes approved by the relevant competent authority, when the illness or injury is part of the research programme, and a competent person has confirmed that the animals are fit for the intended journey, and if no additional suffering is so caused.
- The person responsible for the journey is ultimately responsible for all parts of it.
- During transport the welfare of the animals is the responsibility of the person travelling with them and who should be aware of their special needs.

- The route should be planned to minimize journey time and maintain suitable comfort and environmental conditions for the species.
- Containers designed to prevent the spread or entry of microorganisms should have provision for visual inspection of the animals.
- On arrival at their destination, a competent person should examine the animals as soon as possible. Any sick or injured animals should be observed closely and isolated and, if appropriate, receive veterinary treatment or be promptly killed by a humane method.

4.4 Quarantine, acclimatization and isolation

- Quarantine is required for newly introduced or re-introduced animals to house them separately from existing animals in the establishment and is recommended when the health status of the animal needs to be determined.
- Acclimatization of animals is required to allow them to recover from transport and become accustomed to a new environment and husbandry practices. It will vary according to, for example, duration of transport, age of the animal and change in diurnal rhythm.
- Isolation is required to reduce the risk of infection to other animals or humans.
- Quarantine and isolation periods are:
  - to protect other animals from infection
  - to protect man against zoonotic infection.
- Periods may vary and may be defined by national regulations or by a competent person, normally the veterinarian appointed by the establishment.

4.5 Housing and enrichment

- All animals should be:
  - allowed sufficient space to express a wide behavioural repertoire
  - socially housed where possible and appropriate to the species, in stable groups of compatible individuals
  - provided with an adequately complex environment, with a degree of control and choice over it.
- Housing and enrichment strategies should be designed to:
  - fulfil the needs of the species housed
  - ensure animals can make best use of the space
  - enable observation of animals with minimum disruption
  - facilitate handling
  - be compatible with the purpose for which the animals are being used so as to ensure the generation of valid scientific data.
- Animals should only be singly housed:
  - on veterinary or welfare grounds, or
  - on experimental grounds after consultation with the animal technician and the competent person responsible for advising on the wellbeing of the animals;
- and only if
  - additional resources are targeted to their welfare and care
  - the duration is limited to the minimum period necessary

  - visual, auditory, olfactory and tactile contact are maintained where possible.
- Introduction or re-introduction of animals to established groups should be carefully monitored by adequately trained staff.
- The environmental enrichment programme should:
  - extend the range of activities available to the animals and increase their coping activities
  - be appropriate to the species-specific and individual needs
  - be regularly reviewed and updated
  - be adaptable so as to incorporate new understanding
  - ensure new initiatives are monitored and adjusted as necessary.
- Animal enclosures should be designed and constructed of materials such that:
  - they are not detrimental to the animals' health
  - no injury to the animals is caused
  - they are (unless intended to be disposable) resistant to cleaning and decontamination techniques
  - removal of excreta is facilitated.

4.6 Feeding

- The form, content and presentation of the diet should meet the nutritional and behavioural needs of the animal.
- Roughage is an important component of the diet for some species.
- The diet should be palatable and non-contaminated.
- The feed bags should provide information on the identity of the product and its date of production. The expiry date should be adhered to.
- Packing, transport and storage should avoid contamination, deterioration or destruction.
- Storerooms should be cool, dark, dry and vermin- and insect-proof.
- Perishable feed should be stored in cold rooms, refrigerators or freezers.
- All feed utensils should be regularly cleaned and, if necessary, sterilized.
- Each animal should be able to access the food, with sufficient space to limit competition.
- Food intake may need to be controlled to avoid obesity.

4.7 Watering

- Uncontaminated drinking water should always be available to all animals.
- The watering system should provide water of an adequate quantity and suitable quality and minimize the risk of contamination by microorganisms.
- Sufficient watering points (drinkers) should be available.
- The functioning of automatic watering systems should be checked and serviced regularly.
- Care should be taken to minimize the risk of flooding in solid-bottomed cages.
- In fishes, amphibians and reptiles, tolerance for acidity, chlorine and many other chemicals differs widely from species to species. The water supply for aquaria and tanks should be adapted to the needs and tolerance limits of the individual species.

4.8 Flooring, substrate, litter, bedding and nesting material

- Appropriate bedding materials or sleeping structures should always be provided for animals, as well as appropriate nesting materials or structures for breeding animals.
- Various materials are placed in the animal enclosure in order to:
  - absorb urine and faeces
  - allow certain species-specific behaviour, such as foraging or burrowing
  - provide a comfortable surface or secure area for sleeping
  - allow building of a nest for breeding purposes

    and should:
    - be dry and dust-free
    - avoid the introduction of physical or chemical contaminants
    - be prepared from standardized products.
- Flooring of animal enclosures should provide a solid, comfortable resting area for all animals.
- All sleeping surfaces should be kept clean and dry.

4.9 Cleaning

- Good hygiene standards are essential in all holding, washing and storage rooms.
- Adequate routines for the cleaning, washing, decontamination and, when necessary, sterilization of enclosures and accessories, should be established and carried out.
- These cleaning and disinfection regimes should not be detrimental to animal health or welfare and take into account behavioural needs such as odour marking.
- Clear operating procedures, including a recording system, should be in place for the changing of bedding in animal enclosures.
- There should be regular cleaning and, where appropriate, renewal of the materials forming the ground surface in animal enclosures to avoid them becoming a source of infection and parasite infestation.
- The frequency of cleaning should be based on the type of animal enclosure, the type of animal, the stocking density, and the ability of the ventilation system to maintain suitable air quality.

4.10 Handling

- Staff responsible for animals should always have a respectful attitude to animals in their care and should be proficient in their handling and restraint.
- The quality of care animals are given may influence welfare, breeding success, growth rate, and the quality and outcome of experimental procedures.
- Accustoming animals to competent and confident handling reduces stress both to animals and personnel.
- For some species, such as dogs and non-human primates, a training programme to encourage cooperation during procedures can be beneficial.
- Social contact with humans should be a priority for some species, but in others (e.g. wild animals) should be avoided.

- Where appropriate, staff time should be set aside for talking to, handling, training and grooming animals.

4.11 Humane killing

- All humane methods of killing animals require expertise, which can only be attained by appropriate training.
- Animals should be killed using a method that adheres to the principles set by the European Commission recommendations for the euthanasia of experimental animals.
- A deeply unconscious animal can be exsanguinated, but drugs which paralyse muscles before unconsciousness occurs, drugs with curariform effects and electrocution without passage of current through the brain, should not be used without prior anaesthesia.
- Disposal should not be allowed until death has been confirmed.

4.12 Records

- Records of source, use and final disposal of all animals bred, kept for breeding, or for subsequent supply for use in scientific procedures should be kept for statistical purposes and, in conjunction with health and breeding records, as indicators of animal welfare and for husbandry and planning purposes.

4.13 Identification

- Animals may need to be identified individually to enable accurate records to be kept.
- Staff carrying out the identification techniques should be appropriately trained.
- The method of identification should be reliable and cause minimum discomfort and pain both during application and in the long term.
- Sedatives and local anaesthetics and analgesics should be used if necessary.

III. SPECIES-SPECIFIC SECTION

A. Rodents (mice, rats, gerbils, hamsters, guineapigs)

1. The environment and its control

Ventilation
- See General section 2.1.

Temperature
- Temperature should be within a range of 20–24°C.
- Local temperatures among groups of rodents in solid-floored enclosures will often be higher than room temperatures.
- Nesting material/nest boxes give animals the opportunity to control their own microclimate.
- Special attention should be paid to the temperature in containment systems as well as that provided for hairless animals.

Humidity
- Relative humidity should be 55±10%, except for gerbils (45±10%).

Lighting
- Light levels within the enclosure should be low. Racks should have shaded tops to reduce the risk of retinal degeneration, particularly for albino animals.
- A period of red light at frequencies undetectable to the rodents can be useful during the dark period so that staff can monitor the rodents in their active phase.

Noise
- As rodents are very sensitive to ultrasound, and use it for communication, it is important that this extraneous noise is minimized. Many common laboratory fittings, including dripping taps, trolley wheels and computer monitors can produce ultrasonic noise (>20 kHz), which may affect behaviour and breeding cycles. It may be advisable to monitor the acoustic environment over a broad range of frequencies and over extended time periods.

Alarm systems
- See General section 2.6.

2. Care

Health
- See General section 4.1.

Housing and enrichment
- Gregarious species should be housed in stable and harmonious groups. This can be achieved, although it is difficult, with male mice, adult hamsters or gerbils. Animals may be housed individually if adverse effects or damage are likely to occur.
- Disruption of established stable and harmonious groups should be minimized, as this can be very stressful.
- The enclosures and their enrichment should allow the animals to manifest normal behaviours and reduce competitive situations.
- Bedding and nesting material, and refuges should be provided unless withholding is justified on veterinary or welfare grounds. If on experimental grounds, this should be agreed with the animal technician and with the competent person responsible for advising on the wellbeing of the animals.
- Rodents should be provided with sufficient materials allowing them to construct a complete, covered nest or a nest box should be provided. Nesting material is important for rats, mice, hamsters and gerbils as it enables them to create appropriate microenvironments for resting and breeding. Nest boxes or other refuges are important for guineapigs, hamsters and rats.

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2. Care *(continued from previous page)*

	• Many rodent species attempt to divide up their enclosures into functional areas. Partial barriers, such as tubes, boxes and climbing racks, may be beneficial to allow the animals to control social interactions and also to increase usable floor area. • Gerbils need comparatively more space than other rodent species to enable them to build and/or use burrows of sufficient size. Gerbils require a thick layer of litter for digging and nesting or a burrow substitute, which needs to be at least 20 cm long. • The use of translucent or tinted enclosures and inserts should be considered as these permit good observation of the animals without disturbing them. • All of these principles should also apply to containment systems, such as individually ventilated cages.
Animal enclosures	• See General section 4.5.
Dimensions	• See Annex, Tables A.1. to A.5.
Flooring	• Solid floors with bedding or perforated floors are preferable to grid or wire mesh floors. If grids or wire mesh are used, a solid or bedded area or, as an alternative in the case of guineapigs, a slatted area, should be provided for the animals to rest on unless specific experimental conditions prevent this. Bedding may be withheld as part of time-mating practices. • Mesh floors can lead to serious injuries and should be closely inspected and maintained to ensure that there are no loose or sharp projections. • During late pregnancy, parturition and lactation, breeding females should only be kept on solid floors with bedding.
Feeding	• See General section 4.6.
Watering	• See General section 4.7.
Substrate, litter, bedding and nesting material	• See General section 4.8.
Cleaning	• Although high hygiene standards should be maintained, it may be advisable to maintain some odour cues left by animals. Too frequent changing of enclosures should be avoided, particularly where pregnant animals and females with litters are concerned, as such disturbances can result in mis-mothering or cannibalism. • Decisions on frequency of cleaning should therefore be based on the type of the enclosure, type of animal, stocking densities, and the ability of ventilation systems to maintain suitable air quality.
Handling	• When handling, care needs to be taken to minimize disturbance of the animals or their enclosure environment. This is of particular importance with hamsters.
Humane killing	• See General section 4.11.
Records	• See General section 4.12.
Identification	• See General section 4.13.

B. Rabbits

1. The environment and its control

Ventilation	• See General section 2.1.
Temperature	• Temperature should be within a range of 15–21°C. • Local temperatures among groups of rabbits in solid-floored enclosures will often be higher than room temperatures. • Nesting material/nest boxes give animals the opportunity to control their own microclimate. • Special attention should be paid to the temperature in containment systems.
Humidity	• The relative humidity should be not less than 45%.
Lighting	• See General section 2.4.
Noise	• See General section 2.5.
Alarm systems	• See General section 2.6.

2. Care

Health	See General section 4.1.
Housing and enrichment	• Young rabbits and adult females should be housed in harmonious social groups. Groups should be carefully managed to avoid aggression. • Single housing should only occur if there is justification on veterinary or welfare grounds. If on experimental grounds, this should be agreed in consultation with the animal technician and with the competent person responsible for advising on the wellbeing of the animals. Where individuals cannot be group-housed, consideration should be given to housing them in close visual contact. • Adult entire males may exhibit territorial behaviour and should not be housed with other entire males. • Ideally rabbits for group housing should be littermates that have been kept together since weaning. • Suitable enrichment for rabbits includes roughage, hay blocks or chew sticks as well as an area for withdrawal. • For breeding does, nesting material and a nest box should be provided, preferably outside the enclosure, at least three to four days before giving birth. The enclosure should be designed so that does can move to another compartment or raised area away from their pups after the pups have left the nest. After weaning, the littermates should stay together in their breeding enclosure for as long as possible. • Enriched floor pens may be used for group housing and should provide visual barriers and structures for refuges and look-out behaviour.
Animal enclosures	• Wherever possible, rabbits should be kept in pens. • It is preferable for enclosures to be rectangular. • A raised area should be provided to allow the animal to lie, sit and easily move underneath, but should not cover more than 40% of the floor space. • While the enclosure height should be sufficient for the rabbit to sit upright without its ears touching the roof of the enclosure, this degree of clearance is not considered necessary for the raised area. • If there are good scientific or veterinary reasons for not using a shelf then the enclosure should be 33% larger for a single rabbit and 60% larger for two rabbits.
Dimensions	• See Annex, Tables B.1. to B.4.

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2. Care *(continued from previous page)*

Flooring	• Solid floors with bedding or perforated floors are preferable to grid or wire mesh floors. Wire floors should only be used if a resting area large enough to hold all the rabbits at any one time is provided.
Feeding	• See General section 4.6.
Watering	• See General section 4.7.
Substrate, litter, bedding and nesting material	• See General section 4.8.
Cleaning	• See General section 4.9.
Handling	• See General section 4.10.
Humane killing	• See General section 4.11.
Records	• See General section 4.12.
Identification	• See General section 4.13.

C. Cats

1. The environment and its control

Ventilation
- See General section 2.1.

Temperature
- Cats may be maintained within a wide temperature range provided welfare is not compromised.
- 15–21°C should be maintained for cats under procedure where precise control is required.
- Kittens have limited thermoregulatory control and additional local heating should be provided during the first 10 days of life.

Humidity
- See General section 2.3.

Lighting
- The natural 24 h light–dark cycle is acceptable.
- Where artificial lighting is used, the light part of the photoperiod should be 10–12 h and low level night lighting (5–10 lux) should be provided.

Noise
- See General section 2.5.

Alarm systems
- See General section 2.6.

2. Care

Health
- See General sections 4.1 and 4.4.

Housing and enrichment
- Females and neutered cats of both sexes are generally sociable and commonly held in groups of up to 12. Establishment of groups of two or more cats requires careful monitoring for compatibility. Special care is needed when regrouping, introducing a new cat, housing un-neutered animals in a group or maintaining cats in large groups.
- Social stress in all pair- or group-housed individuals should be monitored at least weekly using an established behavioural and/or physiological stress scoring system.
- Cats that are normally group-housed should not be housed singly for more than 24 h without justification on veterinary, welfare or experimental grounds. If on experimental grounds, the animal technician and the competent person responsible for advising on the wellbeing of the animals should be consulted.
- All cats should have a period of play and general social interactions with humans on a daily basis, plus time for regular grooming. Additional human contact should be provided for singly-housed cats.
- During the period of 2–8 weeks of age, it is particularly important the cat has social contacts with other cats and with humans and is familiarized with environmental conditions likely to be encountered during subsequent use.
- Pseudo-predatory and play behaviour should be encouraged.
- Raised part-enclosed structures should be provided in sufficient numbers to minimize competition.
- Additional enclosure furniture should provide a comfortable resting place.
- There should be provision for cats to seek refuge and privacy within their own enclosure and from the sight of cats in other enclosures.
- Vertical wooden surfaces should be provided to allow claw-sharpening and scent-marking.
- Areas for feeding and litter trays should be at least 0.5 m apart and should not be inter-changed.
- Outside runs should be provided wherever possible, but cats should always have access to an internal enclosure that meets all standards in these guidelines, including minimum dimensions.

Animal enclosures
- Design and construction should provide an open and light facility, giving cats comprehensive sight outside their enclosure.

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2. Care *(continued from previous page)*

Dimensions	• See Annex, Table C.1. • Any constraint in a space below the minimum requirement should be for the minimum time, in a space as close as possible to the minimum requirement and no less than that required for cats to stretch fully horizontally and vertically, to lie down and turn around.
Flooring	• A solid continuous floor with smooth non-slip finish is preferable. • Open flooring systems such as grids or mesh should not be used. If there is a justification for their use, great care should be taken in their design and construction so as to avoid pain, injury or disease and to allow animals to exhibit normal behaviours.
Feeding	• See General section 4.6.
Watering	• See General section 4.7.
Substrate, litter, bedding and nesting material	• At least one litter tray of minimum dimension 300x400 mm should be provided for every two cats and should contain a suitable absorbent and non-toxic litter or substrate material that is acceptable to and used by the cats. • Sufficient beds should be provided for all cats and contain bedding material such as polyester fleece or similar.
Cleaning	• Enclosures should be cleaned at least daily and litter trays emptied and litter material replaced. • Cleaning of enclosures should not result in cats becoming wet.
Handling	• Close contact with the person caring for the cats is crucial, especially for singly-housed cats.
Humane killing	• See General section 4.11.
Records	• See General section 4.12.
Identification	• See General section 4.13.

D. Dogs

1. The environment and its control

Ventilation
- See General section 2.1.

Temperature
- Dogs may be maintained within a wide temperature range provided welfare is not compromised.
- 15–21°C should be maintained for dogs under procedure where precise control is required.
- Puppies have limited thermoregulatory control and additional local heating should be provided during the first 10 days of life.

Humidity
- It is considered unnecessary to control relative humidity.

Lighting
- Holding of dogs under the natural 24 h light–dark cycle is acceptable.
- Where the light part of the photoperiod is provided by artificial lighting, this should be within the range of 10–12 h daily.
- If natural light is excluded, low level night lighting (5–10 lux) should be provided.

Noise
- Noise in dog kennels can reach high levels and cause damage to humans as well as affect dogs' health or physiology.
- Much of this noise is generated by the dogs' own vocalizations but also by husbandry operations and ingress from outside sources.
- Noise should be minimized by:
  - addressing dogs' behavioural needs in the facility design
  - reducing penetration of external noise by appropriate siting of the facility and architectural design
  - reducing noise generated within the facility by using noise absorbent materials or structures.
- Expert advice on noise reduction should be taken when designing or modifying dog accommodation.

Alarm systems
- See General Section 2.6.

2. Care

Health

See General sections 4.1 and 4.4.

Housing and enrichment
- Dogs should be housed in socially harmonious groups wherever possible. Special care is needed when regrouping dogs or introducing a new dog.
- Dogs that are normally group-housed should not be housed singly for more than 4 h without justification on veterinary, welfare or experimental grounds. If on experimental grounds, the animal technician and the competent person charged with advisory duties in relation to the wellbeing of the animals should be consulted.
- Additional human socialization time, and visual, auditory and, where possible, tactile contact with other dogs should be provided daily for singly-housed dogs.
- Stud dogs should, wherever possible, be housed in socially harmonious pairs or groups or with bitches.
- Periparturient bitches should only be moved to the whelping enclosure between one and two weeks of the expected parturition.
- During the period of 4–20 weeks of age, it is particularly important that the dog has social contacts with other dogs and with humans and is familiarized with conditions likely to be encountered during subsequent use.
- The design of indoor and outdoor enclosures should allow some privacy for the dogs and allow them to exercise some control over their social interactions.
- Separate areas for different activities should be provided, for example by inclusion of raised platforms and pen subdivisions.

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2. Care *(continued from previous page)*

- Dog treats and toys afford welfare benefits but should be adequately monitored. Chewing is an important behaviour and items should be provided to meet this need.
- Outside runs should be provided wherever possible.
- Unless contraindicated on scientific or welfare grounds, dogs should be allowed to exercise in a separate area, preferably with other dogs, and with staff supervision and interaction, ideally on a daily basis.

Animal enclosures

- Design and construction should provide an open and light facility giving dogs comprehensive sight outside their enclosure.

Dimensions

- See Annex, Table D.1. for minimum enclosure dimensions and space allowances for dogs, based on the requirements of beagles. For other breeds, space allowances should be determined in consultation with veterinary staff and the responsible authority.
- Dogs should never be forced to spend their whole time outside and should always have access to an internal enclosure that meets all standards in these guidelines. The internal enclosure should represent not less than 50% of the minimum space to be made available to the dogs, as detailed in Table D.1.
- Dogs that are pair- or group-housed may each be constrained to half the minimum space allowance for one dog of that weight while they are undergoing procedures, if such separation is essential for scientific purposes. The period of constraint should be minimized and should not exceed 4 h.
- Any further social or physical constraint should be for the minimum time, in a space as close as possible to the minimum requirement and no less than that required for dogs to stretch fully, to lie down and to turn around.
- A nursing bitch and litter should have the same space allowance as a single bitch of equivalent weight. The design of the whelping pen should allow the bitch to move to an additional compartment or raised area away from the puppies.
- After weaning at 6–9 weeks of age puppies should be housed according to Annex, Table D.2.

Flooring

- A solid continuous floor with smooth non-slip finish is preferable.
- A comfortable solid resting place should be provided for all dogs, for example a raised bed or platform.
- Open flooring systems should not be used. However, if there is a justification for their use, great care in design and construction is essential to avoid pain, injury or disease and to allow animals to show normal behaviours. If flooring-related welfare problems arise, veterinary advice should be sought and, if necessary, dogs relocated onto solid flooring.

Feeding

- See General section 4.6.

Watering

- See General section 4.7.

Substrate, litter, bedding and nesting material

- For solid floors, some litter or substrate material facilitates cleaning and minimizes the need for regular washing or hosing down.
- Periparturient and suckling bitches should be provided with a bed and bedding material. Puppies also benefit from the provision of bedding materials, as may certain breeds such as the greyhound.

Cleaning

- Each occupied enclosure should be cleaned at least daily. All excreta and soiled materials should be removed more frequently if necessary.
- Cleaning of enclosures by hosing down should not result in dogs becoming wet.

Handling

- See Housing and enrichment section above and General section 4.10.

Humane killing

- See General section 4.11.

Records

- See General section 4.12.

Identification

- See General section 4.13.

E. Ferrets

1. The environment and its control

Ventilation
- See General section 2.1.

Temperature
- A temperature range of 15–24°C should be provided.
- Ferrets do not have well-developed sweat glands and, to avoid heat exhaustion, should not be exposed to high temperatures.

Humidity
- It is considered unnecessary to control relative humidity.

Lighting
- Holding of ferrets under the natural 24 h light–dark cycle is acceptable.
- Where the light part of the photoperiod is provided by artificial lighting, this should be within the range of 8–16 h daily.
- For manipulation of the reproductive cycle, variation in the light–dark cycle is necessary (e.g. the light part can vary from 6–16 h).
- If natural light is excluded, low level night lighting (5–10 lux) should be provided.

Noise
- Lack of sound/auditory stimulation can make ferrets nervous, however loud unfamiliar noise and vibration may cause stress-related disorders.
- Noise should be minimized by:
  - reducing penetration of external noise by appropriate siting of the facility and architectural design
  - reducing noise generated within the facility by using noise absorbent materials or structures.
- Expert advice on noise reduction should be taken when designing or modifying ferret accommodation.

Alarm systems
- See General section 2.6.

2. Care

Health
- See General sections 4.1 and 4.4.

Housing and enrichment
- Ferrets should be housed in socially harmonious groups wherever possible.
- During the breeding season, adult males may need to be maintained singly to avoid fighting/injury.
- Pregnant females should be housed singly from no more than two weeks prior to parturition.
- Ferrets that are normally group-housed should not be housed singly for more than 24 h without justification on veterinary, welfare or experimental grounds. If on experimental grounds, the animal technician and the competent person charged with advisory duties in relation to the wellbeing of the animals should be consulted.
- Additional human socialization time, and visual, auditory and, where possible, tactile contact with other ferrets should be provided daily for singly-housed ferrets.
- During the early weeks of age, it is particularly important that the ferret has social contacts with other ferrets and with humans. During this time, daily handling is a prerequisite for the social behaviour of the adult ferret. This interaction should be continued through into adult life.
- The design of the enclosure should allow some privacy for the ferrets and allow them to exercise some control over their social interactions.
- Separate areas for different activities should be provided, for example by inclusion of raised platforms and pen subdivisions.
- Provision of containers and tubes of cardboard or rigid plastic, and paper bags, stimulates both investigative and play behaviour.
- Water bowls and baths are used extensively by ferrets.

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2. Care *(continued from previous page)*

Animal enclosures	• Design and construction should provide an open and light facility giving ferrets comprehensive sight outside their enclosure. • Ferrets have a remarkable ability to escape and the enclosure design should be such that animals are unable to escape or injure themselves while attempting to do so.
Dimensions	• See Annex, Table E.1. for minimum enclosure dimensions and space allowances. • Constraint in less than these space requirements, such as in a metabolism cage, may severely compromise the welfare of the animals.
Flooring	• A solid continuous floor with smooth non-slip finish is preferable. • A warm and comfortable resting place should be provided for all ferrets, for example a raised bed or platform. • Open flooring systems should not be used.
Feeding	• See General section 4.6.
Watering	• See General section 4.7.
Substrate, litter, bedding and nesting material	• Bedding material is required for all ferrets and, in addition, nesting materials such as hay, straw or paper should be provided. • Deep litter systems provide additional enrichment. • Use of litter or substrate material will facilitate cleaning.
Cleaning	• Ferrets tend to defaecate against a vertical surface in one area of the enclosure. Provision of a litter tray may reduce the frequency of cleaning required for the remainder of the enclosure. • All excreta and soiled materials should be removed from litter trays and/or removed from other areas used by the animals as a toilet at least daily and more frequently if necessary. • Frequency of cleaning of the remainder of the enclosure should be determined on factors such as enclosure design, stocking density and stage of breeding. • Cleaning of enclosures by hosing down should not result in ferrets becoming wet.
Handling	• See General section 4.10.
Humane killing	• See General section 4.11.
Records	• See General section 4.12.
Identification	• See General section 4.13.

F. Non-human primates (marmosets and tamarins, squirrel monkeys, macaca and vervets, baboons)

1. The environment and its control

Ventilation

- See General section 2.1.

Temperature

- Where outdoor enclosures are in use, it is essential to provide shelter from inclement weather for all individuals and continuous access to adequate heated indoor accommodation.
  - Species-specific provisions:
    - *Marmosets and tamarins*
      - A temperature range of 23–28°C should be maintained. Levels slightly higher are acceptable.
    - *Squirrel monkeys*
      - A temperature of 24°C (±2°) is adequate. In restricted exercise areas, temperatures around 26°C may be more appropriate.
    - *Macaques and vervets*
      - For rhesus monkeys, stump-tailed macaques and vervets, a temperature range of 16–25°C is suitable. For long-tailed macaques, a more suitable range is 21–28°C, although they will adapt to much cooler outdoor weather.
    - *Baboons*
      - A temperature range of 16–28°C is suitable.

Humidity

- Humidity levels of 40–70% should be provided. Prolonged exposure outside this range should be avoided.
  - Species-specific provisions:
    - *Marmosets and tamarins*
      - The animals will tolerate relative humidity levels higher than 70%.

Lighting

- Non-human primates should have a 12 h/12 h light/dark cycle.
- For the nocturnal species the cycle should be modified so that dim red light is used during part of the normal working day to allow the animals to be observed during their active periods.
  - Species-specific provisions:
    - *Marmosets and tamarins*
      - A shaded area should always be provided.
    - *Squirrel monkeys*
      - The daylight period should not be less than 8 h. Time-limited exposure to ultraviolet light enables essential vitamin D_3 synthesis in the skin.

Noise

- Restful background music, not exceeding 65 dBA, may provide a form of environmental enrichment and have a calming effect on the animals.
  - Species-specific provisions:
    - *Marmosets and tamarins*
      - Special consideration should be given to minimize exposure to ultrasound, which is within their hearing range.

Alarm systems

- See General section 2.6.

2. Education and training

- For animal carers and scientists working with non-human primates, training should include species-specific information and methods used for the introduction and removal of animals and social dynamics.
- Training should also include information on the health and safety of staff working with non-human primates including zoonotic disease risk, and management.

3. Care

Health

- Non-human primates' close affinity to humans results in susceptibility to diseases and parasites that are common to both and occasionally life threatening to the other.
- All newly acquired animals should arrive with full health certification and be quarantined on arrival.
- All non-human primates in the colony should be under expert veterinary control and submitted to periodical diagnostic tests.
- The investigation of unexpected morbidity and mortality should be thorough, having regard for potential zoonotic diseases, and be entrusted to competent personnel and laboratories.
- Non-human primates from different geographical areas should be strictly separated from each other until their health status has been clarified.
- In outdoor enclosures vermin control is of particular importance.
  - Species-specific provisions:
    - *Marmosets and tamarins*
      - See squirrel monkeys below.
    - *Squirrel monkeys*
      - Squirrel monkeys may be silent carriers of a herpesvirus (Saimirine herpesvirus 1, syn. Herpesvirus tamarinus, herpes T, Herpesvirus platyrrhinae), which, when transmitted to marmosets, may prove fatal. Therefore these two species should not be housed in the same units unless proven free of these viral infections.
    - *Macaques and vervets*
      - Old World monkeys belong to the most susceptible species for tuberculosis and a high percentage of Asiatic macaques in the wild are silent carriers of herpes B (syn. Herpes simiae, Cercopithicine herpesvirus 1). Vervets may also be susceptible to the Marburg virus and Ebola virus.

Capture from the wild

- See General section 4.2.

Transport

- Animals should, where possible, be transported in compatible pairs. However, adult animals may need to be transported singly.

Quarantine, acclimatization and isolation

- See General section 4.4.

Housing and enrichment

- Housing:
  - A person competent in the behaviour of non-human primates should be available for advice on social behaviour, environmental enrichment strategies and management.
  - Because the common laboratory non-human primates are social animals, they should be housed with one or more compatible conspecifics.
  - Compatibility, and hence group composition, in terms of the age and sex of its members, depends on the species. In confined conditions, however, modifications to group structure may be required. For example, a harem structure may be substituted for the natural multi-male, multi-female troop in macaques.
  - Experimental protocol may also determine group composition, for example, single-sex or same-age groups.
  - Visual barriers and multiple escape routes are important in group housing.
  - A programme of action should be in place for managing and minimizing aggressive interaction following animal grouping or mixing.
  - Where animals are housed in same-sex groups, it is best to avoid housing the two sexes in close proximity.
  - For experimental animals, where housing them in large groups is not possible, keeping them in same-sex compatible pairs is probably the best social arrangement.

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3. Care *(continued from previous page)*

- The only exceptions to social housing should be either for veterinary reasons or where an experimental protocol demands it to ensure good science. Single housing should only be allowed for as short a time as possible, under close supervision, where there is a justification on veterinary or welfare grounds. In such circumstances, additional resources should be targeted to the welfare and care of these animals.
- Where socially-housed animals need to be separated for a period of time, care and vigilance should be exercised on re-introduction as the social organization in the group may have changed and the animal may be attacked. Possible solutions include confinement of this animal to an individual enclosure attached to, or within, the main living area or separation of all individuals briefly followed by re-introduction of the whole group simultaneously.
- Species-specific provisions:
  - *Marmosets and tamarins*
    - Marmosets and tamarins should be housed in family groups consisting of unrelated male–female pairs and one or more sets of offspring. Groups of stock animals should consist of compatible same-sex peer individuals or juveniles. When grouping unrelated adult individuals of the same sex, overt aggression may occur.
    - During experiments, marmosets and tamarins can generally be kept with a compatible same-sex animal (twins, parent/offspring) or in male–female pairs, using contraception.
  - *Squirrel monkeys*
    - Saimiris can be kept in large single-sex groups. However, male and female groups should be well separated to avoid fighting.
  - *Macaques and vervets*
    - Same-sex groups are most easily created when the animals are separated from their mothers.
  - *Baboons*
    - Stock animals can be kept in compatible same-sex groups. Wherever possible, experimental animals should be kept in same-sex pairs or groups.

- Breeding:
  - For future breeding animals, it is important that the young grow up in stable social groups, preferably their natal group, with their mothers for developing appropriate parenting and social skills.
  - Species-specific provisions:
    - *Marmosets and tamarins*
      - Breeding pairs should be formed only when the animals are aged about two years. In family groups, the presence of the mother will inhibit the ovulatory cycle in her female offspring. New pairs intended for breeding should not be kept close to the parental family since reproduction may be inhibited.
    - *Squirrel monkeys*
      - For breeding purposes a group of seven to 10 females kept with one or two males appears to be adequate. Breeding groups should have visual contact, but should be prevented from physical contact, with other groups.
    - *Macaques and vervets*
      - Breeding groups in captivity will usually be composed of one male and six to 12 females. With larger groups, to improve conception rates, two males can be included.
    - *Baboons*
      - Breeding groups should be composed of one male and six to seven females, or two males and 12 to 15 females.

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3. Care *(continued from previous page)*

- Separation from the mother:
  - Species-specific provisions:
    - *Marmosets and tamarins*
      - The appropriate age of weaning should not be earlier than eight months of age. When animals are to be used as breeders, they should remain in the family group until at least 13 months of age in order to acquire adequate rearing experience.
    - *Squirrel monkeys*
      - Young animals should not be separated from their families before six months of age.
    - *Macaques, vervets and baboons*
      - The young should not normally be separated from their mothers earlier than eight months of age, preferably 12 months.
- Enrichment:
  - Non-human primates should be provided with a suitably complex environment to allow them to run, walk, climb and jump.
  - Materials providing tactile stimuli are valuable.
  - Some novelty should be introduced at intervals, for example: minor changes in the conformation or arrangement of enclosure furniture and feeding practices.
  - Species-specific provisions:
    - *Marmosets and tamarins*
      - Furniture of natural or artificial materials should include: perches, platforms, swings, ropes. Wooden perches allow marmosets and tamarins to express their natural behaviour of gnawing followed by scent-marking. For marmosets, which are specialized in tree-gnawing to obtain gum, sections of dowel drilled with holes and filled with gum arabic have proved very beneficial.
      - Some neighbouring groups may need opaque screens or increased separation to avoid territorial interaction.
      - A comfortable secure resting area, such as nest boxes, should be included since they are used for resting, sleeping and hiding in alarming situations.
    - *Squirrel monkeys*
      - As arboreal animals, squirrel monkeys need sufficient climbing possibilities, which can be provided by wire-mesh walls, poles, chains or ropes. They prefer to run along horizontal and diagonal branches or rope bridges or swing on them.
    - *Macaques and vervets*
      - A solid floor with substrate and concealed scattered food items encourages foraging. Devices to encourage foraging have proved effective.
      - Vertical and diagonal structures for climbing should be provided; shelves and perches should not be placed one above the other. A space should be left between the shelf and enclosure wall to allow animals to suspend their tails freely.
    - *Baboons*
      - A solid floor with substrate and concealed scattered food items encourages foraging. Ladders, perches and toys to chew are all of value.

Animal enclosures

- The following factors will determine the enclosure dimensions for a given species:
  - the adult size of the animals (juvenile animals require similar space allowances for physical development and play)
  - sufficient space to provide a complex and challenging environment and
  - the size of the group to be accommodated.
- The following principles should apply to the housing of all species of non-human primates:
  - enclosures should be of adequate height to allow the animal to flee vertically and sit on a perch or a shelf, without its tail contacting the floor

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3. Care *(continued from previous page)*

- the animal should be able to display a normal locomotor and behavioural repertoire
- there should be room for suitable environmental enrichment
- apart from exceptional circumstances, the animal should not be singly-housed
- enclosures should not be arranged in two or more tiers vertically.
- Species-specific provisions:
  - *Marmosets and tamarins*
    - The volume of available space and the vertical height of the enclosure are more important than the floor area, due to the arboreal nature and the vertical flight reaction of these species.
  - *Macaques, vervets and baboons*
    - For the animals to feel secure, the design and interior dimensions of the enclosure should at least allow them to climb above human eye level.

- Outdoor enclosures:
  - Where possible, non-human primates should have access to outdoor enclosures.
  - Part of each outdoor enclosure should be roofed; shelters and heated indoor enclosures should be provided.
  - The minimum size for an indoor enclosure should meet the minimum values specified to ensure that the animals are not overcrowded in inclement weather. As outdoor enclosures represent additional space, minimum dimensions are not set. Where different enclosures are connected more than one connecting door should be provided to prevent subordinates being trapped by more dominant animals.
- Indoor housing:
  - Indoor enclosures will commonly be constructed of metal; other materials, such as wood, laminates and glass have been used successfully and provide a quieter environment.
  - The walls can include mesh to allow climbing but sufficient diagonal branches or perches should also be provided to allow all animals to sit on them simultaneously.
  - Non-human primates may need to be confined in smaller home enclosures for short periods of time. Smaller volumes can be created by partitioning the main enclosure using dividers and/or a mobile back to the enclosure, having a cage within the home enclosure, two linked units, or attaching experimental enclosures to a larger exercise enclosure.

Dimensions

- For marmosets and tamarins see Annex, Table F.1.
- For squirrel monkeys see Annex, Table F.2.
- For macaques and vervets see Annex, Table F.3.
- For baboons see Annex, Table F.4.

Feeding

- Presentation and content of the diet should be varied to provide interest and environmental enrichment.
- Food which requires manipulation (e.g. whole fruits or vegetables, or puzzle-feeders) should be offered.
- Vitamin C is an essential component of the primate diet. New World monkeys require adequate quantities of vitamin D_3.
- It is advisable to feed the standard diet first thing in the morning when the animals are hungry and have no alternative.
- A varied diet should not be provided if it is likely to have disturbing effects on experimental results.
  - Species-specific provisions:
    - *Marmosets and tamarins*
      - Marmosets and tamarins require a high protein intake and, since they are unable to synthesize vitamin D_3 without access to ultraviolet B radiation, the diet must be supplemented with adequate levels of vitamin D_3.

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3. Care *(continued from previous page)*

- ◆ *Squirrel monkeys*
  - ◇ Squirrel monkeys require a high protein intake and high levels of vitamin D_3 in addition to vitamin C. Pregnant females are susceptible to folic acid deficiency, and should be provided with an appropriate powder or liquid supplement containing synthetic folic acid.

Watering

- See General section 4.7.

Substrate, litter, bedding and nesting material

- Non-toxic substrates such as wood chips, wood granulate with a low dust level or shredded paper are valuable in promoting foraging in indoor enclosures. Grass, herbage wood chip or bark chip are suitable for outdoor facilities.

Cleaning

- Species-specific provisions:
  - ○ *Marmosets and tamarins*
    - ◆ Marmosets and tamarins frequently scent-mark their environment and the total removal of familiar scents may cause behavioural problems. Alternate cleaning and sanitation of the enclosure and the enrichment devices retains some of the territorial scent-marking and has beneficial effects on the psychological wellbeing of the animals, reducing over-stimulated scent-marking.

Handling

- Various methods of restraint are employed, e.g. enclosures with sliding partitions, netting, holding the animals manually, using a dart to tranquillize them.
- Training animals to cooperate should be encouraged, as this will reduce the stress caused by handling.
- The response of individuals to training and procedures should be regularly reviewed, as some animals may be particularly difficult or non-responsive and in such cases, careful consideration should be given to their continued use.
- Though animals can be trained to accomplish tasks, attention should be paid to appropriate recovery periods when subjected to repeated experiments.
  - ○ Species-specific provisions:
    - ◆ *Marmosets and tamarins*
      - ◇ For the capture and transport of the animals, nest boxes can be used to reduce handling stress.
    - ◆ *Squirrel monkeys*
      - ◇ Animals should be trained to enter gangways with trap cages or individual enclosures.

Humane killing of animals

- See General section 4.11.

Records

- Individual records containing detailed information for each animal should be maintained. These should include: species, sex, age, weight, origin, clinical and diagnostic information, present and previous housing system, history of experimental use and any other information relevant for management and experimental procedures, such as reports on their behaviour or status, and favoured social companions/social relationship.

Identification

- All non-human primates should be identified with a permanent and unique laboratory identification code before weaning.
- Individual animals can be identified visually by using necklaces with attached medallions or tattoos for large species. Microchips can be injected into accessible sites.

G. Farm animals (cattle, sheep and goats, pigs and minipigs, equines)

1. The environment and its control

Ventilation

- In farm buildings it is important to ensure that good quality air is provided by natural ventilation. Dust levels should be minimized.

Temperature

- Under natural conditions farm animals will usually tolerate a wide temperature range. They seek shelter from adverse climatic conditions and such shelters should be provided together with a dry lying area.
- Farm animals living outdoors acclimatize naturally to seasonal variations in temperature.
- In indoor enclosures it is important to avoid wide fluctuations and sudden changes in temperature and also when moving animals between indoor and outdoor accommodations.
- As farm animals may suffer from heat stress, during periods of high temperature it is important to ensure that appropriate measures, for example the shearing of sheep and provision of shaded lying areas, are in place to avoid welfare problems.
- Appropriate temperature ranges are dependent on a number of factors including breed, age, caloric intake, weight, stage of lactation and type of environment.
  - Species-specific provisions:
    - *Sheep and goats*
      - Sheep require access to natural or artificial wind-break shelter and shade, while different coat characteristics make goats less tolerant to prolonged rain and they should have access to roofed shelters.
      - Recently shorn animals may need higher environmental temperatures than fleeced animals.
    - *Pigs and minipigs*
      - Pigs and minipigs are highly sensitive to environmental temperature and place a high behavioural priority on thermoregulation.
      - Pigs may be kept in rooms maintained within the thermoneutral zone. Alternatively, they may be kept in an enclosure with different microclimates, by providing localized heating or kennelling of the lying area and provision of adequate bedding material. Outdoor pigs can compensate for lower ambient temperature provided that adequate shelter, with plentiful dry bedding, and additional food is provided.
      - Temperature ranges for pigs and minipigs are shown in Annex, Table G.3.
      - Within the ranges given, suitable temperatures will vary according to body weight, sexual maturity, the presence or absence of bedding, group housing, and the caloric intake of the animals.
      - Litters of newborn piglets should be offered a lying area within the farrowing room having a local heat supply to maintain a minimum temperature of 30°C, decreasing to 26°C at the age of two weeks. Because of their high metabolic activity, lactating sows are prone to heat stress and farrowing room temperatures should ideally not exceed 24°C.
    - *Equines*
      - Rugs can be used in cool conditions, especially if hair has been clipped, but these should be removed and checked daily.
      - The mane and tail provide protection from adverse weather conditions and flies but if they do need to be shortened or tidied it should be done by trimming rather than by pulling.

Humidity

- Under natural conditions, farm animals tolerate a wide range of relative humidities.
- In controlled environments, fluctuations of humidity should be minimized, as both high and low humidity can predispose animals to disease.
- Indoor enclosures should have sufficient ventilation to prevent prolonged periods of high humidity.

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1. The environment and its control *(continued from previous page)*

Lighting

- Provision of adequate natural light is preferred for all farm animals. If not provided, the light part of the photoperiod should be within a range of 8–12 h daily, or should reproduce natural light cycles. Controlled photoperiods may be needed for breeding and for some experimental procedures. Sufficient light should be available for inspection of groups and individuals.

Noise

- Unavoidable background and sudden noises should be minimized.

Alarm systems

- See General section 2.6.

2. Care

Health

- Disease control:
  - It is important to ensure that animals sourced from commercial farms are of a suitable health status. Mixing animals from different sources is a particular risk.
  - Preventive medicine programmes, including foot care, parasite control and nutritional management, should be developed on the basis of veterinary advice for all farm species.
  - For equines, regular dental examinations and respiratory disease preventive measures are important.
  - Regular review of production indices and condition scoring should be included.
  - Any substrate provided should not introduce or promote infectious agents or parasites.
- Behavioural abnormalities:
  - Behavioural abnormalities can occur as a consequence of poor husbandry or environmental conditions, social isolation, or from boredom due to long periods of inactivity. If abnormalities do occur, the causes should be identified and rectified.
- Husbandry:
  - Disbudding, dehorning of adult animals, castration and tail docking should not be done unless justified on welfare or veterinary grounds in which case appropriate anaesthesia and analgesia should be used.
  - Species-specific provisions:
    - *Sheep and goats*
      - Adult sheep and goats of wool breeds should be shorn at least once per year, unless this would compromise their welfare.
- Neonatal care:
  - Suitable accommodation, with a dry clean area, should be provided for periparturient and neonatal animals.
  - All neonates should receive adequate amounts of colostrum as soon as possible after birth, and preferably within 4 h.
  - Feeding practices should allow normal development, with access of roughage to ruminants from two weeks of age to promote normal rumen development.
  - Because neonatal animals have poor thermoregulatory control, suitable temperatures should be provided and maintained.
  - During the first few days of life management procedures which might disrupt the development of a strong maternal bond should be avoided.
  - Weaning strategies should minimize stress in the mother and offspring. Weaning into groups of animals of similar ages facilitates the development of socially compatible groups.
  - Naturally reared pigs and minipigs should not be weaned before four weeks of age; lambs, kids and beef calves before six weeks of age and equines before 20 weeks of age, unless there is justification on veterinary or welfare grounds.
  - Early weaning on experimental or veterinary grounds should be determined in consultation with the animal technician and the competent person charged with advisory duties in relation to the wellbeing of the animals.

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2. Care *(continued from previous page)*

Housing and enrichment

- Farm animals should be housed in socially harmonious groups, and husbandry practices should minimize social disruption, unless scientific procedures, welfare requirements or veterinary grounds make this impossible. Examples include females about to give birth, and adult boars, which can be solitary under natural conditions.
- Single housing on experimental grounds should be determined in consultation with the animal technician and the competent person charged with advisory duties in relation to the wellbeing of the animals. Where individual housing is necessary, animals should have visual, auditory and olfactory contact with conspecifics.
- Special care is needed to minimize aggression and potential injury when grouping, regrouping, or introducing an unfamiliar animal to a group. Animals should be grouped according to size and age and monitored for social compatibility on an ongoing basis.
- All farm animal species naturally spend a large amount of time grazing, browsing or rooting for food, and in social interaction. Suitable opportunities should be provided to meet these behaviours.
- Enrichment should be provided to minimize or prevent boredom and stereotypic and aggressive behaviour. Enrichment materials and devices should be changed at regular intervals to retain animals' interest.
  - Species-specific provisions:
    - *Cattle*
      - Horned and polled animals should not be mixed, except for young calves and their mothers.
    - *Sheep and goats*
      - Entire adult males can be more solitary than females and young offspring. They may be aggressive, particularly during the breeding season, requiring careful management.
      - Horned and polled goats should not be housed together.
      - Sufficient raised areas of appropriate size and quantity to prevent dominant animals impeding access should be provided for goats.
    - *Pigs and minipigs*
      - Pigs separate different activities such as lying, feeding and excretion. Enclosures should allow for the establishment of separate functional areas by providing either plentiful space or appropriate subdivision of the enclosure area.

Animal enclosures

- Farm animal enclosures should have sufficient space to allow the animals to stand up, lie comfortably, stretch and groom themselves and to carry out a range of normal behaviour. Floor type, drainage, provision of bedding and the group size and its stability will all impact on the space requirements.
- All enclosures should be designed and maintained to ensure that animals cannot be trapped or injured.
- Animals should not be tethered, unless justified on scientific or veterinary grounds, in which case this should be for the minimum time period necessary.
- The lying area should allow the animals to lie in lateral recumbency simultaneously and should be provided with bedding. Some farm animals generally prefer to lie in physical contact with other conspecifics; others prefer a degree of spatial separation. Where absence of bedding is necessary for experimental reasons, the floor should be designed and insulated to guarantee physical and thermal comfort.
- Under conditions of high temperatures, where animals need to lie with complete spatial separation to facilitate heat loss, a greater lying area should be allowed.

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2. Care *(continued from previous page)*

- The height of enclosures should allow natural rearing and mounting behaviour.
  - Species-specific provisions:
    - *Cattle*
      - Where cubicles are not provided, the bedding area will normally be approximately 70% of the minimum floor area.
      - If individual open-ended cubicles are provided as the bedded area, this area may be reduced in size, but the total number of cubicles should exceed animal numbers by 5% to reduce competition. The design of cubicles should include consideration of the body size of the animal, a surface sufficiently cushioned to prevent injury, adequate stall drainage, correctly positioned stall dividers and head rails, lateral and vertical freedom for head movement and adequate lunging space. The height of the rear step should prevent dung entering the cubicle during cleaning, but not be of such a height that it causes damage to the feet during ingress and exit.
    - *Sheep and goats*
      - The entire enclosure should have a solid floor with appropriate bedding provided.
    - *Pigs and minipigs*
      - Where pigs are housed individually or in small groups, greater space allowances per animal are required than for those in larger groups.
      - Pigs should not be tethered and should not be confined in stalls or crates except for short periods of time necessary for feeding, insemination, parturition, veterinary or experimental purposes. The accommodation for sows and piglets should satisfy the behavioural needs of the sow before and after parturition and of the piglets after birth. Farrowing crates can safeguard piglet survival and welfare under some conditions. The close confinement of sows during the perinatal and suckling periods should be limited and loose housing systems should be preferred.
      - To facilitate provision of rooting/nesting substrate, a solid floor in the lying area should be provided. Slatted floors facilitate good hygiene, provided that the widths of the slat and void are appropriate to the size of the pigs to prevent foot injuries.
    - *Equines*
      - Equines should be kept at or have access to pasture for at least 6 h a day or additional roughage should be provided to extend the time spent feeding and reduce boredom.
      - Slatted floors should not be used for equines.

Dimensions

- For cattle see Annex, Table G.1.
- For sheep and goats see Annex, Table G.2.
- For pigs and minipigs see Annex, Table G.4.
- For equines see Annex, Table G.8.

Feeding

- Forage, including hay, straw, silage and root crops, forms a significant component of the diets of farm animals.
- Additional energy is needed to support pregnancy, lactation and growth. Where necessary, mineral licks and vitamin supplements should be provided.
- When grazed grass is used as forage, stocking densities should be controlled to ensure adequate supplies are available for all animals. Where grass supply is limited additional feed should be provided.
- For ruminants and equines, sudden changes in diet should be avoided, and new items introduced gradually. Sufficient roughage should be provided.
- In group-housing systems, there should be sufficient food provided at sufficient sites to allow all individuals access without risk of injury.

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2. Care *(continued from previous page)*

- Grass cut for feeding housed animals should be cut frequently, as cut grass heats up when stored and becomes unpalatable.
  - Species-specific provisions:
    - *Cattle*
      - The trough space should allow all animals to feed at the same time, unless the diet is available *ad libitum*. Horned cattle require more trough space and due allowance should be made for this.
    - *Pigs and minipigs*
      - Unless kept for meat production, restricted feeding practices are necessary to avoid obesity. Where feed restriction is necessary, pigs show increased foraging motivation expressed by increased activity, aggression, and development of stereotyped oral behaviours. To avoid obesity and behavioural problems it is important to provide increased dietary fibre and an appropriate foraging substrate such as straw.
      - With restricted feeding practices, young growing animals should be fed at least twice and mature animals once daily, as an adequate meal size provides satiety and minimizes aggression.
      - Recommended requirements for feeding are given in Annex, Table G.5. Where animals are housed singly or in small groups, the minimum trough space should be that for restricted feeding. When animals are housed in larger groups and fed *ad libitum*, trough space can be shared and a lower total space is required.
    - *Equines*
      - Incorrect feeding of equines may cause illnesses such as colic and laminitis.
      - Where equines are not given the opportunity to graze, they should be provided with suitable roughage every day. Where possible, roughage should be fed on the ground or round bale feeders. Hay nets and racks should be designed and positioned to minimize risk of injury.
      - If the animals are housed in groups the feeding order should, where possible, follow the herd order of dominance. Where possible, animals should be fed individually. If not possible, feeding points should be spaced at least 2.4 m apart and there should be at least one point per animal. Horses fed with concentrates need to be given small amounts of feed frequently.

Watering

- Species-specific provisions:
  - *Cattle*
    - Water troughs should be of sufficient length to allow 10% of the animals to drink at one time. This equates to a minimum of 0.3 m/10 adult cattle. Lactating dairy cows will require 50% more space.
    - A minimum of two, and at least one drinking bowl per 10 animals should be provided when cattle are group-housed.
  - *Sheep and goats*
    - Enclosures for sheep and goats should have at least one drinking point per 20 animals.
  - *Pigs and minipigs*
    - Being particularly sensitive to water deprivation group-housed pigs should have access to at least two drinking points or a large communal drinking bowl. Recommended minimum drinking point allowances are shown in Annex, Table G.6.
    - Where pigs housed in larger groups are watered from an open bowl, the minimum length of bowl perimeter should be that allowing a single pig unimpeded access (as indicated in Table G.5. for restricted feeding space), or 12.5 cm of trough length per pig, whichever is greater.
    - Minimum drinking water flow rates for pigs are shown in Annex, Table G.7.

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2. Care *(continued from previous page)*

- *Equines*
  - Horses prefer to drink from an open water surface, and this should be provided where possible. If automatic water nipple drinkers are used, animals may need to be trained to use them.

Substrate, litter, bedding and nesting material

- Species-specific provisions:
  - *Pigs and minipigs*
    - Bedding, unless precluded for experimental reasons, should be provided to all pigs. Bedding enhances physical and thermal comfort, can be eaten to provide gut fill and satiety, and provides a substrate for foraging and nest-building behaviours, particularly for farrowing sows.

Cleaning

- See General section 4.9.

Handling

- Handling and restraint facilities should be of robust construction and safe for animals and operators. In particular, a non-slip floor should be provided.
- Handling and restraint facilities can be basic equipment provided within the animal enclosure or dedicated facilities serving the needs of the whole establishment.
- Dedicated facilities should, where possible, incorporate races and pens for separating animals; footbaths; special facilities for some species such as plunge dip baths and shearing pens for sheep; and an area to allow animals to recover after treatments. Ideally these facilities should be protected from prevailing weather conditions. Passages and gates should be of sufficient width to permit two animals to pass freely, whereas races should be of sufficient width only to permit one-way movement.
- Animals should be handled quietly and firmly and not be rushed along races and passageways. These should be designed, taking account of the natural behaviour of the animals, to facilitate ease of movement and minimize the risk of injury. Immobilization devices should not cause injury or unnecessary distress. Aversive stimuli, physical or electrical, should not be used.
- Where frequent handling is required, a programme of training and positive rewards should be considered to minimize fear and distress.
- Animals should not be closely confined except for the duration of any examination, treatment or sampling, while accommodation is being cleaned, collecting for milking, or loading for transport.
  - Species-specific provisions:
    - *Cattle*
      - Where animals are milked by machine, equipment should be maintained to a high standard to prevent diseases such as mastitis.
      - Horned cattle may present a danger to personnel in confined spaces and it may be necessary to dehorn, preferably on calves under the age of eight weeks.

Humane killing

- Killing should not be performed in rooms where other animals are housed, unless in the case of a badly injured animal where additional suffering may be caused by moving it.

Records

- See General section 4.12.

Identification

- Tagged or tattooed ears should be checked regularly for signs of infection and lost tags should be replaced using the original tag hole where possible.
- Electronic devices of identification should be of the correct size and specification for the animal and should be checked regularly for function and the absence of any adverse reactions.
  - Species-specific provisions:
    - *Sheep and goats*
      - Dyeing the fleece or coat using non-toxic markers may be used for short-term experiments in short-wool breeds of sheep and in goats.
    - *Equines*
      - Ear tags and tattooing should not be used in equines. If identification other than coat colour is required then transponders should be used.

H. Birds (domestic fowl, domestic turkeys, quail, ducks and geese, pigeons, zebra finches)

1. The environment and its control

Ventilation

- Measures should be in place to ensure that individuals do not become chilled as a result of draught.
- Accumulation of dust and gases such as carbon dioxide and ammonia should be kept to a minimum.

Temperature

- Where appropriate, birds should be provided with a range of temperatures so that they can exercise a degree of choice over their thermal environment.
- All healthy adult quail, pigeon and domestic ducks, geese, fowl and turkeys should be housed at temperatures of between 15 and 25°C.
- Because of the interaction between temperature and relative humidity some species will suffer from heat stress within the prescribed temperature range if the relative humidity is too high.
- For species where there are no published guidelines on temperature and humidity, the climate experienced in the wild throughout the year should be researched and replicated as closely as possible.
  - Species-specific provisions:
    - *Domestic fowl and turkeys*
      - Higher room temperatures than those indicated in Annex, Table H.1., or a localized source of supplementary heat such as a brooder lamp may be required for sick or juvenile birds.
      - The chicks' behaviour should be used as a guide when setting brooder lamp temperature. If thermally comfortable, chicks will be evenly spaced in the enclosure and making a moderate amount of noise; quiet chicks may be too hot and chicks making noisy distress calls may be too cold.
    - *Domestic ducks and geese*
      - It is not necessary to control the temperature of swimming water.

Humidity

- Relative humidity should be maintained within the range of 40–80% for healthy, adult, domestic birds.

Lighting

- Light quality and quantity are critically important for some species at certain times of the year for normal physiological functioning. Appropriate light and dark regimes for each species, life stage and time of year should be known before animals are acquired.
- Lights should not be abruptly switched off or on, but should be dimmed and raised in a gradual fashion. This is especially important when housing birds capable of flight. Dim night-lights may facilitate movement at night for heavy-bodied poultry strains. Where provided, care should be taken to ensure that circadian rhythms are not disrupted.
- Very low lighting (i.e. $<$20 lux) for prolonged periods causes distress and should not be used.
- Periodically or temporarily lowering light intensity, using red lights or lights that emit ultraviolet rays may avoid outbreaks of injurious pecking.

Noise

- Some birds, for example the pigeon, are considered to be able to hear very low frequency sounds. Although infrasound (sound below 16 Hz) is unlikely to cause distress, birds should be housed away from any equipment that emits low frequency vibrations whenever possible.

Alarm systems

- See General section 2.6.

2. Care

Health

- Captive-bred birds should be used wherever possible. Wild birds may present special problems in terms of their behaviour and health when in a laboratory situation. A longer period of quarantine and habituation to captive conditions is generally required before they are used in scientific procedures.
- Careful health monitoring and parasite control should minimize health risks in birds with outdoor access.
- Many of the potential welfare problems specific to birds are associated with inappropriate pecking behaviour. This can be divided into aggressive pecking; feather pecking (where individuals either peck at other birds' feathers or pluck and pull at their own); and pecking at the skin of other birds, which can cause serious suffering and mortality if unchecked.
- The cause of inappropriate pecking is not always clear, but it is often possible to avoid outbreaks by rearing chicks with access to substrate that enables them to forage and peck appropriately. Chicks of all species should therefore be housed on solid floors with litter.
    - Species-specific provisions:
        - *Domestic fowl*
            - Fowl strains developed for rapid growth rates (broilers) are highly susceptible to lameness and their use should be avoided wherever possible. If broilers are used, individuals should be assessed for lameness at least weekly and grown more slowly than those reared commercially unless growth rate is essential for the study.
        - *Domestic turkeys*
            - Adequate monitoring is essential as injurious feather pecking and head pecking can occur from the first day of life.
            - Lameness is a common problem and needs to be carefully monitored. Veterinary advice should be sought on a policy for dealing with lameness.

Housing

- Many birds will benefit from housing that allows them to go outdoors and the feasibility of this should be evaluated with respect to the potential to cause distress or to conflict with experimental aims.
- Some form of cover such as shrubs should always be provided outdoors to encourage birds to use all the available area.
- Most species of bird are social for at least part of the year and highly sensitive to family relationships, so the formation of appropriate, stable, harmonious groups should be given a high priority.
- As there are significant species variations, the optimal composition of groups, and at what stage in the birds' lives these should be created should be known before groups are formed and procedures are undertaken.
    - Species-specific provisions:
        - *Domestic fowl*
            - Fowl are social and should be housed in groups of around five to 20 birds, with fewer males than females in adult groups, for example a ratio of 1:5. Attempts have been made to select strains of fowl for reduced feather pecking or agonistic behaviour. The existence of appropriate strains of this type should be determined, and the feasibility of acquiring them, should be assessed for each project.
            - Fowl are highly motivated to perform 'comfort behaviour' such as wing flapping, feather ruffling and leg stretching, which help to maintain strong leg bones. Birds should therefore be housed in floor enclosures large enough to permit all of these behaviours.

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2. Care *(continued from previous page)*

- ◇ Where the minimum enclosure sizes (see Annex, Table H.2.) cannot be provided for scientific reasons, the duration of the confinement should be justified by the experimenter and determined in consultation with the animal technician and with the competent person charged with advisory duties in relation to the wellbeing of the animals. In such circumstances, birds can be housed in smaller enclosures containing appropriate enrichment and with a minimum floor area of 0.75 m^2. These can be used to house two laying birds or small groups of birds in accordance with the space allowances given in the table.

◆ *Domestic turkeys*

- ◇ Where the minimum dimensions of the enclosure (see Annex, Table H.3.) cannot be provided for scientific reasons, the duration of the confinement should be justified by the experimenter and determined in consultation with the animal technician and with the competent person charged with advisory duties in relation to the wellbeing of the animals. In such circumstances, birds can be housed in smaller enclosures containing appropriate enrichment and with a minimum floor area of 0.75 m^2 and a minimum height of 50 cm for birds below 0.6 kg, 75 cm for birds below 4 kg, and 100 cm for birds over 4 kg. These can be used to house small groups of birds in accordance with the space allowances given in the table.

◆ *Quail*

- ◇ The housing of quail in aviaries or pens as opposed to cages is strongly recommended.
- ◇ Quail should be group-housed in either all female or mixed-sex groups. Where the sexes are mixed, the ratio of males to females should be low (for example 1:4) to reduce aggression between males and injuries to females. It may be possible to pair-house males if stable pairs are formed during rearing. The likelihood of aggressive pecking leading to skin lesions and feather loss is reduced if quail are not kept under intensive conditions and established groups are not mixed.
- ◇ If quail must be housed in cages, consideration should be given to combining enclosures and adding enrichment items. Solid enclosure roofs may make birds feel safer, although this could result in unacceptably low light levels in lower enclosures if birds are housed in racks. Birds should be cage-housed for the minimum possible period because many welfare problems become more severe with age, especially in birds kept for one year or more.

◆ *Domestic ducks and geese*

- ◇ Ducks and geese should always be kept outdoors or have access to outdoor runs unless there is scientific or veterinary justification for keeping them indoors. Birds housed with outside access should be kept secure from predators and should be supplied with a dry shelter to enable them to rest.
- ◇ Birds should have sufficient space to permit foraging, walking, running and wing flapping.
- ◇ Many species become territorial during the breeding season so it may be necessary to reduce group sizes and ensure that there is sufficient enclosure space to reduce the risk of injury, particularly to female birds.
- ◇ Where the minimum enclosure sizes (Table H.5.) cannot be provided for scientific reasons, the duration of the confinement should be justified by the experimenter and determined in consultation with the animal technician and with the competent person charged with advisory duties in relation to the wellbeing of the animals. In such circumstances, birds can be housed in smaller enclosures containing appropriate enrichment and with a minimum floor area of 0.75 m^2. These can be used to house small groups of birds in accordance with the space allowances per animal given in the table.

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2. Care *(continued from previous page)*

- ◆ *Pigeons*
  - ◇ Pigeons should be allowed an area sufficient for flight wherever possible, with a separate perching area for each bird along at least one wall of the enclosure.
  - ◇ Enclosures should be long and narrow (for example 2 m by 1 m) rather than square to allow birds to perform short flights.
  - ◇ Minimum enclosure sizes for pigeons are set out in Table H.7.
- ◆ *Zebra finches*
  - ◇ Minimum enclosure sizes for zebra finches are set out in Table H.8. Enclosures should be long and narrow (for example 2 m by 1 m) to enable birds to perform short flights.
  - ◇ Zebra finches thrive in outdoor enclosures provided they have access to shelter and heating is provided in cold conditions.
  - ◇ For breeding studies, pairs may be housed in smaller enclosures containing appropriate enrichment with a minimum floor area of 0.5 m^2 and a minimum height of 40 cm. The duration of the confinement should be justified by the experimenter and determined in consultation with the animal technician and with the competent person charged with advisory duties in relation to the wellbeing of the animals.

Enrichment

- Perches, dust and water baths, suitable nest sites and nesting material, pecking objects and substrate for foraging should be provided for species and individuals that will benefit from them unless there is scientific or veterinary justification for withholding such items.
- Birds should be encouraged to use all three dimensions of their housing for foraging, exercise and social interactions including play wherever possible.
  - ○ Species-specific provisions:
    - ◆ *Domestic fowl*
      - ◇ Fowl should always be provided with the opportunity to perch, peck appropriate substrates, forage and dust bathe from one day old. Suitable materials for dust bathing include sand or soft wood shavings.
      - ◇ Perches should be 3 to 4 cm in diameter and round with a flattened top. The optimum height above the floor varies for different breeds, ages and housing conditions but perches should initially be fixed at 5 to 10 cm and for older birds at 30 cm above the floor. All birds should be able to perch at the same time and every adult bird should be allowed 15 cm of perch at each level. Especially during the establishment of groups, birds should also be briefly observed during dark periods to confirm that all individuals are roosting.
      - ◇ Laying hens should have access to nest boxes from at least two weeks before coming into lay and no later than 16 weeks of age. Singly- or pair-housed birds should each have access to a nest box, with a ratio of at least one nest box per two birds provided in larger groups. Nest boxes should be enclosed and large enough to allow one hen to turn around. A loose substrate such as wood shavings or straw should be supplied within nest boxes to promote nesting behaviour. Substrate should be regularly replaced and kept clean.
    - ◆ *Domestic turkeys*
      - ◇ Turkeys should be provided with perches placed at a height where birds on the ground are not able easily to peck and tug at the feathers of perching birds. However, if birds are older and less agile, the access to perches should be facilitated by special equipment such as ramps. Where this is not possible, perches should be placed at a low height (for example 5 cm). The shape and size of the perch should be in accordance with the rapidly growing claws of the birds. Perches should be ovoid or rectangular with smooth corners and made of wood or plastic.

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2. Care *(continued from previous page)*

- *Quail*
  - Quail are capable of extremely rapid startle responses, which can lead to head injuries. Staff should therefore always approach birds slowly and calmly and quail should be provided with cover and environmental enrichment, especially early in life, in order to reduce fear.
  - Quail chicks should have access to coloured objects such as balls, tubing and cubes to alleviate fear of both humans and novel stimuli in adult birds. Adult birds should be given pecking objects such as stones, pine cones, balls and branches of vegetation.
  - Sand, wood shaving or straw substrate for foraging and a place to which the birds can withdraw should be provided, with additional dust baths of sand or sawdust if the foraging substrate is not suitable for dust bathing.
  - Laying hens should have access to nest boxes and nesting material, such as hay.
- *Domestic ducks and geese*
  - Ducks and geese should be provided with a pond with a mixture of stones and grit on the bottom, both to increase the birds' behavioural repertoire and to encourage adequate maintenance of the feathers. The very minimum that waterfowl should be able to do is to immerse their head under water and to shake water over the body. Drinkers and ponds for waterfowl should be located over grid areas with drains beneath to reduce flooding.
  - Within 24 h of hatching and throughout the first week of life, water should be provided to facilitate swimming behaviour, but care should be taken to minimize the risk of drowning by, for example, the use of a shallow bowl. After the first week, a shallow pond (dimensions as in Table H.6.) with large stones on the bottom should be provided with food or grit scattered among the stones to encourage dabbling or diving, as appropriate. In the absence of the parent birds, access to ponds for juvenile birds should only be under supervision to ensure that they can leave the water and do not become chilled. This should continue until they are clearly capable of leaving the water unaided and their waterproof feathers have begun to emerge. Ponds should be regularly cleaned and water replaced as necessary to ensure good water quality.
  - A complex environment should be provided, including for example natural or artificial cover, boxes and straw bales.
  - Serious consideration should be given to supplying other features of the habitat that are likely to be important to each species whether birds are housed indoors or outdoors. This includes shallow water with vegetation for dabbling ducks, turf for geese and deeper water with large stones for species whose natural habitat is along rocky coastlines.
- *Pigeons*
  - Box perches approximately 30 cm x 15 cm located in blocks should be provided. Branches hung from the roof and scaffolding can also be used for perching.
  - Toys hung from chains should be provided, for example bird bells, mirrors and commercially available toys designed for pets.
  - Each enclosure should have shallow water baths.
  - Where pigeons must be handled frequently, 'nesting areas' or chambers can be provided so that birds can be trained to retreat to them for capture.
- *Zebra finches*
  - Nests should be provided for breeding birds, for example, in the form of wicker or plastic baskets or wooden boxes with dried grass, paper strips or coconut fibres for nesting material, but birds will defend these and it is important to monitor behaviour to ensure that sufficient nests are provided.

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2. Care *(continued from previous page)*

- ◇ Sprays of *Panicum* millet should be continually available as dietary enrichment.
- ◇ Toys, perches and swings designed for pet birds will benefit zebra finches and these should be provided wherever possible. Perches are particularly important for wellbeing and should be provided at a range of heights to facilitate normal feeding and roosting behaviour.
- ◇ Water for bathing should be provided at least once a week in shallow trays with water of approximately 0.5–1 cm in depth.

Enclosures

- All birds, especially species that spend a significant proportion of their time walking, such as quail or fowl, should be housed on solid floors with substrate rather than on grid floors.
- In practice, it may be necessary to consider a compromise between solid and grid flooring. In such cases, birds should be provided with solid-floored resting areas occupying at least one-third of the enclosure floor. Grid areas should be located under perches if faecal collection is required.
- To reduce the incidence of foot injuries, slats made of plastic should be used in preference to wire mesh wherever possible. If wire mesh must be used, it should be of a suitable grid size to adequately support the foot and the wire should have rounded edges and be plastic coated.
- Birds can be prone to foot problems due to standing on wet litter, on any type of flooring, and so frequent monitoring of foot condition is always necessary.
  - ○ Species-specific provisions:
    - ◆ *Quail*
      - ◇ Solid enclosure roofs may make birds feel safer, although this could result in unacceptably low light levels in lower enclosures if birds are housed in racks. Birds should be cage-housed for the minimum possible period because many welfare problems become more severe with age, especially in birds kept for one year or more.
    - ◆ *Domestic ducks and geese*
      - ◇ Ducks and geese should be housed on solid floors.
    - ◆ *Pigeons*
      - ◇ Pigeons benefit from being able to forage and should not be kept on grid floors without strong scientific justification.
    - ◆ *Zebra finches*
      - ◇ As zebra finches feed extensively on the ground, birds should be housed on solid floors to facilitate natural foraging behaviour.

Dimensions

- See Annex, Tables H.2. to H.8.

Feeding

- Part of the diet or additional treats should be scattered on the enclosure floor to encourage foraging wherever appropriate.
- Dietary enrichment benefits birds, so additions such as fruit, vegetables, seeds or invertebrates should be considered where appropriate.
- As some species, particularly granivores, require grit to digest their food, these should be provided with appropriately sized grit. Birds will select grit of the size they prefer if material of various sizes is provided. The grit should be renewed regularly.
- Dietary calcium and phosphorus should also be provided for birds in an appropriate form and at an appropriate level for each life stage, to prevent nutritional bone disease.
- Food can be supplied in feeders that are either attached to the side of the enclosure or standing on the enclosure floor. Space occupied by floor feeders is not available to the birds and should not be included in calculations of pen area. Wall mounted feeders do not occupy floor space but should be designed and fitted with care so that birds cannot become trapped underneath them.

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2. Care *(continued from previous page)*

- Chicks of some species (for example domestic turkeys) may need to be taught to feed and drink in order to avoid dehydration and potential starvation.
  - Species-specific provisions:
    - *Pigeons*
      - Pigeons are primarily seed-eaters but are omnivorous, so food containing animal protein should be offered regularly.

Watering

- One nipple or cup drinker should be provided for every three or four birds, with a minimum of two in each enclosure.
- Supplementary water may also be given as enrichment in birds' feed if appropriate.

Substrate, litter, bedding and nesting material

- Suitable substrates for birds should be absorbent, unlikely to cause foot lesions and of an appropriate particle size to minimize dust and prevent excessive accumulation on the birds' feet. Suitable substrates include chipped bark, white wood shavings, chopped straw or washed sand, but not sandpaper. Other suitable floor coverings include plastic artificial turf or deep pile rubber mats.
- A suitable pecking substrate such as pieces of straw should be scattered over the floor.
- Hatchlings and juvenile birds should be provided with a substrate that they can grip to avoid developmental problems such as splayed legs.
- Juvenile birds should also be encouraged if necessary, for instance by tapping with the fingers, to peck at the substrate to help prevent subsequent misdirected pecking.

Cleaning

- See General section 4.9.

Handling

- Suitable equipment for catching and handling should be available, for example well maintained nets in appropriate sizes and darkened nets with padded rims for small birds.

Humane killing

- The preferred method of killing for juvenile and adult birds is an overdose of anaesthetic using an appropriate agent and route. This is preferable to carbon dioxide inhalation, as carbon dioxide may be aversive.
- As diving birds and some others, for example mallard ducks, can slow their heart rates and hold their breath for long periods, care should be taken when killing such species by inhalation to ensure that they do not recover.
  - Species-specific provisions:
    - *Ducks and geese*
      - Ducks, diving birds and very young chicks should not be killed using carbon dioxide.

Records

- See General section 4.12.

Identification

- Non-invasive or minimally invasive methods such as noting physical differences, ringing with either closed or split rings and staining or dyeing the feathers are preferable to more invasive techniques such as electronic tagging or wing tagging.
- Combinations of coloured leg rings minimize handling for identification, although due regard should be paid to any potential impact of colours on behaviour in some species. When using rings as temporary marking for rapidly growing chicks, regular checking is essential to ensure that the ring is not impeding the growth of the leg.
- Toe-clipping and web-punching cause suffering and should not be used.
  - Species-specific provisions:
    - *Zebra finches*
      - Fitting zebra finches with coloured leg bands for identification can have significant effects on their social and reproductive behaviour (for example red can enhance dominance and green or blue reduce it). Care should be taken in the selection of colours and patterns of leg bands.

I. Amphibians

1. The environment and its control

Main categories and examples by habitat of species frequently used are given in Annex, Table I.1

Ventilation
- Enclosures for amphibians should be adequately ventilated.

Temperature
- Areas of different temperature and humidity are beneficial; frequent fluctuations of these parameters should be avoided.
- Room and water temperatures should be controlled.
- Hibernation may be induced or interrupted by regulating light–dark rhythm and room temperature.
- When animals are used as breeders, a state of near winter torpor may be simulated.

Humidity
- Areas of different humidity are beneficial. Also desert-adapted amphibians should have access to a humid environment.

Lighting
- Photoperiods reflecting the natural cycle of the animals should be used.
- Both semi-terrestrial and aquatic animals should be able to withdraw to shaded areas.

Noise
- Noise and vibration should be minimized.

Alarm systems
- Recommended if circulation systems and/or aeration are used.

2. Care

Health
- See General section 4.1.

Housing, enrichment and care
- Housing:
  - Group-housing is advisable.
  - To avoid cannibalism certain species (e.g. *Ambystoma* spp. and *Scaphiopus* spp.) should be maintained in small groups.
- Enrichment:
  - Amphibians benefit from environmental enrichment; the terrestrial habitat should be structured, including, for example, branches, leaves, pieces of bark, stones or suitable man-made materials. The side walls of the terraria should be textured to provide a structured surface.
  - The provision of hiding places/shelters is recommended. Refuges should be inspected regularly for sick or injured animals.
  - A dark floor of the tank may enhance the sense of security in the animals.
- Enclosures – dimensions and flooring:
  - *Enclosures for aquatic amphibians*
    - Tanks and aquaria may be equipped with a gentle flow-through water system for the circulation of uncontaminated water, a heating device and a compressed air supply and air stones for aeration. When a proper flow system is not in place, the water should be renewed about twice a week. For *Xenopus* spp. regular changes of water are sufficient and air stones are not required.
    - Long, narrow enclosures should be avoided.
  - *Enclosures for semi-aquatic and semi-terrestrial amphibians*
    - The enclosures consist of a terrestrial and an aquatic part.
    - The water area of the terrarium should allow animals to submerge.
    - When a proper flow system is not in place, the water should be renewed at least twice a week.
    - The terrarium should be covered to prevent escape; the outside transparent walls should be painted or covered.

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2. Care *(continued from previous page)*

- ◆ Additions to the interior can include: soft-foamed plastic material on the floor near the pool area, stones, pieces of artificial bark material, artificial branches and leaves, and shelves.
- ◆ Fine sawdust and small-particle substrate should be avoided.

○ *Enclosures for arboreal amphibians*

- ◆ Appropriate structures for climbing and resting should be provided. It is also necessary to provide water where they can submerge themselves or seek greater humidity.

- Dimensions of enclosures for amphibians are shown in Annex, Tables I.2. to I.6.

Feeding

- Their natural foods or foodstuffs similar to their natural diets should be provided. Captive aquatic amphibians can be maintained on pieces of fish fillet or scrapings from frozen liver and heart.
- Once to three times weekly to satiation is recommended for adult animals.

Water quality

- Water should be filtered, circulated and aerated.
- For aquatic and semi-aquatic amphibians water quality, including concentration of ammonia and the pH level, should be regularly monitored.

Substrate, litter, bedding and nesting material

- See General section 4.8.

Cleaning

- Dirt, excrements and food particles should be carefully removed.

Handling

- Care is required during handling, to be kept to a minimum, to prevent injuries to the skin of the animals.

Anaesthesia and humane killing

- In anaesthetized animals the body skin should always be kept moist, for example, with a wet tissue.

Records

- See General section 4.12.

Identification

- Where animals need to be identified individually, transponders can be applied. Tank labels, monitoring pigment or wart configurations, small labels by coloured thread can also be used. Chemical markings and toe clipping should not be done.

Transport

- Amphibians should be provided with sufficient air and moisture.
- If necessary, appropriate temperature and humidity should be provided.

J. Reptiles (aquatic and terrestrial)

1. The environment and its control

Main categories and examples by habitat of species frequently used are given in Annex, Table J.1

Ventilation
- Enclosures of reptiles should be adequately ventilated and provided with screened ports to prevent escape.

Temperature
- Enclosures should provide areas of different temperatures (temperature gradient).
- Room and water temperatures should be controlled.
- An incandescent lamp positioned over a resting board allows basking reptiles to increase their body temperature. When the lights are turned off, a flat heating device may be used.
- Terraria of snakes or lizards from tropical biotopes should be thermostatically controlled and include at least one warmth-plate.

Humidity
- A relative humidity of 70–90% should be maintained. The provision of areas of different humidity (humidity gradient) is beneficial.

Lighting
- Appropriate light–dark regimes for each species, life stage, and time of the year should be provided. Enclosures should include shaded areas. Light or sun lamps should not be the sole source of heat. The provision of ultraviolet radiation is necessary to stimulate the animal's production of vitamin D.

Noise
- See General section 2.5.

Alarm systems
- See General section 2.6.

2. Care

Health
- See General section 4.1.

Social housing
- See General section 4.5.

Environmental complexity
- The habitat of reptiles should include, for example, natural or artificial branches, leaves, pieces of bark and stones. Glass walls of terraria should be patterned to provide a structured surface.

Enclosures, dimensions and flooring
- Enclosures and enclosure furniture should have smooth surfaces and rounded edges to minimize the risk of injury and in the most sensitive species opaque materials should be used.
  - *Enclosures for aquatic reptiles*
    - Aquatic reptiles should be accommodated in water-circulated, filtered, and aerated tanks. Water should be renewed about twice per week. Water levels should be sufficient for reptiles to submerge.
    - A platform should be provided on which the reptiles can haul out or shelter under. Platforms should be made of suitable materials, such as wood, so that animals are able to get a purchase with their claws. Epoxy or polyurethane platforms are not recommended.
  - *Enclosures for terrestrial reptiles*
    - Enclosures for terrestrial reptiles should have appropriate terrestrial and aquatic parts. The latter should allow animals to submerge. It is advisable to renew the water at least twice a week, except in the case of a flow-through system.

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2. Care *(continued from previous page)*

- ◆ Terraria should be transparent, have tight seams, with all holes securely screened, and be provided with well-fitted lids or doors that can be securely fastened. It is advisable to construct doors and lids, so that the entire top, end or side opens to facilitate cleaning (exception: venomous reptiles for which certain security criteria must be fulfilled). For some species, except for the front wall, all side walls and the top should be opaque. In case of highly irritable or easily frightened reptiles, the clear wall can be provided with a removable covering.
- ◆ The provision of appropriate shelter is important for all terrestrial reptiles.
- Dimensions of enclosures for reptiles are shown in Annex, Tables J.2. and J.3.

Feeding
- Reptiles should be maintained on their natural foods, foodstuffs or commercial diets approximating those of their natural diets. Carnivorous and omnivorous reptiles, except for some snakes, can be trained to feed on dead prey and it should normally not be necessary to feed live vertebrates. For adult reptiles, feeding two to three times weekly to satiation is recommended.

Watering
- See General section 4.7.

Substrate, litter, bedding and nesting material
- A variety of substrates may be used for terraria, depending on the requirements of the species. Fine sawdust and any other small-particle substrate should be avoided, as this may cause serious mouth or internal injuries or bowel obstruction, particularly in snakes.

Cleaning
- See General section 4.9.

Handling
- Care is needed when handling reptiles, as they can be easily injured, e.g. some lizards may shed their tails (autotomy) if handled in an inappropriate way.

Humane killing
- See General section 4.11.

Records
- See General section 4.12.

Identification
- Transponders, enclosure labels, individual skin patterns (according to colour, skin damages, etc.), pen markings (require renewal after skin shedding) or small labels at the toes by coloured thread can be used to individually identify animals. Toe clipping is deleterious and should not be done.

Transport
- During transport reptiles should be provided with adequate air and moisture and, if necessary, with controlled temperature and humidity.

K. Fish

1. The environment and its control

Water supply

- An adequate water supply of suitable quality should be provided at all times.
- Water flow should be sufficient to remove suspended solids and wastes and to ensure that water quality parameters are maintained within acceptable levels.
- Water flow should also be appropriate to enable fish or post-larval fish to swim correctly and to maintain normal behaviour.

Water quality

- Water quality parameters should be monitored to be within the acceptable range that sustains normal activity and physiology for a given species depending on different life stages or according to physiological status.
- Some degree of acclimatization may be necessary depending on the fish species.
- Suspended solids should be maintained within an acceptable range. Where necessary, water supply to facilities should be appropriately filtered to remove substances harmful to fish and to maintain suitable water physico-chemical parameters.
  - *Oxygen* concentration should be appropriate to the species and will vary according to temperature, carbon dioxide concentration, salinity, feeding level and amount of handling. Where necessary, supplementary aeration should be provided.
  - *Nitrogen compounds* such as ammonia and nitrite are very toxic to fish and their accumulation must be avoided by increasing flow rate, reducing density or temperature, or biofiltration. The toxic form of ammonia is unionized ammonia, the amount of which depends not only on total ammonia concentration, but also on pH, salinity and temperature.
  - *Carbon dioxide* in the free form and at high concentrations can be fatal to fish, although this is most unlikely to be a problem under normal housing conditions.
  - *pH* should be kept stable as any changes will influence other water quality parameters. In general pH may be lower in freshwater than in salt water. If necessary, water supply should be buffered.
  - *Salinity* requirements of fish will vary according to whether they are marine or freshwater in origin or adapted. Changes in salinity should be introduced gradually.

Temperature

- Temperature should be maintained within the optimal range of the fish species involved and any changes should take place gradually.

Lighting

- Fish should be maintained on an appropriate photoperiod since the day/night cycle may influence the physiology and the behaviour of fish depending on the species. As appropriate for the species, lighting should be subdued or tanks should be covered and suitable hiding places provided. Abrupt changes in light should be avoided.

Noise

- Noise levels should be kept to a minimum. Where possible, equipment causing noise or vibration should be separated from fish-holding facilities. Fish reared in a particular environment will adapt to the stimuli presented there and may become stressed if moved to unfamiliar surroundings.

Alarm systems

- See General section 2.6.

2. Care

Health

- Most diseases are associated with stress arising from deficiencies in environmental and husbandry conditions. Fish health management is almost always concerned with populations rather than single individuals, and control measures should be designed accordingly.
- *Hygiene and disinfection*
  - Fish-holding facilities, including associated pipe work, should be cleaned and disinfected when appropriate. In closed systems cleaning and disinfection should be compatible with maintenance of optimal microbiological conditions. Equipment, for example nets, should be disinfected between uses. Staff should take precautions to prevent cross-contamination between fish enclosures.
- *Quarantine*
  - Newly introduced farmed and wild fish should be given an appropriate quarantine period. Any disease problem which arises should be treated or the stock destroyed. Farmed fish, preferably with a verified health status, should be procured from reputable suppliers.

Housing and enrichment

- Because fish behaviour will influence stocking density, schooling or territorial behaviour should be considered. Acceptable stocking density for a given species will vary depending on enclosure size and shape, water flow and current, water quality, fish size, age, health and feeding method. In principle, groups should consist of fish of the same size to minimize the risk of injuries or cannibalism.
- For some species, appropriate environmental enrichment may be necessary to take account of their behavioural traits, for example, in reproduction or predation.

Enclosures

- *Fish holding facilities*
  - Fish can be maintained in land-based enclosures in dedicated buildings or in external areas, or in enclosures in open-water systems and, where practical, with controlled access in order to minimize disturbance of the fish.
- *Land-based enclosures*
  - The materials used for the enclosures should be non-toxic, durable and with a smooth internal surface to prevent abrasions to the fish. Enclosures should be designed to prevent escape and, where appropriate, be self-cleaning to aid removal of waste products and surplus feed.
- *Open-water enclosures*
  - Fish, especially marine species, may be kept in large floating enclosures. The dimensions, including depth, should permit active swimming and shoaling of the fish. Mesh size should permit good water exchange while preventing escape of fish. Enclosures should be designed to minimize the risk of attack by predators. Enclosures should be rigged so as to prevent their shape distorting in tidal flows or running water and thus trapping fish.

Feeding

- Fish may be fed either on artificial diet or fresh/frozen natural feed.
- It is important that fish are fed at an appropriate feeding rate and frequency, and this will depend on a number of factors including temperature, size and maturity. Feeding regime, palatability and the presentation of food should ensure that all fish obtain sufficient food. Particular attention should be paid to the feeding of larval fish, especially where feeding is switched from live to artificial diets.

Cleaning

- All enclosures should be kept free of fish waste products or uneaten feed. If enclosures are not self-cleaning, waste material should be siphoned off as necessary, generally as soon as possible after feeding.
- The sides and bottom of enclosures should be cleaned regularly to avoid the build-up of algae and other detritus. Care should be taken to minimize stress during cleaning.

Handling

- Fish may be severely stressed by handling which should be kept to the minimum. Fish should normally be netted out from the enclosure and anaesthetized in a smaller container before handling. Fish should be kept under anaesthetic for as short a time as possible and be placed in clean aerated water for recovery.

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2. Care *(continued from previous page)*

- When catching fish, nets with an appropriate frame and mesh size should be used. Knotted net mesh should be avoided. Nets should be disinfected and rinsed in clean water before use.
- Out-of-water fish should be handled with wet gloves or wet hands and on a moist surface to avoid scale and mucus loss. Particular attention should be paid to handling practices to avoid desiccation, suffocation and other injury.

Humane killing

- Fish should normally be killed by either:
  - an overdose of anaesthetic using an appropriate route and anaesthetic agent for the size and species. When killed by immersion, fish should be left in the anaesthetic solution for at least 5 min following the cessation of opercular movement and/or vestibulo-ocular reflex (VOR), or
  - concussion of the brain by striking of the cranium.
- Death should be confirmed, for example, by physical destruction of the brain or exsanguination.

Records

- Records should be maintained on water quality parameters.

Identification

- It is not always necessary or feasible to individually identify all fish within a facility.
- Subcutaneous dye injection is considered the least invasive method of identification. Careful consideration is needed before more invasive methods such as fin clipping or passive integrated transponder (PIT) tagging are used. Mechanical tagging should not be used unless no other method is suitable.
- Marking should generally be carried out under anaesthesia in order to minimize the risk of morbidity and stress.

Transportation

- Fish should be deprived of food prior to transportation. Care should be taken to prevent injury and stress to fish during capture, loading, transportation and unloading. Abrupt temperature changes, periods of hypoxia and any deterioration in water quality should be avoided.

IV. ANNEX

A. Rodents (mice, rats, gerbils, hamsters, guineapigs)

Table A.1. Mice: minimum enclosure dimensions and space allowances

	Body weight (g)	Minimum enclosure size (cm^2)	Floor area per animal (cm^2)	Minimum enclosure height (cm)
In stock and during procedures	≤20	330	60	12
	21–25	330	70	12
	26–30	330	80	12
	>30	330	100	12
Breeding		330 For a monogamous pair (outbred/ inbred) or a trio (inbred). For each additional female plus litter 180 cm^2 should be added		12
Stock at breeders* Enclosure size 950 cm^2	<20	950	40	12
Stock at breeders* Enclosure size 1500 cm^2	<20	1500	30	12

*Post-weaned mice may be kept at these higher stocking densities, for the short period after weaning until issue, provided that the animals are housed in larger enclosures with adequate enrichment. These housing conditions should not cause any welfare deficit such as: increased levels of aggression, morbidity or mortality, stereotypies and other behavioural deficits, weight loss, or other physiological or behavioural stress responses

Table A.2. Rats: minimum enclosure dimensions and space allowances

	Body weight (g)	Minimum enclosure size (cm^2)	Floor area per animal (cm^2)	Minimum enclosure height (cm)
In stock and during procedures*	≤200	800	200	18
	201–300	800	250	18
	301–400	800	350	18
	401–600	800	450	18
	>600	1500	600	18
Breeding		800 Mother and litter. For each additional adult animal permanently added to the enclosure add 400 cm^2		18
Stock at breeders† Enclosure size 1500 cm^2	≤50	1500	100	18
	51–100	1500	125	18
	101–150	1500	150	18
	151–200	1500	175	18
Stock at breeders† Enclosure size 2500 cm^2	≤100	2500	100	18
	101–150	2500	125	18
	151–200	2500	150	18

*In lifetime studies, animals should be provided with enclosures of a suitable size to enable the animals to be socially housed. As stocking densities towards the end of such studies may be difficult to predict, consequentially there may be occasions where space allowances per individual animal may fall below those indicated above. In such circumstances priority should be given to maintaining stable social structures

†Post-weaned rats may be kept at these stocking densities, for the short period after weaning until issue, provided that the animals are housed in larger enclosures with adequate enrichment. These housing conditions should not cause any welfare deficit such as: increased levels of aggression, morbidity or mortality, stereotypies and other behavioural deficits, weight loss, or other physiological or behavioural stress responses

Table A.3. Gerbils: minimum enclosure dimensions and space allowances

	Body weight (g)	Minimum enclosure size (cm^2)	Floor area per animal (cm^2)	Minimum enclosure height (cm)
In stock and during procedures	≤40	1200	150	18
	>40	1200	250	18
Breeding		1200 Monogamous pair or trio with offspring		18

Table A.4. Hamsters: minimum enclosure dimensions and space allowances

	Body weight (g)	Minimum enclosure size (cm^2)	Floor area per animal (cm^2)	Minimum enclosure height (cm)
In stock and during procedures	≤60	800	150	14
	61–100	800	200	14
	>100	800	250	14
Breeding		800 Mother or monogamous pair with litter		14
Stock at breeders*	<60	1500	100	14

*Post-weaned hamsters may be kept at these stocking densities, for the short period after weaning until issue, provided that the animals are housed in larger enclosures with adequate enrichment. These housing conditions should not cause any welfare deficit such as: increased levels of aggression, morbidity or mortality, stereotypies and other behavioural deficits, weight loss, or other physiological or behavioural stress responses

Table A.5. Guineapigs: minimum enclosure dimensions and space allowances

	Body weight (g)	Minimum enclosure size (cm^2)	Floor area per animal (cm^2)	Minimum enclosure height (cm)
In stock and during procedures	≤200	1800	200	23
	201–300	1800	350	23
	301–450	1800	500	23
	451–700	2500	700	23
	>700	2500	900	23
Breeding		2500 Pair with litter. For each additional breeding female add 1000 cm^2		23

B. Rabbits

Table B.1. Rabbits > 10 weeks of age: minimum enclosure dimensions and space allowances

Final body weight (kg)	Minimum floor area for one or two socially harmonious animals (cm^2)	Minimum height (cm)
<3	3500	45
3–5	4200	45
>5	5400	60

The table is to be used for both cages and pens. In cages a raised area should be provided (see Table B.4.). Pens should contain structures that subdivide the space to allow animals to initiate or avoid social contact. The additional floor area is 3000 cm^2 per rabbit for the third, fourth, fifth and sixth rabbit, while 2500 cm^2 should be added for each additional rabbit above a number of six

Table B.2. Doe plus litter: minimum enclosure dimensions and space allowances

Doe weight (kg)	Minimum enclosure size (cm^2)	Addition for nest boxes (cm^2)	Minimum height (cm)
<3	3500	1000	45
3–5	4200	1200	45
>5	5400	1400	60

At least three to four days before giving birth, does should be provided with an extra compartment or a nest box in which they can build a nest. The nest box should preferably be outside the enclosure. Straw or other nesting material should be provided. The enclosure should be designed so that the doe can move to another compartment or raised area away from her pups after they have left the nest. After weaning, the littermates should stay together in their breeding enclosure as long as possible. Up to eight littermates may be kept in the breeding enclosure from weaning until seven weeks old, and five littermates may be kept on the minimum floor area from eight to 10 weeks of age

Table B.3. Rabbits <10 weeks of age: minimum enclosure dimensions and space allowances

Age	Minimum enclosure size (cm^2)	Minimum floor area per animal (cm^2)	Minimum height (cm)
Weaning to 7 weeks	4000	800	40
8–10 weeks	4000	1200	40

The table is to be used for both cages and pens. Pens should contain structures that subdivide the space to allow animals to initiate or avoid social contact. After weaning, the littermates should stay together in their breeding enclosure for as long as possible

Table B.4. Rabbits: optimal dimensions for raised areas for enclosures having the dimensions indicated in Table B.1

Age (weeks)	Final body weight (kg)	Optimal size (cm x cm)	Optimal height (cm)
<10	–	55×25	–
>10	<3	55×25	25
	3–5	55×30	25
	>5	60×35	30

To allow proper use of the raised area and of the enclosure as a whole the dimensions given above for the raised area size and height are optimal, with very close minima and maxima (±5–10%). If there are scientific or veterinary justifications for not providing a raised area then the floor area should be 33% larger for a single rabbit and 60% larger for two rabbits, to facilitate the rabbit's locomotor activities and to enhance the opportunity to escape from a more dominant animal

C. Cats

Table C.1. Cats: minimum enclosure dimensions and space allowances

	Floor* (m^2)	Shelves (m^2)	Height (m)
Minimum for one adult animal	1.50	0.50	2
For each additional cat add	0.75	0.25	–

*Floor area excluding shelves

D. Dogs

Table D.1. Dogs: minimum enclosure dimensions and space allowances

Weight (kg)	Minimum enclosure size (m^2)	Minimum floor area for one or two animals (m^2)	For each additional animal add a minimum of (m^2)	Minimum height (m)
≤20	4	4	2	2
>20	4	8	4	2

Table D.2. Dogs: minimum enclosure dimensions and space allowances for post-weaned stock

Weight (kg)	Minimum enclosure size (m^2)	Minimum floor area/animal (m^2)	Minimum height (m)
≥2	4	0.5	2
≥5	4	1.0	2
≥10	4	1.5	2
≥15	4	2.0	2
≥20	8	4.0	2

E. Ferrets

Table E.1. Ferrets: minimum enclosure dimensions and space allowances

	Minimum enclosure size (cm^2)	Minimum floor area per animal (cm^2)	Minimum height (cm)
Animals up to 600 g	4500	1500	50
Animals over 600 g	4500	3000	50
Adult males	6000	6000	50
Jill + litter	5400	5400	50

F. Non-human primates (marmosets and tamarins, squirrel monkeys, macaca and vervets, baboons)

Table F.1. Marmosets and tamarins: minimum enclosure dimensions and space allowance

	Minimum floor area of enclosures for 1*–2 animals plus offspring up to 5 months old (m^2)	Minimum volume per additional animal over 5 months (m^3)	Minimum enclosure height (m)†
Marmosets	0.5	0.2	1.5
Tamarins	1.5	0.2	1.5

*Animals should only be kept singly under exceptional circumstances
†The top of the enclosure should be at least 1.8 m from the floor

Table F.2. Squirrel monkeys: minimum enclosure dimensions and space allowances

Minimum floor area for 1*–2 animals (m^2)	Minimum volume per additional animal over 6 months of age (m^3)	Minimum enclosure height (m)
2.0	0.5	1.8

*Animals should only be kept singly under exceptional circumstances. Squirrel monkeys should preferably be kept in groups of four or more animals

Table F.3. Macaques and vervets: minimum enclosure dimensions and space allowances*

	Minimum enclosure size (m^2)	Minimum enclosure volume (m^3)	Minimum volume per animal (m^3)	Minimum enclosure height (m)
Animals <3 years of age†	2.0	3.6	1.0	1.8
Animals > 3 years of age‡	2.0	3.6	1.8	1.8
Animals held for breeding purposes§			3.5	2.0

*Animals should only be kept singly under exceptional circumstances
†An enclosure of minimum dimensions may hold up to three animals
‡An enclosure of minimum dimensions may hold up to two animals
§In breeding colonies no additional space/volume allowance is required for young animals up to 2 years of age housed with their mother

Table F.4. Baboons: minimum enclosure dimensions and space allowances*

	Minimum enclosure size (m^2)	Minimum enclosure volume (m^3)	Minimum volume per animal (m^3)	Minimum enclosure height (m)
Animals† < 4 years	4.0	7.2	3.0	1.8
Animals† > 4 years	7.0	12.6	6.0	1.8
Animals held for breeding purposes‡			12.0	2.0

*Animals should only be kept singly under exceptional circumstances
†An enclosure of minimum dimensions may hold up to two animals
‡In breeding colonies no additional space/volume allowance is required for young animals up to 2 years of age housed with their mother

G. Farm animals (cattle, sheep and goats, pigs and minipigs, equines)

Table G.1. Cattle: minimum enclosure dimensions and space allowances

Body weight (kg)	Minimum enclosure size (m^2)	Minimum floor area/animal (m^2/animal)	Trough space for *ad libitum* feeding of polled cattle (m/animal)	Trough space for restricted feeding of polled cattle (m/animal)
<100	2.50	2.30	0.10	0.30
101–200	4.25	3.40	0.15	0.50
201–400	6.00	4.80	0.18	0.60
401–600	9.00	7.50	0.21	0.70
601–800	11.00	8.75	0.24	0.80
>800	16.00	10.00	0.30	1.00

Table G.2. Sheep and goats: minimum enclosure dimensions and space allowances

Body weight (kg)	Minimum enclosure size (m^2)	Minimum floor area/animal (m^2/animal)	Minimum partition height* (m)	Trough space for *ad libitum* feeding (m/animal)	Trough space for restricted feeding (m/animal)
<20	1.0	0.7	1.0	0.10	0.25
20–34	1.5	1.0	1.2	0.10	0.30
35–60	2.0	1.5	1.2	0.12	0.40
>60	3.0	1.8	1.5	0.12	0.50

*For adult goats, an increased minimum partition height may be required to prevent escape

Table G.3. Pigs and minipigs: guideline temperature ranges for singly-housed animals

Live weight (kg)	Recommended temperature range (°C)
<3	30–36
3–8	26–30
8–30	22–26
30–100	18–22
>100	15–20

Table G.4. Pigs and minipigs: minimum enclosure dimensions and space allowances

Live weight (kg)	Minimum enclosure size* (m^2)	Minimum floor area per animal (m^2/animal)	Minimum lying space per animal (in thermoneutral conditions) (m^2/animal)
Up to 5	2.0	0.20	0.10
5–10	2.0	0.25	0.11
10–20	2.0	0.35	0.18
20–30	2.0	0.50	0.24
30–50	2.0	0.70	0.33
50–70	3.0	0.80	0.41
70–100	3.0	1.00	0.53
100–150	4.0	1.35	0.70
>150	5.0	2.50	0.95
Adult (conventional) boars	7.5	–	1.30

*Pigs may be confined in smaller enclosures for short periods of time, for example by partitioning the main enclosure using dividers, when justified on veterinary or experimental grounds, for example where individual food consumption is required

Table G.5. Pigs and minipigs: minimum feeding trough space allowances

Live weight (kg)	Minimum trough space (cm)(*ad libitum* and restricted feeding*)	Minimum trough space per animal on *ad libitum* feeding (cm/animal)
Up to 10	13	2.0
>10–20	16	2.5
>20–30	18	3.0
>30–50	22	3.5
>50–70	24	4.0
>70–100	27	4.5
>100–150	31	5.0
>150	40	7.0

*Each animal on restricted feeding should be provided with at least the minimum trough space allowance

Table G.6. Pigs and minipigs: minimum drinking point allowances

Drinker type	No. of pigs per drinking point
Nipple or bite drinkers	10
Large bowl drinkers (which allow at least 2 pigs to drink at the same time)	20

Table G.7. Pigs and minipigs: minimum drinking water flow rates for pigs

Type of pig	Minimum water flow rate (mL/min)
Weaners	500
Growers	700
Dry sows and boars	1000
Lactating sows	1500

Table G.8. Equines: minimum enclosure dimensions and space allowances

	Minimum floor area/animal (m^2/animal)			
Wither height (m)	For each animal held singly or in groups of up to 3 animals	For each animal held in groups of 4 or more animals	Foaling box/mare with foal	Minimum enclosure height (m)
1.00–1.40	9.0	6.0	16	3.00
> 1.40–1.60	12.0	9.0	20	3.00
> 1.60	16.0	$(2xWH)^2$*	20	3.00

The total space requirement for indoor enclosures depends on whether animals have access to additional areas for grazing and/or other forms of exercise. The figures assume that such additional areas will be provided. If not, then space allowances should be increased accordingly

*To ensure adequate space is provided, space allowances for each individual animal should be based on height to withers (WH)

H. Birds (domestic fowl, domestic turkeys, quail, ducks and geese, pigeons, zebra finches)

Table H.1. Guidelines for temperatures and relative humidities for juvenile domestic fowl and turkeys, *Gallus gallus domesticus* and *Meleagris gallopavo*

Age (days)	Under lamp (°C)	Ambient temperature in room (°C)	Relative humidity (%)
Up to 1	35	25–30	60–80
1–7	32	22–27	60–80
7–14	29	19–25	40–80
14–21	26	18–25	40–80
21–28	24	18–25	40–80
28–35	–	18–25	40–80
>35	–	15–25	40–80

Table H.2. Domestic fowl: minimum enclosure dimensions and space allowances

Body mass (g)	Minimum enclosure size (m^2)	Minimum area per bird (m^2)	Minimum height (cm)	Minimum length of feed trough per bird (cm)
Up to 200	1.00	0.025	30	3
200–300	1.00	0.03	30	3
300–600	1.00	0.05	40	7
600–1200	2.00	0.09	50	15
1200–1800	2.00	0.11	75	15
1800–2400	2.00	0.13	75	15
>2400	2.00	0.21	75	15

Table H.3. Domestic turkeys: minimum enclosure dimensions and space allowances

Body mass (kg)	Minimum enclosure size (m^2)	Minimum area per bird (m^2)	Minimum height (cm)	Minimum length of feed trough per bird (cm)
Up to 0.3	2.00	0.13	50	3
0.3–0.6	2.00	0.17	50	7
0.6–10	2.00	0.30	100	15
1–4	2.00	0.35	100	15
4–8	2.00	0.40	100	15
8–12	2.00	0.50	150	20
12–16	2.00	0.55	150	20
16–20	2.00	0.60	150	20
>20	3.00	1.00	150	20

Table H.4. Quail: minimum enclosure dimensions and space allowances

Body mass (g)	Minimum enclosure size (m^2)	Area per bird pair-housed (m^2)	Area per additional bird group-housed (m^2)	Minimum height (cm)	Minimum length of trough per bird (cm)
Up to 150	1.00	0.5	0.10	30	4
150–250	1.00	0.6	0.15	30	4

Table H.5. Ducks and geese: minimum enclosure dimensions and space allowances

Body mass (g)	Minimum enclosure size (m^2)	Area per bird (m^2)*	Minimum height (cm)	Minimum length of feed trough per bird (cm)
Ducks				
Up to 300	2.00	0.1	50	10
300–1200†	2.00	0.2	200	10
1200–3500	2.00	0.25	200	15
>3500	2.00	0.5	200	15
Geese				
Up to 500	2.00	0.2	200	10
500–2000	2.00	0.33	200	15
>2000	2.00	0.5	200	15

*This should include a pond (see Table H.6.)
†Pre-fledged birds may be held in enclosures with a minimum height of 75 cm

Table H.6. Ducks and geese: minimum pond sizes*

	Area (m^2)	Depth (cm)
Ducks	0.5	30
Geese	0.5	10–30

*Pond sizes are per 2 m^2 enclosure. The pond may contribute up to 50% of the minimum enclosure size

Table H.7. Pigeons: minimum enclosure dimensions and space allowances

Number of birds	Minimum enclosure size (m^2)	Minimum area (m^2)	Minimum height (cm)	Minimum length of food trough per bird (cm)	Minimum length of perch per bird (cm)
2–6	2	2	200	5	30
7–12	2	3	200	5	30
Each additional bird above 12	–	0.15		5	30

Table H.8. Zebra finches: minimum enclosure dimensions and space allowances

Number of birds	Minimum enclosure size (m^2)	Minimum height (cm)	Minimum number of feeders
Up to 6	1.0	100	2
7–12	1.5	200	2
13–20	2.0	200	3
Each additional bird above 20	0.05	–	1 per 6 birds

I. Amphibians

Table I.1. Main habitat categories and examples per habitat of species frequently used

Habitat	Amphibian species	Size (cm)	Original geographic distribution/Biotope	Optimal temperature	Relative humidity	Main period of activity
Aquatic Urodeles	*Ambystoma mexicanum* (axolotl)	24–27	Mexico/Channels of the former sea of Xochimilco	15–22°C	100%	Twilight
Aquatic Anurans	*Xenopus laevis* (clawed frog)	6–12	Central and South Africa/Ponds, ground water and spring-fed	18–22°C	100%	Twilight/ night
Semi-aquatic Anurans	*Rana temporaria* (common frog)	7–11	Europe (middle and north) to Asia (without southern Balkan)/Near ponds, lakes, streams (shores, meadows)	10–15°C	50–80%	Day/night
Semi-terrestrial Anurans	*Bufo marinus* (marine toad)	12–22	Central and South America/Mangrove, woods	23–27°C	80%	Night
Arboreal Anurans	*Hyla cinerea* (green tree frog)	3–6	Southeast USA/Open bushy borders of cypress swamps, flat country, forest	18–25°C	50–70%	Day/night

Table I.2. Aquatic urodeles (e.g. *Ambystoma* spp.): minimum enclosure dimensions and space allowances

Body length* (cm)	Minimum water surface area (cm^2)	Additional minimum water surface area for each animal in group holding (cm^2)	Minimum water depth (cm)
≤10	262.5	50	13
11–15	525.0	110	13
16–20	875.0	200	15
21–30	1837.5	440	15
31–40	3150.0	800	20

*Measured from snout to tail

Table I.3. Aquatic anurans (e.g. *Xenopus* spp.): minimum enclosure dimensions and space allowances*

Body length† (cm)	Minimum water surface area (cm^2)	Minimum water surface area for each additional animal in group-holding (cm^2)	Minimum water depth (cm)
< 6	160	40	6
6–9	300	75	8
10–12	600	150	10
13–15	920	230	12.5

*These recommendations apply to holding (i.e. husbandry) tanks but not to those tanks used for natural mating and superovulation for reasons of efficiency, as the latter procedures require smaller individual tanks. Space requirements determined for adults in the indicated size categories; juveniles and tadpoles should either be excluded, or dimensions altered according to the scaling principle
†Measured from snout to vent

Table I.4. Semi-aquatic anurans (e.g. *Rana temporaria*): minimum enclosure dimensions and space allowances

Body length* (cm)	Minimum enclosure area† (cm^2)	Minimum area for each additional animal in group holding (cm^2)	Minimum enclosure height‡ (cm)	Minimum water depth (cm)
≤5.0	1500	200	20	10
5.5–7.5	3500	500	30	10
>7.5	4000	700	30	15

*Measured from snout to vent
†One-third land division, two-thirds water division sufficient for animals to submerge
‡Measured from the surface of the land division up to the inner part of the top of the terrarium; furthermore, the height of the enclosures should be adapted to the interior design

Table I.5. Semi-terrestrial anurans (e.g. *Bufo marinus*): minimum enclosure dimensions and space allowances

Body length* (cm)	Minimum enclosure area† (cm^2)	Minimum area for each additional animal in group-holding (cm^2)	Minimum enclosure height‡ (cm)	Minimum water depth (cm)
≤5.0	1500	200	20	10
5.5–7.5	3500	500	30	10
>7.5	4000	700	30	15

*Measured from snout to vent
†Two-thirds land division, one-third water division sufficient for animals to submerge
‡Measured from the surface of the land division up to the inner part of the top of the terrarium; furthermore, the height of the enclosures should be adapted to the interior design

Table I.6. Minimum space requirements for arboreal anurans (e.g. *Hyla cinerea*)

Body length* (cm)	Minimum enclosure area† (cm^2)	Minimum area for each additional animal in group-holding (cm^2)	Minimum enclosure height‡ (cm)
≤3	900	100	30
>3.0–5.0	1500	200	30

*Measured from snout to vent
†Two-thirds land division, one-third pool division sufficient for animals to submerge
‡Measured from the surface of the land division up to the inner part of the top of the terrarium; furthermore, the height of the enclosures should be adapted to the interior design including, e.g. shelves, large artificial branches, and structures for climbing

J. Reptiles (aquatic and terrestrial)

Table J.1. Two habitat categories and examples of reptile species of each habitat frequently used

Habitat	Species	Size (cm)	Original geographic distribution/Biotope	Optimal temperature	Relative humidity	Main period of activity
Aquatic	*Trachemys scripta elegans* (red-eared terrapin)	20–28	Mississippi Valley drainage/Quiet water with muddy bottom	20–25°C	80–100%	Day
Terrestrial	*Thamnophis sirtalis* (common garter snake)	40–70	North America/ Woodland, wet areas	22–27°C	60–80%	Day

Table J.2. Aquatic chelonians (e.g. *Trachemys* spp.): minimum enclosure dimensions and space allowances

Body length* (cm)	Minimum water surface area (cm^2)	Minimum water surface area for each additional animal in group holding (cm^2)	Minimum water depth (cm)
≤5	600	100	10
6–10	1600	300	15
11–15	3500	600	20
16–20	6000	1200	30
21–30	10000	2000	35
31–40	20000	5000	40

*Measured in a straight line from the front edge to the back edge of the shell

Table J.3. Terrestrial snakes (e.g. *Thamnophis* spp.): minimum enclosure dimensions and space allowances

Body length* (cm)	Minimum floor area (cm^2)	Minimum area for each additional animal in group-holding (cm^2)	Minimum enclosure height† (cm)
≤30	300	150	10
31–40	400	200	12
41–50	600	300	15
51–75	1200	600	20
76–100	2500	1200	28

*Measured from snout to tail

†Measured from the surface of the land division up to the inner part of the top of the terrarium; furthermore, the height of the enclosure should be adapted to the interior design including, e.g. shelves and large artificial branches <AQ4>

EUROGUIDE

On the accommodation and care of animals used for experimental and other scientific purposes

BASED ON THE REVISED APPENDIX A OF THE EUROPEAN CONVENTION ETS 123

The Council of Europe is the continent's oldest political organization, founded in 1949. It develops Europe-wide recommendations, agreements and conventions with a view to facilitating member states' economic and social progress. Its *European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes* (ETS 123 of 1986) concerns the care and use of animals in procedures (experiments). The Convention includes Appendix A, which presents guidelines for accommodation and care of animals.

From 1997 to 2006 the Parties to the Convention undertook a revision of Appendix A, involving many stakeholders representing science, industry, animal welfare, governments and regulators. The revised Appendix A has a General Section – providing guidelines on accommodation and care relevant to all animals used for experimental and other scientific purposes – and species-specific provisions for rodents, rabbits, cats, dogs, ferrets, non-human primates, farm animals (cattle, sheep, goats, pigs and mini-pigs, horses), birds, amphibians, reptiles and fish.

The Federation of European Laboratory Animal Science Associations (FELASA) represents national associations across Europe and actively participated in the Appendix A revision process. Readers of this *Euroguide* should remain aware that the official approved Appendix A will always be the definitive document that should be consulted for points of certitude for accommodation and care of animals; however, FELASA has produced the *Euroguide* as a concise and user-friendly reference for anyone working with laboratory animals and for those who have activities in services related to their housing and care.

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