

Cattery Design and Management

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General Concepts

A group of cats brought together for the purpose of raising kittens for show or sale is called a "cattery." A "multiple-cat household" is a home that has at least 2 or more cats not used for breeding purposes. Pounds are public-funded facilities where stray, abandoned or unwanted cats are kept for a finite period, usually less than a week, pending adoption or reclaiming by the owner. If the animals are not reclaimed or adopted, they are destroyed. A "cat shelter" is usually a privately run abode for homeless cats that are kept for an indefinite period pending adoption into permanent homes. If they are not adopted, they often spend the remainder of their lives in the facility. "Boarding kennels" are privately run businesses that house (board) pet cats for short periods for a fee. All of these environments share many of the inherent problems of keeping relatively large numbers of cats in close quarters. The discussion that follows applies more or less to all of these situations, though the emphasis of this chapter is on catteries.

Success in cat breeding is a measurable entity. It is reflected by the numbers of kittens per litter that are successfully weaned, and the magnitude of disease problems that occur in the neonatal (first 2 weeks of life) and postweaning (6-16 weeks) periods. Successful cat breeders also produce high-quality examples of a chosen breed. Success in this area is measured by show wins, bloodline reputation, public demand for kittens of the breed, and production of cats with predictable temperaments and appealing

appearance. It is also important to breed cats that are both genetically and phenotypically robust.

Though this balance is difficult to achieve, the triple goals of vigor, proper temperament and breed conformation should not be compromised. Litter sizes should average 3-4 or more kittens (though some breeds have smaller litters), and 90% or more should be healthy at weaning. The incidence of "clinically apparent" infectious disease should also be low. The term "clinically apparent" is stressed because kittens kept in well-managed catteries may be infected with myriad potentially pathogenic agents without becoming ill (see chapter on infectious diseases). Among the infectious diseases of cats, a small number take on serious proportions in catteries that are poorly designed and managed. These diseases, termed "indicator diseases of cattery health," include feline herpesvirus type-1 infection (rhinotracheitis), feline infectious peritonitis, chlamydiosis, ear mite and flea infestations, and dermatomycosis (ringworm). Persistent or recurrent problems with these diseases indicate that cattery design, management and/or genetic vigor of the broodstock are inadequate.

Need for Specially Designed Facilities

The success of any cat breeding program depends on 3 factors: the facilities in which the cats are housed; management and maintenance of the facilities; and care of the animals. As you will see from the following discussion, the last 2 items are totally

dependent on the first. It is important, therefore, for new cat breeders to consider beforehand the need for specially designed facilities to house their animals. Ultimately, cat breeders that start out on the proper footing will enjoy their experience and continue breeding cats. New cat breeders that proceed rapidly forward with too many animals, too many kittens, inadequate facilities, and a poor understanding of proper genetics and cattery management often face severe or even insurmountable disease problems. These problems will either cause them to get out of cat breeding altogether or, even worse, to continue despite disease problems and deplorable environmental conditions. Breeders in the latter category often withdraw inward as their cattery problems increase. With time, many of them become slaves of their situation. The cattery experience should be joyful and allow for a proper balance of human and animal relationships.

Though there are compelling reasons for creating a special cattery facility, only a small proportion of cat breeders actually constructs special quarters for their cats. Indeed, most catteries are within the breeder's home. Homes are used for catteries for several reasons: it is cheaper to purchase and maintain one structure; some cat breeders believe that cats become bored by lack of intimate human contact and that behavior problems can be aggravated by caging the cats; many cat breeders believe that cats must be integrated into households from the day of birth to become socially adjusted to later home life; and cats, even if used for breeding, are also accepted as members of the family (pets) and their owners have no intention of banishing them to private quarters.

Many reasons are used to justify maintaining a cattery in a human abode, but the main tenet of good cattery design and management is that "human homes do not make easily manageable catteries." It is unusual to have more than 5 breeding animals in an unmodified home without creating problems with their care and health. Therefore, unmodified human habitations should not be used to house more than 5 breeding animals. With modifications, a home may be able to handle up to 10 breeding animals;

if more animals are desired, specially designed cat quarters should be constructed.

The objections to separate cattery facilities can easily be countered, with the possible exception of economics. Even with economic consideration, however, separate quarters easily pay for themselves in healthier cats, lower veterinary expenses, and a better cattery reputation. It has been our experience over the last 20 years that cats do not need constant attention to become socialized. A few minutes of individualized attention each day during cleaning and feeding produce well-adapted pets.

During the course of feline health-related research dating back to 1967, we have maintained 2 separate cat breeding facilities that have produced over 3500 kittens. Over 1000 of these animals have been placed in homes throughout the world as pets, usually when 8-12 months of age. Many of these animals have been adopted through Save Our Cats and Kittens (SOCK), Walnut Creek, CA, a group dedicated to raising money for feline health research and to finding homes for animals coming out of our studies. Even though these cats were raised in separate quarters and received relatively short periods of daily human attention, the vast majority of people who have adopted these animals said they have never had friendlier and better-adjusted animals.

Many of the suggestions made in this chapter relate to our own experience with raising cats in cattery environments and with assisting hundreds of cattery owners with their problems. In fact, genetic selection for temperament has, in our hands, been a far more positive tool in producing well-socialized animals than hours of daily human handling. The fact that cats are kept in separate quarters does not preclude breeding animals from being treated as pets. It can be argued that 1-2 cats in the house have a far more positive human-pet interaction than 50 cats.

Guidelines for Cattery Design

Before considering design and management of privately owned and maintained catteries, it is important to review some of the United States government guidelines for maintenance of cats used for experimen-

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tal purposes. These federal guidelines are not legally applicable to privately run catteries where animals are reared for non-laboratory purposes, but they do reflect the experiences and wisdom acquired by laboratory animal managers and veterinarians over many years. Such federal guidelines will probably be used by state and local legislators to formulate local laws and ordinances that may some day affect cattery owners.

USDA and NIH Guidelines

Detailed guidelines for the care and maintenance of cats in laboratory settings have been provided by the United States Department of Agriculture (USDA) and the National Institutes of Health (NIH).^{2,14} Copies of these guidelines can be obtained directly from the Government Printing Office, Washington, DC. Though many of the guidelines given by the USDA refer specifically to laboratory-maintained animals, some of these guidelines have direct application to private cattery design and management (Table 1).

The NIH guidelines for housing experimental cats are similar to USDA guidelines in most aspects.¹⁴ Floor space required for each adult cat is 3 ft² instead of 2 1/2 ft² as in the USDA guidelines. The NIH guideline for humidity is 30-70% and optimum dry bulb temperature range of 64.4-84.2 F. Ventilation comparable to 10-15 room air changes per hour has been recommended by the NIH, based on years of experience with experimental animal quarters. The stringency and necessity of such a requirement has been questioned by some who argued that ventilation must also take into account the spatial arrangement of the animals and pens within the building, and that ventilation rate per animal or animal cage is a better measure of effective air flow.^{4,22} Despite this criticism, the 10-15 room air changes per hour guideline has been maintained. NIH recommends that air in animal facilities should not be recirculated unless it has been treated to remove particulate debris and waste gases. However, air treatment, in addition to being prohibitively expensive, is likely to be ineffective due to improper or insufficient maintenance of the complex air-treatment systems.⁸ NIH is also more explicit about lighting requirements. Illu-

mination levels of 75-100 foot candles have been generally recommended for animal rooms. NIH guidelines also encourage time-controlled lighting systems to provide a regular diurnal (dark-light) lighting cycle.

Revised USDA Guidelines

The USDA is in the process of revising their animal welfare regulations.³ Though not approved at the time of this writing, most revisions will probably be incorporated into the existing guidelines. Proposed changes are meant to strengthen the previous regulations by defining them better or making them more stringent. The proposed guidelines were formulated to "provide for an environment that better promotes health, comfort and well-being of dogs and cats." The aim of the proposed changes is to make cat facilities not only more healthful for the cats, but more appealing to their human inspectors. For example, if an average cat owner (not necessarily familiar with cattery practices) finds some aspect of the operation troubling, cruel or personally offensive, the cattery design and/or management is probably not acceptable. Though the new welfare guidelines are similar to the old, there are several notable differences:

Food storage areas must be kept free of trash, weeds, discarded material and clutter, including equipment, furniture and other stored materials not essential for proper husbandry practices.

Surfaces of housing facilities must be easily cleaned or sanitized, or be removable or replaceable. Hard surfaces in contact with dogs or cats must be cleaned daily and sanitized at least every 2 weeks. Floors made of dirt, sand, gravel or similar material must be raked or spot-cleaned daily.

All facilities must have electrical power and pressurized potable running water, based on the premise that proper cleaning cannot be done without these commodities. Ventilation must be provided to minimize ammonia levels. Artificial or natural light must be provided for at least 8 hours a day, corresponding to the natural period of daylight.

Indoor floor areas in contact with animals, outdoor floor areas not exposed

Table 1. Summary of USDA guidelines for sheltering cats used for experimental purposes. Only guidelines pertinent to management of privately owned catteries or multiple-cat households are listed.

General Facilities

Structural Strength: Structurally sound and adequately maintained so that animals are protected from injury and cannot escape, and so that other animals may not gain entrance.

Storage: Food and bedding to be protected from infestation with vermin. Refrigeration provided for perishable food.

Waste Disposal: Facilities designed and maintained to minimize vermin infestation, odors and disease hazards.

Indoor Facilities

Heating: Sufficiently heated to protect cats from cold and to provide for health and comfort. The ambient temperature shall not be allowed to fall below 50 F for animals not acclimated to lower temperatures (35 F if acclimated).

Cooling: The maximum temperature for acclimated cats is 95 F, and 85 F for unacclimated animals. Cooling of the air is required for temperatures above 85 or 95 F, respectively.

Ventilation: Facilities are to be provided with fresh air by means of windows, doors, vents or air conditioning, and ventilated as to minimize drafts, odors and moisture condensation. Auxiliary ventilation, such as exhaust fans, vents or air conditioning, shall be provided when the ambient temperature is 85 F or higher.

Lighting: Ample lighting by natural or artificial means shall be provided. Lighting shall be uniformly distributed and of sufficient intensity to permit routine inspection and cleaning during the entire working period. Primary enclosures shall be placed to protect cats from excessive illumination.

Interior Surfaces: Shall be constructed and maintained as to be substantially impervious to moisture and readily sanitized.

Outdoor Facilities

Shelter from Weather: Sufficient shade shall be provided to allow cats protection from direct sunlight. Cats shall be allowed access to shelter so as to remain dry during rain or snow. Shelters shall be provided for all cats kept outdoors when the temperature falls below 50 F. Sufficient clean bedding or other means of protection shall be provided when the ambient temperature falls below the temperature to which a cat is acclimated. Pens should be constructed so as to rapidly eliminate excess water.

Primary Enclosures

General Requirements: Structurally sound and well maintained so as to protect animals from injury, contain them, and keep predators out. Enclosures shall be constructed and maintained so as to keep animals dry and clean, and provide convenient access to clean food and water. Receptacles containing sufficient clean litter shall be provided to contain excreta. Each primary enclosure shall be provided with enough solid resting surfaces (perches) of adequate size to comfortably hold all occupants of the enclosure at the same time. Resting surfaces shall be elevated in all enclosures housing 2 or more cats.

Space Requirements: Enclosures shall provide sufficient space to allow each cat to turn about freely and to easily stand, sit and lie in a comfortable normal position. Each adult cat shall be provided with a minimum of 2 1/2 square feet of floor space, and no more than 12 adult cats shall be housed in the same pen.

(Table 1 continued)

Animal Health and Husbandry Standards

Feeding: Cats shall be fed at least once daily, except as otherwise required to provide adequate veterinary care. Food shall be free from contamination, wholesome, palatable, and of sufficient quantity and nutritive value to meet normal daily requirements for the size and condition (nonpregnant, pregnant, lactating, kittens) of the animals. Food receptacles shall be accessible to all animals in the enclosure and localized so as to minimize contamination by excreta. Feeding pans shall be durable and kept clean and sanitized at least every 2 weeks. Self-feeders may be used for feeding dry food, but must be sanitized regularly to prevent moldiness, deterioration or caking of food. Potable water shall be provided at all times or, if not possible, twice daily for periods of not less than 1 hour. Watering receptacles shall be kept clean and sanitized once every 2 weeks.

Sanitation: Excreta shall be removed from primary enclosures as often as is necessary to prevent contamination of the animals and to reduce disease hazards and odors. When enclosures are hosed down, animals contained in the enclosure being cleaned shall be removed during the cleaning process and measures taken to protect the animals from being contaminated with water and other wastes. Cages, rooms and hard-surfaced pens or runs shall be sanitized by washing them with hot water (180 F) and soap or detergent. This shall be followed by a safe and effective disinfectant. Sanitation of this type shall be conducted every 2 weeks. Pens or runs using gravel, sand or dirt shall be sanitized by removing the soiled gravel, sand or dirt and replacing it as necessary.

Housekeeping: Premises (buildings and grounds) shall be kept clean and in good repair to protect animals from injury and to facilitate prescribed husbandry practices. Premises shall be maintained free of accumulations of trash.

Pest Control: An effective pest-control program shall be established and maintained for control of insects, ectoparasites and avian and mammalian pests.

Classification and Separation: Animals housed in the same enclosure shall be maintained in compatible groups, with the following restrictions: females in estrus shall not be housed in the same enclosures with males except for breeding purposes; any cat exhibiting a vicious disposition shall be housed individually; kittens shall not be housed in the same primary enclosure with adult cats other than their dams, except when maintained in breeding colonies; cats shall not be housed in the same primary enclosure with any other species of animals; and cats showing signs of communicable illness shall be separated from other cats in such a manner as to minimize dissemination of disease.

Veterinary Care: Programs of disease control and prevention, euthanasia, and adequate veterinary care shall be established and maintained under the supervision of a veterinarian. Each cat shall be observed daily by the animal caretaker in charge, or by someone under his/her supervision. Diseased animals shall be provided with veterinary care or euthanized.

to the direct sun or made of a hard material such as wire, wood, metal or concrete that are in contact with the animals, and all walls, boxes, houses, dens and other surfaces in contact with the animals shall be impervious to moisture (ceiling excepted). Outside floor areas in contact with the animals and exposed to the direct sun should consist of compacted earth, sand, grass or gravel.

Outdoor facilities shall: contain a shelter area large enough for all ani-

mals in the structure to sit, stand or lie in a normal manner and to turn about freely; provide adequate shelter from cold and heat; have wind and rain breaks at the entrance; contain clean dry bedding material; and contain a separate outside area of shade big enough to contain all animals at one time and protect them from the sun's rays.

The space requirement for cats is increased in the new proposed guidelines.

Weaned cats 4 kg (8.8 lb) shall be provided with 3 ft² of floor space and cats 4 kg with 4 ft². Queens with kittens are to be supplied with their base space plus 5% of minimum for each nursing kitten. The minimum floor space is exclusive of food, water, litter pans and perches, and would have to be at least 24 inches high.

Queens in heat cannot be housed with sexually mature males, except for breeding. Queens with litters and kittens under 4 months of age cannot be housed in the same primary enclosures with any other adult cats, except when maintained in a breeding colony. Vicious or aggressive cats should be housed separately. All resting surfaces shall be elevated, even if only one animal is in the enclosure.

CFA Cattery Guidelines

The Cat Fanciers' Association (CFA) recently approved what they refer to as *minimum* cattery standards for breeders (Table 2).⁴ The purpose of these standards is to provide a basis to judge humane cattery facilities. In particular, they are to provide a means to evaluate complaints of animal abuse against CFA catteries brought by other CFA breeders, the public or local authorities. The minimum nature of these regulations is stressed; they represent a worst-case scenario. Owners of catteries judged not to meet minimum CFA standards would be subject to internal discipline, which would consist mainly of a loss of CFA privileges, such as registration of kittens and certain show privileges.

These standards are based closely on those of NIH and USDA for housing experimental cats, but are stated in much more general terms. Like these other regulations, they stress the point that cats maintained in closed facilities must not only be maintained in good health, but the environment should also have a healthful appearance.

Cattery Design

Preliminary Considerations

It should be evident from USDA, NIH and CFA cattery guidelines that large num-

bers of breeding cats cannot be maintained in a home or structure that has not been modified in some way to house and maintain cats. It is important, therefore, to consider cattery design.

Good cattery design cannot be accomplished without first considering a few basic requirements: numbers of cats, and space allowed for each animal; purpose of the cattery, such as intensive breeding or occasional breeding, no breeding; external climate; internal climate, such as temperature, lighting, ventilation and humidity; legal requirements for licensing, where applicable; and amount of money available for the project.

The number of animals is the most important consideration in cattery design. Disease problems increase in home-type environments as the number of animals exceeds 6 queens and 3 toms, with each female producing 6-8 kittens a year. It is difficult to maintain optimal cattery husbandry in a home environment for more than this number of adult animals and kittens. If more than this number is kept, it is advisable for the health of the animals, to design separate facilities just for them.

The maximum number of cats that can be maintained in catteries also depends on the time and money a person is willing to expend. As a general rule, a single person acting both as owner and caretaker cannot adequately care for more than 25 breeding animals even in the best of facilities. In fact, most successful owner-operated catteries that we have observed seldom exceed about 9 top-quality breeding animals. A good breeding program can involve as few as 6 females and 3 males, providing only one breed is kept. Some breeds, however, require more than this number. For example, the breeding of Colorpoint Shorthairs includes outcrossing to Siamese. Manx and Scottish Folds require that a certain number of tailed or straight-eared cats be kept. Under the most intensive breeding conditions, a cattery of 6 breeding females and 3 males can produce as many as 36-48 kittens per year. The work required to maintain the comfort, sanitation, nutrition and health of this many young animals is tremendous.

Once a decision has been made on how many animals the cattery will maintain, the

Table 2. Minimum cattery standards adopted by the Cat Fanciers' Association in October, 1989.

Definitions
For the purposes of this standard, the following definitions shall apply:
<i>Person:</i> An individual, firm, partnership, corporation, trust or any association of persons.
<i>CFA Cattery:</i> Any person(s) who has registered a litter of kittens with the Cat Fanciers' Association or who has registered 3 or more cats with the Cat Fanciers' Association or who has registered a cattery name with the Cat Fanciers' Association.
<i>Cattery Facility:</i> A building, room or area used to house cats.
<i>Primary Enclosure:</i> A structure used to immediately restrict 1 or more cats to a limited amount of space, such as a room, pen, run, cage or compartment.
<i>Animal Cruelty:</i> Any inhumane or abusive or neglectful treatment causing harm or death of a cat as determined by local law enforcement authorities.
<i>Cat-in-Distress:</i> A cat that is in jeopardy of life or limb, as determined by a qualified animal-control officer or veterinarian.
<i>Litter:</i> Material used by the cat for defecation or urination.
<i>Litter Pan:</i> An enclosure or area (receptacle) in which litter is placed for the cat's use.
Standards
CFA catteries shall maintain the following <i>minimum</i> standards:
Cattery Facility
The cattery facility, whether a private residence, portion of a private residence or separate structure not physically connected to a private residence, shall be structurally sound and maintained in good repair to protect the cats from injury, protect the cats against over-exposure to the elements, contain the cats and restrict entrance of other animals.
Supplies of food, bedding and interior building surfaces shall be maintained in a sanitary manner.
Food shall be transported, handled and stored in a manner that prevents introduction of parasites, disease vectors (such as insects) or chemical contaminants. Supplies of dry food shall be stored in areas that are cool, dry, clean and free of vermin and other potential contaminants. Refrigeration shall be provided for supplies of perishable food. Conditions affecting the shelf life of food, such as date of manufacture, exposure to extremes in temperature and humidity, exposure to moisture, unsanitary conditions, exposure to light, exposure to oxygen and exposure to insects, shall be monitored to prevent deterioration of the food's nutrient value.
The facility shall be sufficiently heated and cooled to protect cats from excessive cold and heat. The ambient temperature shall be maintained in a range that ensures that the cats will not suffer from heat stress (heat stroke or hyperthermia) nor from cold stress (frostbite or hypothermia).
The facility shall be adequately ventilated to provide for the health and comfort of cats at all times. The facility shall be provided with a source of fresh air by means of windows, doors or vents and shall be ventilated in a manner that minimizes drafts, odors and moisture condensation.
The facility shall have ample light of good quality by natural or artificial means or both. Lighting shall provide uniformly distributed illumination of sufficient intensity to permit routine inspection and cleaning, and provide for the well-being of the cats. The cats shall be protected from excessive illumination.
When sunlight is likely to cause overheating or discomfort, sufficient shade shall be provided to allow cats to protect themselves from direct rays of the sun.
Access to shelter shall be provided for cats to allow them to remain dry at all times.

(Table 2 continued)

Primary Enclosures

Primary enclosures shall provide a microenvironment that satisfies the standards for the cattery facility, as well as the following additional standards:

A primary enclosure shall be structurally sound and maintained in good repair to protect the cats from injury, to contain them, to keep other animals out, and to enable the cats to remain dry and clean.

A primary enclosure shall provide sufficient space to allow each enclosed cat to turn freely and to easily stand, sit and lie in a comfortable position. The minimum primary enclosure space for a single cat of 4 lb or greater shall be 30 ft³.* Where the primary enclosure is used for more than one cat, resting perches shall be provided.

A primary enclosure shall be constructed and maintained so that cats have convenient access to clean food, water and litter.

The number of cats in a primary enclosure shall not exceed a number that would prevent proper ventilation and sanitation.

A primary enclosure shall not be constructed or maintained with an exposed wire mesh bottom or any other material that will injure the feet or legs of a cat.

If the primary enclosure is not of sufficient size to allow the cat(s) to express their specialized locomotor patterns, then an additional area shall be made available for the cat(s) to jump, run, exercise and scratch at least once a day.

Feeding and Water

Cats shall be fed at least once each day, except as otherwise required by a veterinarian. The food shall be free from contamination and shall be wholesome, palatable and of sufficient quality and nutritive value to meet the normal daily requirements for the condition and size of the cat. Food shall be provided in sufficient amounts to ensure normal growth of kittens and maintenance of normal body weight in adults.

Food receptacles shall be accessible to all cats and located to prevent contamination by excreta. Feeding dishes shall be kept clean. Self-feeders may be used for feeding of dry food and shall be sanitized regularly to prevent moldiness, deterioration or caking of food.

Cats shall have continuous access to fresh, potable and uncontaminated drinking water.

Cleaning and Sanitation

Primary enclosures, the cattery facility and storage spaces shall be cleaned with appropriate detergents and disinfectants as often as necessary to keep them free of dirt, debris and harmful contamination.

Easily accessible litter pans shall be provided for all cats at all times.

Feces and soiled litter shall be removed from all litter pans at least once a day.

Absorbent litter and/or any other material used to absorb urine shall be changed when 30% saturated with urine.

The cattery facility shall be kept clean and remain free of accumulated debris and excreta.

All primary enclosures and accessory equipment, such as feeding bowls and watering devices, shall be washed and sanitized frequently to keep them clean and free from contamination.

An effective program for control of insects, ectoparasites and mammalian pests, if present, shall be established and maintained using safe products.

* 30 ft³ = a space with dimensions of 3.3 x 3 x 3 ft.

(Table 2 continued)

Health Care

The cattery shall promptly provide medical care to any cat-in-distress and/or any cat exhibiting signs of severe illness.

Cats shall be observed daily and diseased cats shall promptly be provided with medical care.

A vaccination program, under the advice of a veterinarian, is recommended.

Cats shall be kept clean and free of severe coat mats, and generally groomed sufficiently to maintain a healthy condition.

Cruelty

Cats residing in the cattery facility shall be treated humanely and without neglect.

Catteries shall not allow a cat to be deprived of necessary sustenance, deprived of potable water, deprived of clean quarters, deprived of protection from weather, beaten, mutilated or cruelly treated, and shall not allow, through neglect, any situation to exist or persist that would cause a cat-in-distress condition to occur or persist.

next step is to assign a given amount of space for each animal and for each function (breeding, maintenance, rearing of young). The first rule for assigning space is that "no cat will ever be housed individually in small cages of less than USDA, NIH or CFA standards except for transport or temporary (<24 hours) housing." Small cages are extremely stressful on cats, especially if placed in rooms where other animals are allowed to roam free. Whenever possible, cats should be housed in larger open rooms that allow an opportunity for movement and a degree of privacy.

Basic Animal Containment Unit

In designing catteries, it is important to think in terms of a "basic animal containment unit" or "primary enclosure." Research and commercial-type breeding colonies and successful private catteries have certain points in common. Independently of each other, owners and operators of these various types of cat facilities have developed basic designs for catteries that have universal applicability. Depending on garnishings, such facilities are within the financial grasp of most cattery owners.

A basic animal containment unit is shown in Figure 1. This unit can be variable in size, but should be somewhere near 4 feet wide, 7-8 feet high and 8-12 feet long. The outer one-half to two-thirds of the unit

should be relatively open to the elements, and the inner portion more or less closed off and protected from the elements. In warmer climates, the outside runs can be larger, while in cold climates more room should be provided inside. Access from the inner to the outer unit can be provided by anything from regular doors to small openings. At least one perch for each animal should be attached at various heights to the walls in each of the inner and outer portions. The floors and at least the lowest 2 feet of the walls should be constructed of solid concrete, with the concrete sealed or covered to prevent water penetration.

A single unit of the above dimensions can serve any of the following functions: as holding quarters for no more than 4 adult cats during the period when they are not breeding or for the first 40 days of gestation; as holding quarters for 1-2 male cats, depending on temperament, when they are not being used for breeding; as a breeding room; as a delivery and nursery room, where a single female is placed 2-3 weeks before parturition and allowed to deliver and rear its young in isolation until its kittens are weaned; as a rearing room, where weaned kittens are kept in isolation until they are sold or reach 16 weeks of age; and as a room for cats currently being shown. If outside stud service is provided, 1 unit will be required for isolation and holding of visiting females.

Figure 1A. (top) Floorplan of a basic animal containment unit. B. (bottom) Floorplan of a cattery made up of a common central hallway and 12 basic animal containment units. The unit may be contiguous with a private home. It is important to surround the cattery with a barrier fence to prevent contact with free-roaming cats.

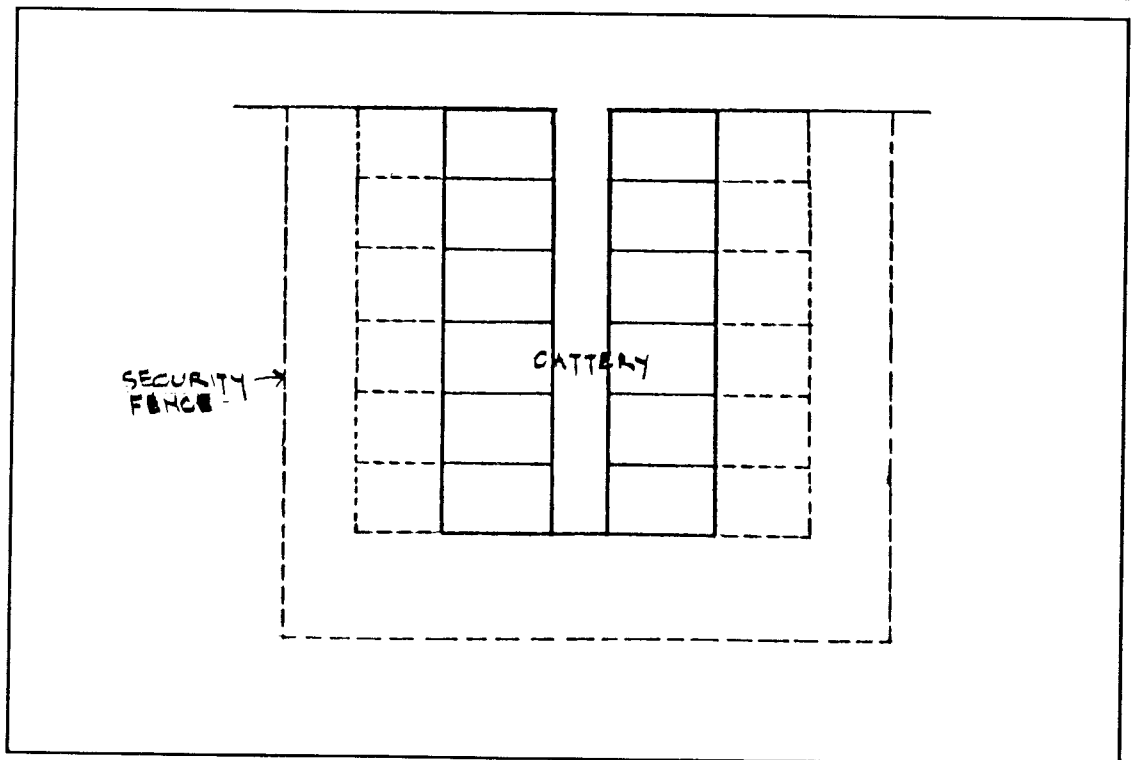
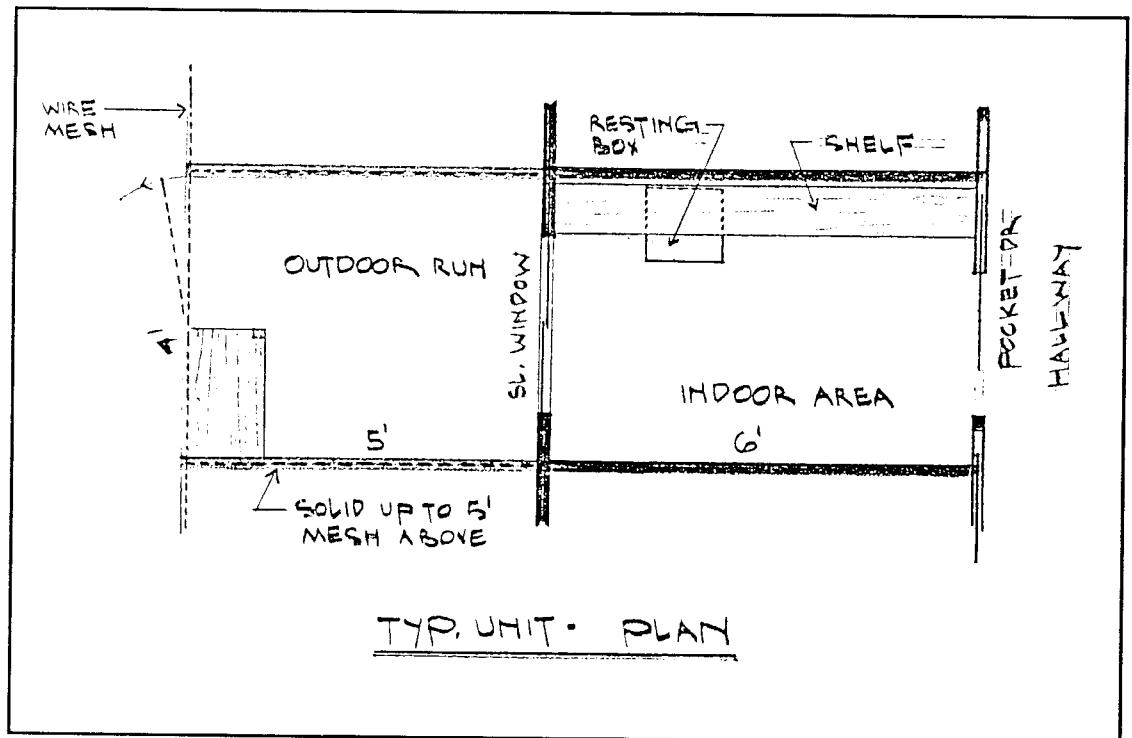
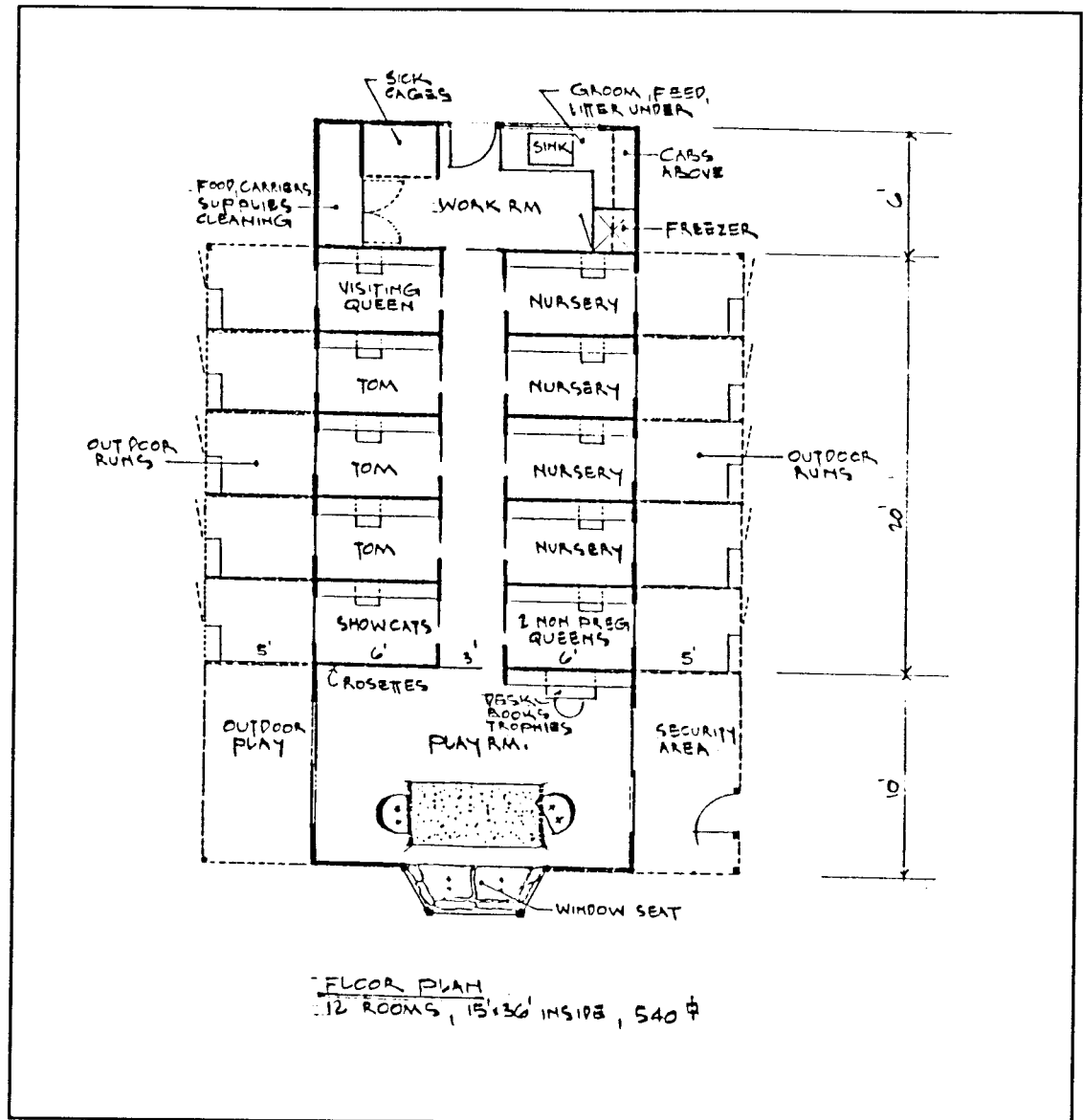


Figure 1C. Floorplan of a cattery with space for ancillary functions.



With this information, it is easy to calculate the number of basic units required for a given cattery. For instance, if a cattery contains 3 breeding males and 6 females, and each female produces 2 litters a year, the following number of units will be required: 2 rooms for nonpregnant and early-gestation queens, 1 breeding room (or room to isolate visiting queens), 3 rooms for toms, and 6 nursery and rearing rooms.

Once the number of units has been determined, it is possible to design the entire cat-

tery. The cattery design depends on ingenuity, aesthetic considerations, and financial and space constraints. Figure 1 shows how 12 basic animal containment units can be put together to provide maximum use of space. In this basic plan, 6 units are placed on each side of a central corridor, with the interior or enclosed part of the unit facing inward. A second cat-proof fence is placed around the outside of the unit to prevent contact between cattery cats and feral animals, and to provide escape-proof access to

the outer portions of the units. The enclosed portions of the basic animal containment units can also be incorporated within homes or garages.

Once the design is created, special provisions should be made for sanitation, ventilation, climate control and ancillary functions. The success or failure of the cattery depends a great deal on how well these various functions are met. Unfortunately, these are the most expensive items in cattery construction and are most likely ignored.

Sanitation

Sanitation refers to the housekeeping functions necessary to maintain an environment that is as free of contagious agents as possible. Contagion arises in 3 ways: exposure to microorganisms in body excretions (urine, feces), secretions (saliva), and exfoliations (hair, dander); direct contact with other cats in the cattery; and contact with outside animals or contaminated air and objects. Because cats are the main source of infection for other cats, indirect exposure to body excretions, secretions and exfoliations, or direct contact between animals, accounts for most spread of disease.

Contact between animals can be controlled by proper cattery design and management, and is the most important means to control infection. Accumulation of excretions, secretions and exfoliations can be prevented by cleaning. Individual units within the cattery should be designed for rapid and efficient cleaning and waste disposal. When possible, the floors and lowest 1-2 feet of the walls should be cast as one piece of concrete. The concrete should be smoothly finished and the foundation sufficiently reinforced to prevent cracking. Nonporous flooring may be used *in lieu* of solid concrete, provided that the joints are well sealed. Because cat urine can spoil many surfaces, care must be taken in selecting floor coverings. Sheet linoleum of the type approved for hospitals is most ideal. Regular linoleum is quickly damaged by urine, water, and the disinfectants and soaps so frequently used in a cattery.

If floors are to be hosed down, floors should slope toward one end of the unit, usually the outer or unenclosed portion. A shallow gutter should be placed at right an-

gles to the floor at the lowest point. Common gutters should slope, in turn, to a common drain at one end of the building (Fig 2). Movement of waste water from the inside to the outside part of the enclosure can be facilitated by a narrow swinging door at the base of the dividing wall. Waste water should never travel through one pen to another. Gutters should be constructed outside of the actual enclosures or a single gutter and drain provided for each run. Drains and drain pipes should be large enough to handle larger particles of litter and excreta. If drains are inside the pens, they should be covered with movable screens to prevent smaller kittens from falling into them.

The remainder of the walls in the enclosed portion of each containment unit should be constructed of marine plywood painted with several coats of an epoxy-type paint, or preferably covered by masonite, laminated plastic or comparable impermeable surfaces. It is important to install all impermeable wall and floor surfaces in such a way as to prevent water intrusion. Flooring material should extend onto the walls (to avoid corner seams) and wall siding should extend downward over the flooring, rather than under it (to prevent water from running down the walls and under the flooring). Commercial caging made of anodized aluminum can also be designed as panels that can be assembled. The assembled cage can then fit on top of prepared concrete floors and pre-walls (Fig 2). Though the initial investment is higher, commercial caging may be less expensive and more easily cleaned and maintained over the long term.

The side panels of each internally situated unit should be solid. This prevents nose-to-nose contact between runs and allows the same wall to be shared by adjoining units. The outward-facing walls of end runs can be made of wire. The front of each unit should be screened for easy view of the animals and fitted with entry doors. Doors may be of a sliding type to save space and provide for rapid and safe closure.

Perches should be provided for each animal, but should be large enough to hold 2 animals if necessary. A narrow space should be left between the perch and wall to prevent urine or water pooling. Perches should also be made from impermeable substances

Figure 2A. (top) Inside of an experimental cat housing facility at the University of California, Davis. Two banks of cages (primary enclosure units) are found in each room; each bank of 4 units is separated by a 4-foot-high concrete divider. The facility is made of waterproof materials and designed for rapid cleaning. The cages themselves were custom made from anodized aluminum by a commercial caging contractor and delivered as flat panels that were assembled on a preformed concrete pad. B. (bottom left) Sliding doors are used for entrance into the primary enclosures. Sliding doors save room and are easier to close rapidly; this helps prevent animals from being injured by closing doors. Each bank of primary enclosures is placed on top of a 4-inch raised concrete pad that slopes slightly to the back. The floors are made from a mixture of epoxy and sand for durability and to facilitate cleaning and drying. C. (bottom right) Inside appearance of a primary enclosure unit. Notice the plastic perches attached to the side wall at varying heights. Plastic trays are used for litter pans and stainless-steel bowls for food and water.

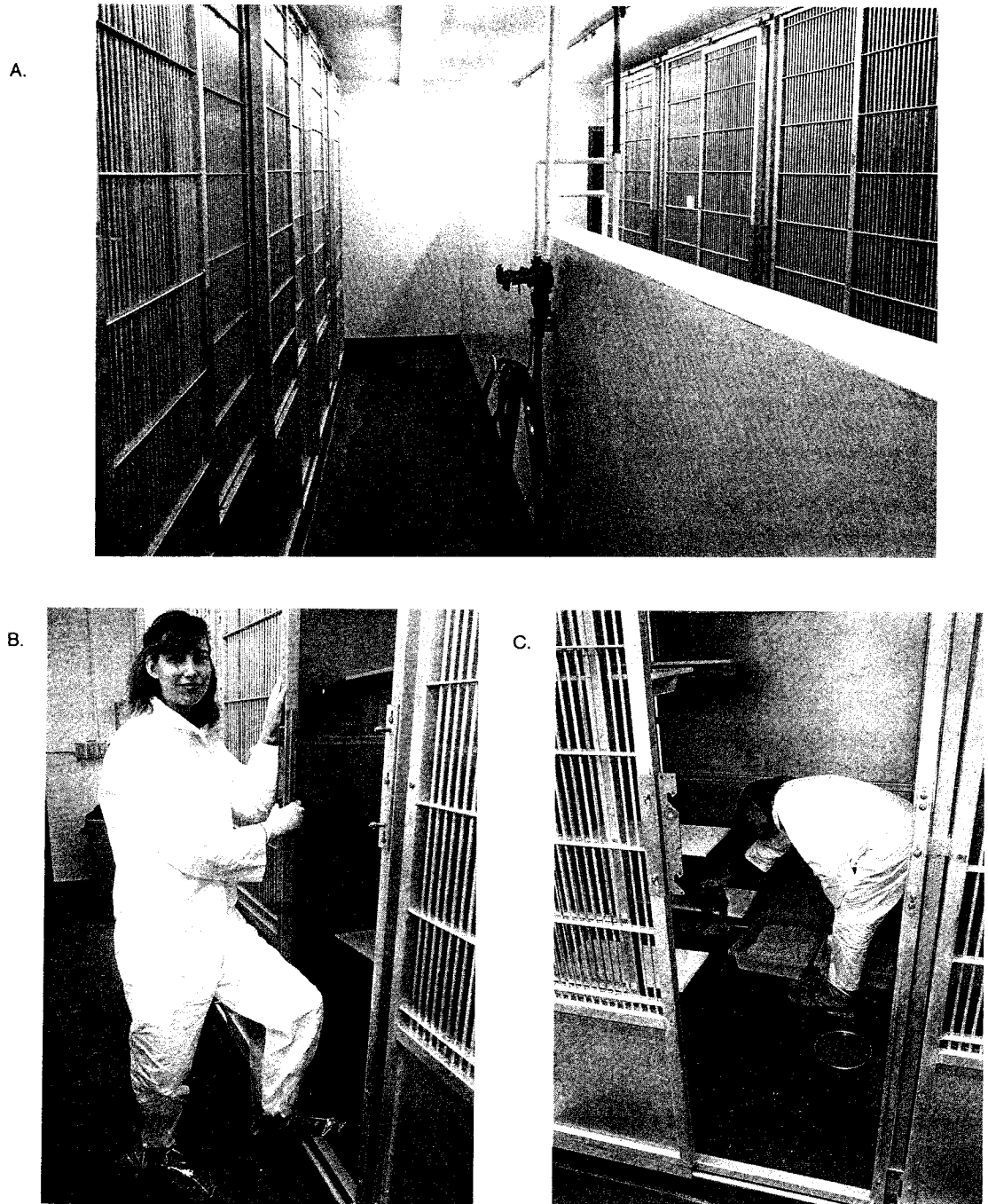
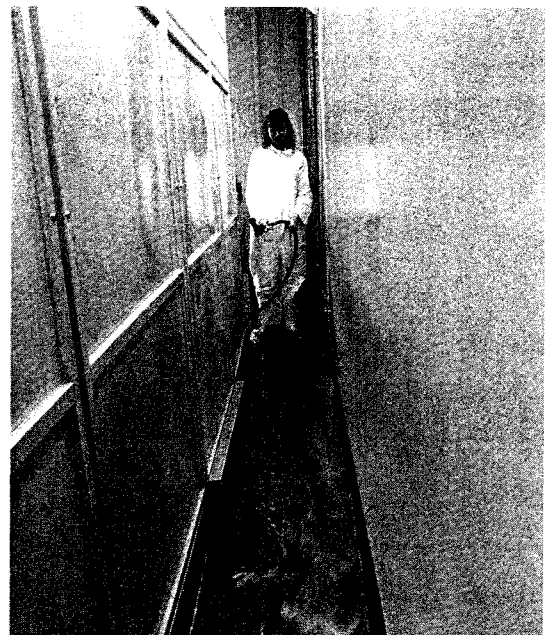


Figure 2D. (left) The lower side of the back wall of each primary containment unit contains a built-in hinged door that can be raised for cleaning. The door is being opened in preparation for washing. Waste is washed under the opening, into a common gutter in the back of the bank of primary enclosures. Notice again the plastic perches for the cats. During washing, the cats move up onto the higher perches away from the water. E. (right) A narrow common alleyway and gutter is located at the back of each bank of primary enclosure units. The common gutter slopes gently away from the animal caretaker to a common drain that is out of view at the bottom of the photograph.



rather than wood. An unpainted wooden scratching post or small movable hemp rugs on the floor can be provided for claw sharpening. The hemp rugs can be washed several times before being replaced. Carpeted scratching posts, while a nice personal touch, should be avoided, as they cannot be cleaned. They provide ideal homes for flea larvae and pupae, and only encourage cats to scratch on furniture when the cats are subsequently placed in homes.

Smaller secondary enclosures within the larger primary enclosures are commonly found in private catteries (Fig 3). Such structures usually contain several openings and compartments at different levels through which the cats can enter and leave. Cats often use such enclosures for privacy and rest. Many innovative designs ranging from miniature mansions to hollow trees are used for such structures; the design is more likely to strike the fancy of the owner than the cat. Though secondary enclosures are appreciated by cats, they are difficult to clean properly and are not essential. If they are used, they should be kept as simple and

easy to clean as possible. Fancy paint, window shades, curtains, doors, carpeting and wall covers should be avoided because they prevent adequate cleaning, especially with soap and water, disinfectants or steam.

Ventilation

Ventilation is one of the most important requirements for a cattery. Good ventilation removes odors and accumulations of waste gases, and dilutes and flushes out air-borne pathogens. NIH regulations for housing experimental cats call for 10-15 complete air changes per hour.⁶ This means that 10-15 times the volume of the enclosures should be replaced with fresh or reconditioned (filtered) air each hour. Filtration of air requires special particulate and toxic gas filters that are prohibitively expensive for most cattery owners, and they also tend to be unreliable.³

Alternatively, if the air is completely exhausted, there is the added expense of heating or cooling the new air that is brought into the unit or installing a heat-recovery system. It is not usually possible, therefore,

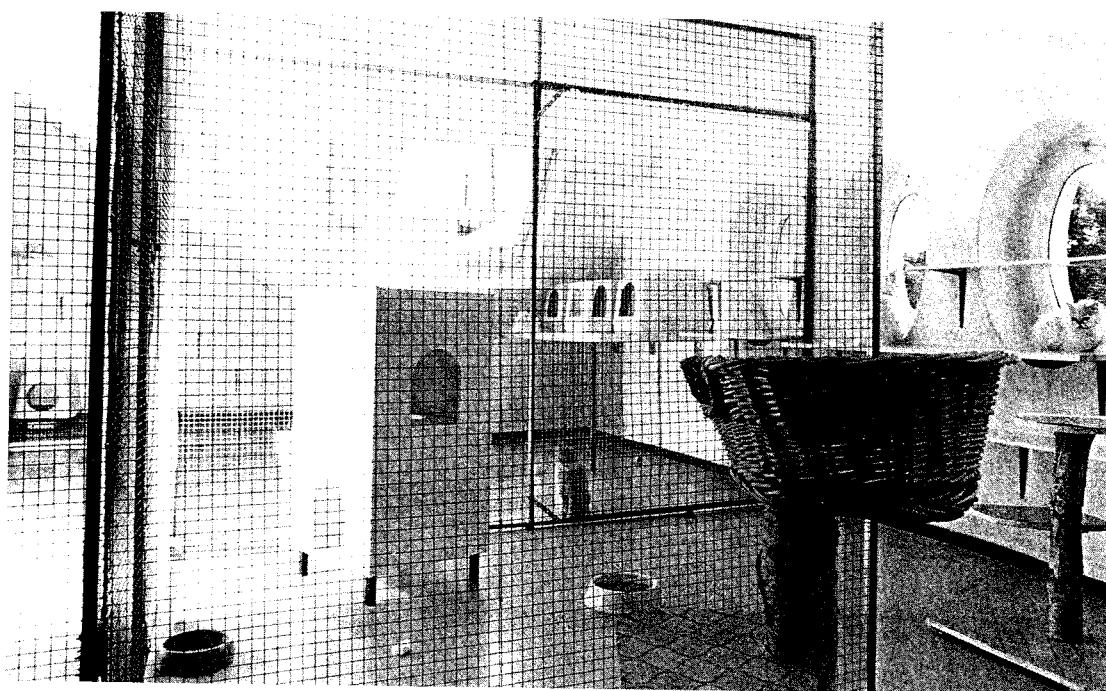
for private catteries to meet the ventilation standards set by the government. Fortunately, it is not necessary to do so. Most pathogenic organisms are transmitted by direct contact or through ingestion, while air-borne transmission is much less important. Sanitation and control of animal movement are more important for disease control than superior ventilation. Moreover, even if NIH ventilation standards were met, they would not effectively reduce disease problems if sanitation remained inadequate.

The least expensive and most effective type of ventilation is provided by free movement (sometimes aided by fans during still days) of outside ambient air through the animal containment units. Catteries should be designed, therefore, to take advantage of passive ventilation as much as possible. Well-designed catteries can be opened up during favorable weather to allow for maximum movement of air and penetration of sunlight. This can be accomplished by using wire screening for the walls of the outer portion of the animal containment units.

Screens can be blocked with solid storm doors or windows during cold or wet weather. Side-to-side air movement is more difficult to obtain because of the need to prevent nose-to-nose contact between pens. Open screens can be placed on adjoining walls if the bottom two-thirds of the wall are left solid. Perches should then be placed only on the solid parts of the intervening walls or on unshared back walls. If perches are low enough and there are no window sills on which to perch, nose-to-nose contact is prevented. Lateral air movement can also be provided by using a common ventilated attic and wire tops on each run. The cattery should be positioned in such a way as to take maximal advantage of prevailing winds.

Sunlight is almost as important as adequate air flow, and is considered one aspect of proper ventilation. Animal containment units should be constructed, therefore, to provide for access of sunlight. Sunlight has a pronounced inhibitory effect on many microorganisms, in addition to its direct health-promoting effect on the animals

Figure 3. This large, airy cattery contains smaller, secondary enclosures inside the main enclosures. The structure on the left is a 2-story "apartment." A wicker laundry basket in the foreground serves as a napping place. Note the linoleum-covered steps leading to the perches, and the windows with perches. (Courtesy of Elke and Norbert Deutschmann, Essen, West Germany)



themselves. Windows and skylights should be used as much as possible in the cattery and positioned in such a way as to take advantage of both summer and winter sun. Cats like to sit by windows, and window sills on the outward-facing walls can double as perches if properly constructed (Fig 3). Outdoor runs can be partially shaded from summer sun in warmer climates with loosely foliated deciduous trees. During winter months, these same runs will be exposed fully to the sun, and on warmer winter days, cats can be allowed to move from indoor to outdoor areas.

In areas with no prevailing breezes, ventilation fans should be installed to encourage movement of air. They are particularly beneficial if an attic-type construction is used. Fans should pull air from the attic portion to the outside. Air is then drawn through the front of the cattery, upward into the attic, and then to the outside. Air does not flow from run to run.

The requirement for clean and odor-free air in the home or cattery is of more than aesthetic importance. Ammonia gas is a common contaminant of the atmosphere in environments where many animals are closely confined.^{28,32,34} Ammonia gas (NH_3) is a product of bacterial breakdown of fecal and urinary urea. This breakdown process is accentuated by conditions of high temperature and humidity, accumulation of waste material (infrequent cleaning of litter boxes), litter favoring bacterial growth, allowing urine to accumulate until litter is soaked, too many animals per litter box, permeable surfaces where urine can accumulate, and inadequate ventilation.

Ammonia gas is detectable to the human nose at about 5 parts per million (ppm) in the air.²³ People usually begin to complain about the ammoniacal odor when the levels reach 20-25 ppm. Irritation to the eyes and nose may follow exposure to levels greater than 50 ppm, though people in continuous contact to irritating levels often become tolerant of the effects of ammonia. Levels of ammonia gas ranging from 2-720 ppm have been recorded in many experimental rat-holding facilities.³² Even in environmentally regulated swine barns, ammonia gas levels frequently reach 13-76 ppm.²⁸ Based on detectable ammoniacal odors, many densely populated and poorly ventilated

catteries reach ammonia gas levels of 25 ppm or greater. Attempts to mask ammoniacal odors in catteries with perfumes and air deodorizers should be avoided. Such measures may confound the normal physical senses necessary to detect the problem and to gauge its severity.

Ammonia gas is absorbed readily through the mucosa of the nasal passages and upper airways. The levels of ammonia in the blood of animals housed in contaminated environments increase in direct proportion to the levels in the surrounding air. Ammonia is potentially toxic to animals once inhaled. The concentration of ammonia gas required to kill 50% of test mice following 1 hour of exposure and again 14 days later is 4230 ppm or greater.³⁰ Acute mortality is not seen in mice exposed to ammonia gas levels under 3500 ppm for 1 hour. Obviously, such high levels of ammonia gas are not seen in nature, except for rare industrial accidents. However, much lower levels of ammonia gas can affect the animals' health in myriad and subtle ways.^{32,34}

The severity of mycoplasmal, viral and secondary bacterial infections of the respiratory tract has been enhanced in chickens and rats exposed to common environmental levels (20 ppm or higher) of ammonia gas in poultry houses and laboratory animal holding facilities.^{24,25} Impairment in reproductive performance and delayed puberty have been observed in cattle and swine exposed to common environmental levels of ammonia gas.^{31,34} Ammonia also has a toxic effect on the nervous and endocrine systems. It is logical to assume that cats would also suffer the same problems from ammonia toxicity as other species. Indeed, cats (especially kittens) quickly develop signs of ammonia toxicosis when fed inordinately large amounts of ammonium chloride as a urinary acidifier.²⁶

In addition to its effects on animals, ammonia gas poses an identical health risk to people that share the same air space. The American Conference of Governmental and Industrial Hygienists has set the minimum safe level for ammonia gas at 25 ppm, a level also adopted by most other countries.²³ However, it must be remembered that toxicity may be a factor of both levels of ammonia gas and duration of exposure. Chickens exposed to ammonia levels of 20 ppm for

levels of 25 ppm ammonia gas levels below 25 ppm, cats kept in individual or group cages within premises may be exposed to several times this level. People began to complain about ammoniacal odors at 25 ppm. Because cat owners often develop a tolerance to the odor, complaints of ammoniacal odors by visitors should be taken seriously. If there is irritation to the nose or eyes, levels of ammonia gas above 50 ppm are present, which is a dangerous situation.

Ammonia gas required 1 hour of exposure is 4230 ppm. Ammonia gas levels above 50 ppm are dangerous, such as in accidental accidents. Ammonia gas in myriad

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Ammonia gas in myriad

less than 6 weeks showed no effects, while chickens exposed for greater than 6 weeks had lung abnormalities.²⁴ Further, even if the air in the home or cattery has ammonia levels below 25 ppm, cats kept in individual or group cages within premises may be exposed to several times this level. People began to complain about ammoniacal odors at 25 ppm. Because cat owners often develop a tolerance to the odor, complaints of ammoniacal odors by visitors should be taken seriously. If there is irritation to the nose or eyes, levels of ammonia gas above 50 ppm are present, which is a dangerous situation.

The only sure way to eliminate ammonia gas from the environment is to increase ventilation and the frequency of litter box changes. Litter boxes should be well washed to remove all remnants of liquid waste, and periodically disinfected. Remaining waste serves as a bacterial inoculum for the new litter and accelerates the ammonification process. The alternative is to greatly decrease the number of animals.

Animal holding rooms should not be overheated, and the humidity of the air in the cattery should be kept as low as possible. Heat and humidity enhance ammonification. Urine spraying outside the litter box, which can be a big problem in some multiple-cat households, is a source of ammonia gas that is less amenable to litter box cleaning. Urine spraying can be decreased by minimizing social and sexual stress within the cattery (see the chapter on Behavior) and by constructing pens with impervious surfaces that resist urine soaking and that can be more efficiently cleaned. Some newer types of litter material greatly inhibit ammonia gas production. However, such materials are usually expensive. They may also allow for a greater buildup of microbial pathogens, as there is a tendency to change them less often. It may some day be possible to treat litter with certain additives to decrease ammonia production, something that has worked on a limited basis with poultry.⁷

Climate Control

Climate control is essential for cats housed in regions of excessive humidity and cold. The need for auxiliary air conditioning

in a cattery depends on its design and external climate patterns. Cats do best in warmer and less humid conditions.

Cold weather, if it is dry, is of little concern. However, cold weather accompanied by excessive dampness is associated with the greatest amount of disease.

Cats, having evolved in desert climates, can tolerate a wide extreme of temperature. Cats can tolerate temperature ranges from 35 to 100 F and average humidities of 10-70%. Though cats can tolerate a wide range of climates, they need time to adjust to seasonal temperature and humidity variations. Cats naturally begin to store subcutaneous and intraabdominal fat and their coats become much thicker as daylight hours shorten in late summer. It is important, therefore, to design catteries so cats can be given adequate exposure to changes in seasonal lighting and temperature. Cats allowed to acclimate themselves to seasonal temperature changes can survive amazingly well in almost all regions of the world with minimum artificial climate control, provided they also have access to protective bedding and shelter. Boxes or small barrels with small openings can be hung on the walls. The openings should be placed away from prevailing winds.

Though most domestic and purebred cats can be kept in environments varying greatly in temperature and humidity, certain breeds require climate control. For example, short-coated cats, such as Cornish and Devon Rex breeds, do not adapt as well to cold as heavy-coated Persians.

Though the temperature and humidity in open parts of the animal containment units can be allowed to fluctuate greatly, the climate within the enclosed part of the unit should be kept within a narrower range. Temperatures of 50-85 F and humidities of 10-50% are optimal.

Temperatures and humidities within this range can usually be maintained in warmer and dryer climates with passive air conditioning and minimal mechanical equipment. The more time that the external climate is outside of this range, the more elaborate the air conditioning requirements become. To minimize the expense of such artificial climate control, many catteries rely on heavier insulation and more re-

stricted air movement. Unfortunately, catteries cannot be constructed like thermos bottles. Air movement must be maintained as much as possible, even during cold weather.

Given these constraints, how can the temperature be maintained during the coldest part of the year when heating is necessary? Indoor portions of the animal containment units should be well insulated yet allow as much free air to enter and leave as possible. To minimize costs, incoming air need only be heated to 50-60 F if the cats have been allowed to become naturally acclimatized. Supplemental heating can be provided by focal heat sources, such as heat lamps. Plugs and wires should come from the ceiling to prevent the cats' chewing on the wires or urinating on the plugs. Wall heaters can also be placed under perches so that the heat radiates upward and warms the perch from the bottom. Again, heaters should be positioned so they cannot be accidentally wet by the hose or urinated upon.

Focal heating sources allow the animals to seek their own optimum temperatures by getting as close to or far from them as they desire. Focal heating is more healthful than overheating the entire cattery. If air is overheated, there is a tendency for less ventilation and more marked fluctuations in temperatures. Overheating of the air also adds appreciably to the humidity, which in turn adds to the problem of contagion. Overheating, especially if accomplished with fuel oil or coal, can also diminish the oxygen content of the air and bring the danger of toxic accumulations of harmful gases, such as carbon monoxide. To further compensate for lower winter temperatures, it is prudent to reduce the density of numbers of animals within the cattery during winter months. Cat numbers can be decreased during this period by breeding queens mainly in the spring, so that most of the kittens are well past weaning or have been sold by the onset of winter.

Cattery owners in colder climates often believe that outdoor runs are not acceptable. Even in the coldest climates, however, outdoor or feral cats can survive if they are properly adapted and have shelter from cold winds, snow and dampness. Fortunately, such shelter is usually abundant in nature. If outdoor cats are allowed to acclimate

themselves, their coats become quite thick, providing a great deal of protection against the cold. Moreover, even in cold climates, the weather is still reasonably favorable for 7-8 months or more of the year. Basements are a feature of homes in most cold climates and are commonly used for catteries in such areas. If the basements have ground-level windows, as most do, the windows can serve as access doors to above-ground runs built on the side of the house.

Flea Control

Cattery owners are often reluctant to build separate facilities for their cats in warmer and more humid climates where fleas abound. This attitude is hard to understand, as flea control is much more difficult in a home than in a well-designed outdoor cattery. The most effective way to control fleas is to create an environment in which they cannot reproduce. If surfaces are constructed so they do not collect dust and dander, and they can be readily vacuumed, cleaned and hosed down, the life cycle of the flea is interrupted. Such surfaces do not exist in the average human abode.

One innovation in flea control, especially in warm and humid climates, is to build all or part of the cattery on stilts 18-24 inches off the ground (Fig 4). Since fleas cannot jump over this height, access to the building is limited. The floors in such a raised building can be solid, provided that they can be washed down. They can also be covered with sturdy 1/8- to 1/4 inch mesh, with narrow solid walkways between runs. Female fleas dropping off the cats then fall through the wire or are washed out during cleaning. If the ground under the pen is covered by smooth concrete, it can be readily hosed down or sprayed without disturbing the cats above. Adult fleas dropping off the animals lay their eggs at ground level, rather than on the cattery floor above.

A concrete-lined shallow water moat around the cattery, with retractable drawbridge, may prove equally useful in limiting movement of fleas from surrounding yards. After gross litter and excrement are removed, the cattery floors can be hosed out and the drainage allowed to flow into the moat. The moat can also serve a dual role as a fish or aquatic plant pond, if excessive

amounts of toxic materials (nonbotanical insecticides, disinfectants, excrement) are not allowed to enter the pond.

In hot and dry climates, the ground around the cattery should be left bare or planted with vegetation requiring little superficial watering (see section on fleas). Dark-colored gravel placed around the cattery absorbs heat and inhibits flea development. In cold climates, cat runs should be maintained at temperatures of 55 F or lower. These low temperatures are inhibitory to flea development. Surrounding yards can also be periodically sprayed with insecticide to maintain a relatively flea-free zone around the cattery. A high perimeter fence with a 12-inch smooth metal strip at the top (to prevent cats from climbing over the top) placed 5 feet or more back from the cattery also prevents contact between feral or outdoor pet cats and cattery animals. Outdoor animals constitute an important reservoir of fleas. If a cattery maintains a number of pet cats that are allowed to roam freely, flea control is almost impossible. Such cats continually bring fleas back with them. Though these pet cats may have no direct access to the cattery cats, the fleas have no such limitations.

Lighting

Lighting is also an important consideration. Like heating and cooling, it can be done passively through well-designed windows, screened enclosures and skylights, or mechanically with light fixtures. Sunlight, if unimpeded by glass, inhibits growth of pathogens that accumulate in the environment. Sunlight filtered through glass windows also generates heat by the so-called "greenhouse effect."

In addition to its heating and antimicrobial effects, lighting plays an important role in cat breeding. Cats are seasonally polyestrous and are brought into heat in spring and fall by relative changes in the hours of daylight and darkness. Cats can be artificially brought into season by manipulating the hours of light and dark through artificial lighting.

If units are kept artificially lighted for 12 hours or more each day throughout the year, the cats show no seasonality of estrus, but come into heat as their litters are born

and weaned. The intensity of lighting within a cattery need not be high. Light intensity equal to that of a well-lit room is usually sufficient.

Ancillary Functions

In addition to the basic housing units, good catteries often provide space for other functions. A room to store cleaning equipment is necessary, as well as a room to shelter food and litter from water and vermin. A treatment and grooming room is also a nice touch. It is essential to have excellent lighting in the treatment room to better observe eye, dental or other problems. The treatment room can contain several individual cages for care of sick animals, the only small individual cages that should be allowed in the cattery. These cages can be obtained from veterinary supply houses and should have impermeable and easily disinfected surfaces. Many cat breeders like to have a "play room" where the owner and guests can commingle temporarily with their animals. This might also be a good place to display trophies, ribbons, pictures and other mementoes. With such auxiliary space, a basic cattery may appear like the one shown in Figure 1C. However, some breeders believe such an arrangement exposes kittens to potentially pathogenic organisms. These breeders use a display cage instead.

At this point, many potential cattery owners might be taken aback by the apparent complexity and cost of a well-designed cattery facility. With time, ingenuity and donated labor, however, home-built cattery facilities can be constructed relatively inexpensively (Fig 5). Readers interested in cattery facilities designed and built by ordinary cattery owners should also refer to a number of excellent articles that have appeared in lay magazines over the last decade.^{1,5-7,10,13,15-18,21}

Cattery Design in Great Britain

There are no specific guidelines for cattery design and management in Great Britain; however, general guidelines are provided in the Animal Boarding Establishment Act of 1963. Though these guidelines are for animal boarding facilities and not technically for feline breeding establish-

Figure 4A. (top) Floor plan of a basic animal containment unit in a cattery, specifically designed to aid flea control. The cattery was designed and owned by Jim Rambo of Rambo Cattery, Atlanta, Georgia. The basic animal containment unit in this plan consists of 3 sections. The inner section is part of the basement of the home, the central unit is a screened run covered by the porch, and the outer unit is a completely open run with wire walls and ceiling. The outer run has a slatted wood floor elevated several feet over a concrete floor that is part of the home's foundation. B. (bottom) Side view showing the relative position of the basic animal containment units to the existing home, basement, foundation and porch.

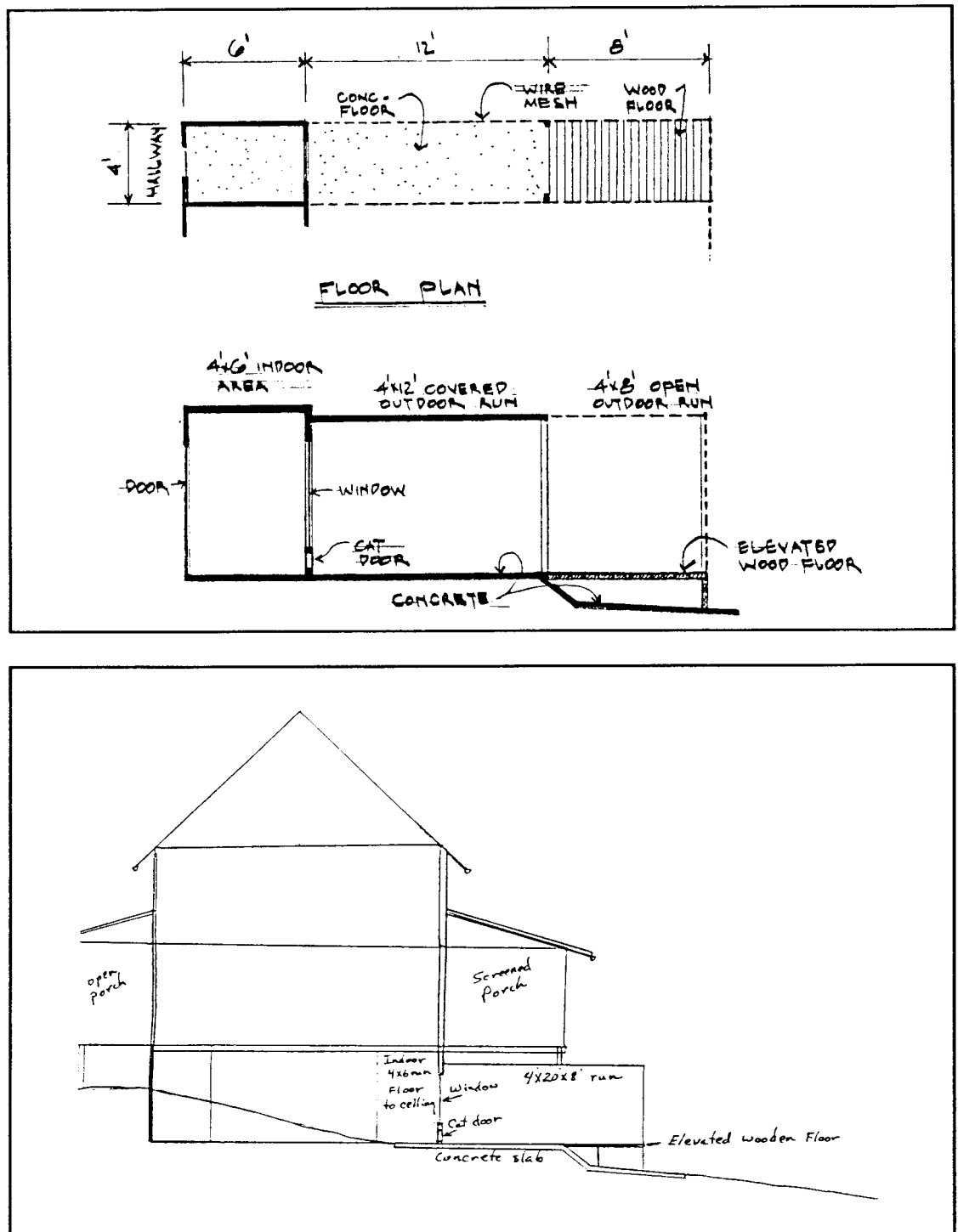
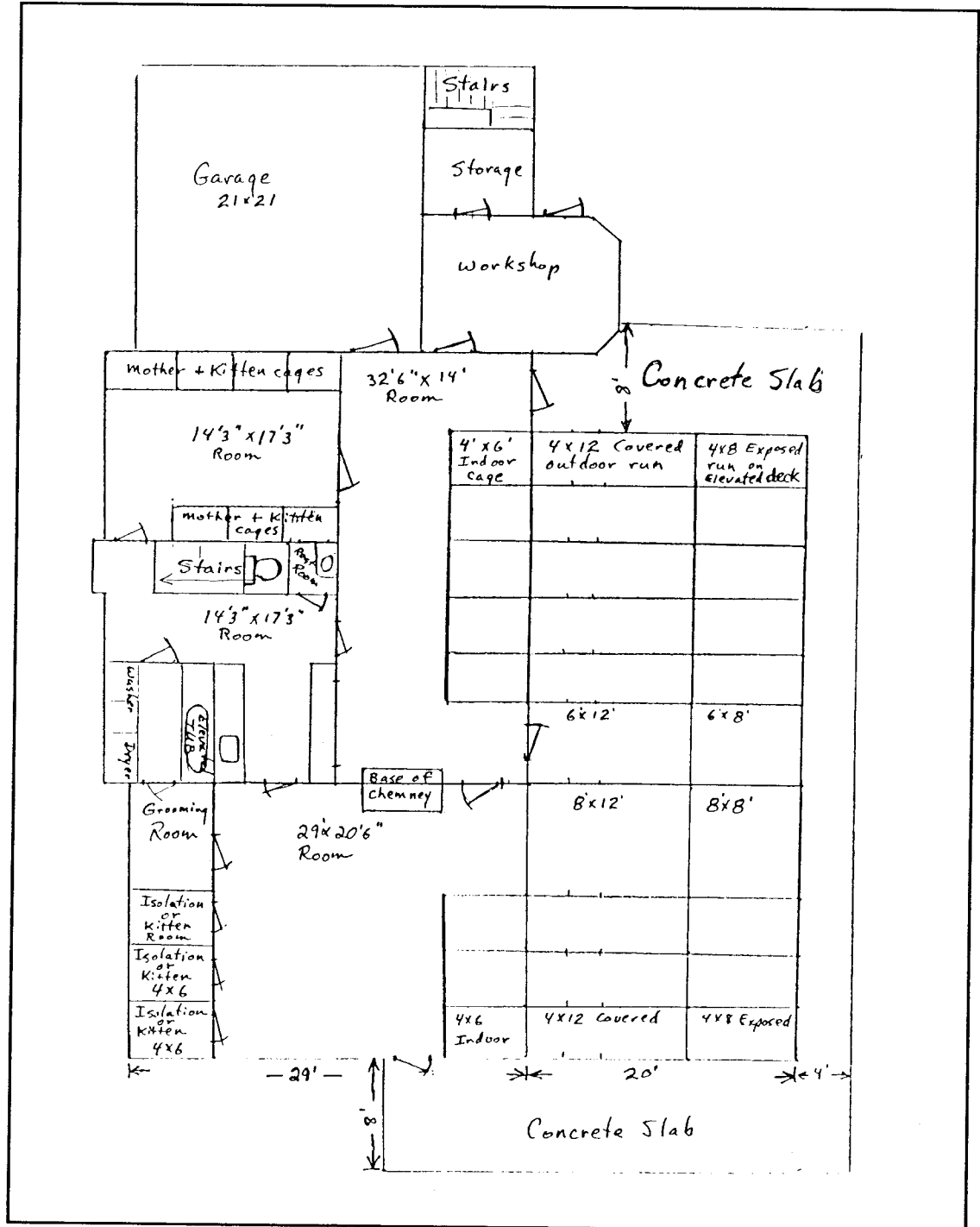


Figure 4C. Floor plan showing the relative position of the basic animal containment units to each other and to ancillary rooms. The basic animal containment units are constructed to allow the floors to be swept and washed down from the inside toward the outside. Weather permitting, cats spend most of their time in the outer open run. During the heat of the day or during inclement but not severe weather, cats spend most of their time in the central run. Adult fleas are swept or hosed into the outer run, or drop directly from the cats through the slatted floors. Since fleas cannot jump the distance from the concrete to the slattedwood floor, they cannot reenter the cattery. The lower concrete floor can be easily cleaned and sprayed with insecticide, and is not a good environment for flea eggs to hatch and larval stages to develop.



ments, the guidelines are often applied to both situations.

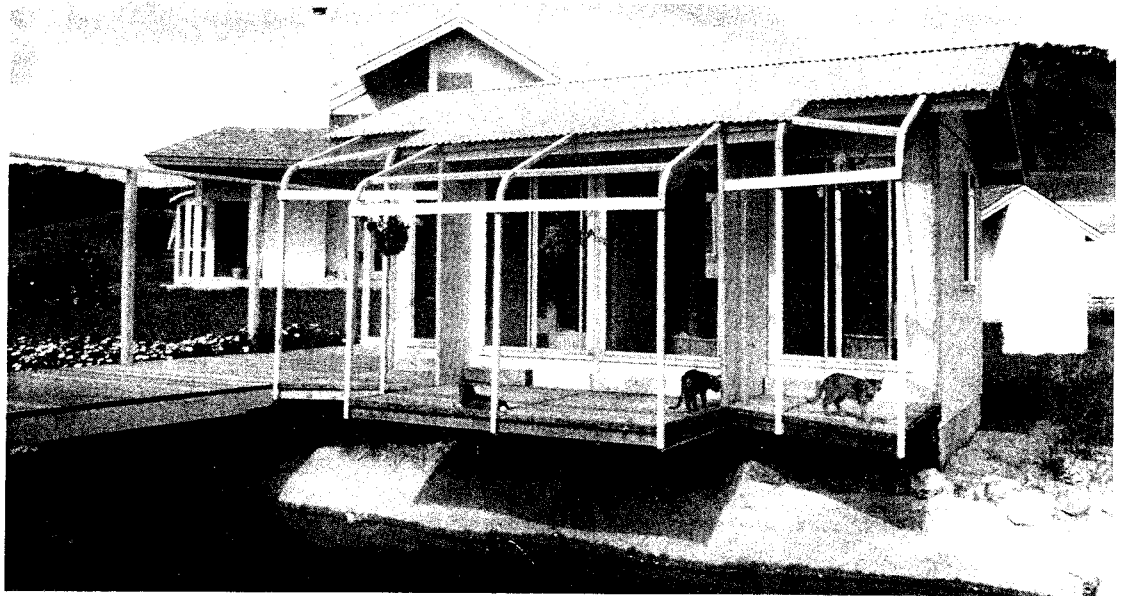
"Under the Animal Boarding Establishment Act of 1963, no person should keep a boarding establishment for animals except under a license granted by the Local Authority. In determining whether to grant a license, the Local Authority must have regard to the need for ensuring: a) that all animals will at all times be kept in accommodations suitable as respects construction, size of quarters, number of occupants, exercising facilities, temperatures, lighting, ventilation and cleanliness; b) that animals will be adequately supplied with suitable food, drink and bedding material and, so far as necessary, visited at suitable intervals; c) that all reasonable precautions will be taken to prevent and control the spread among animals of infectious diseases, including the provision of adequate isolation facilities; d) that appropriate steps will be taken for the protection of the animals in case of fire or other emergency; and e) that a register be kept containing the description of any animal received into the establishment, date of arrival and departure, and name and address of the owners. Such register is to be

available for inspection at all times by an officer of the Local Authority, veterinary surgeon or veterinary practitioner authorized under Section 2(1) of this Act and without prejudice to their right to withhold a license on other grounds."

These general guidelines are vague because such terms as suitable, adequate, reasonable, appropriate, as far as necessary, intervals, temperatures, lighting, ventilation and cleanliness are not strictly defined and are therefore subject to a great range of interpretations, depending on the "Local Authority." Nevertheless, these guidelines provide a reasonable basis for proper animal facilities and management.

Facilities that meet the above requirements are not described by the British government, but guidelines have been made available in the form of a pamphlet by the Feline Advisory Bureau (*Boarding Cattery Construction and Management*, 1 Church Close, Orcheston, Nr Salisbury, Wilts SP3 4RP, United Kingdom), a private registered charity organization, in consultation with the British Small Animal Veterinary Association. While the Bureau's recommendations are not legally binding, they are widely ad-

Figure 5. Containment units, designed by Joan and Alfred Wastlhuber. The cattery is built on a small island surrounded by a moat. Wood decking is suspended over concrete and water.

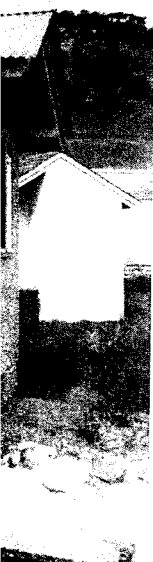


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vocated by governmental and professional organizations. Though the pamphlet describes a boarding facility, the principles are frequently applied to purebred catteries as well. The facilities are remarkably similar to those previously described, again indicating the universality of thought on good cattery design and management.

The authors of this pamphlet (Sophie Hamilton-Moore and Caryl Cruickshank) believe that a well-run, efficient boarding cattery should accommodate no more than 45-50 cats. Their design calls for construction of a single outdoor (preferred) or indoor facility made up of no more than 25 individual animal-holding units, called "chalets." The figure of 25 is about the number of units that 2 people can care for properly in a day, with each chalet housing 1-4 cats, depending on its size.

The size of each chalet is predicated on its use. A 2-room chalet, with each room having a dimension of 44 1/4 inches long, 44 1/4 inches wide and 71 inches high is suitable for 1 or 2 small to regular-sized cats from the same household (remembering that this cattery is designed as a boarding facility for household pets). A chalet with each room measuring 48 inches long, 44 1/4 inches wide and 71 inches high is sufficient for 1 or 2 large cats from the same household. A chalet with each room measuring 60 inches long, 44 1/4 inches wide and 71 inches high is sufficient to hold 3 or 4 cats from the same household. The number of small, middle-sized or large chalets incorporated into the boarding facility depends on the proportion of the clientele that have single, double or multiple cats in their homes.

Each chalet consists of an indoor or closed section with solid walls and roof, and a single window and access door, and a contiguous open section with wire sides and translucent plastic roof (Figs 6A, B). This basic 2-room chalet is very similar to the basic animal containment unit described earlier. Individual units are positioned on a sturdy sloping concrete floor with at least 2 feet of space between each of them. The units are arranged in either a "C" or "L" shape (for outdoor catteries), with the open-wired portions of the chalets facing south for maximum effect (Fig 6C). For indoor catteries, the units are positioned in a manner identical to that described earlier in Fig-

ure 1C and are enclosed under a single roof. To prevent animal escape or entrance of unwanted animals, a 4-foot-wide safety passage is constructed around the outside perimeter of the entire complex (Figs 6A-C).

Cat fanciers desiring detailed construction information on this type of cattery should write to the Feline Advisory Board of Great Britain for their *Boarding Cattery Construction and Management* book. In addition to construction details, the pamphlet contains information on cattery management practices.

Cattery Management

The main goal of all cattery managers is to create a healthy environment, in which animals are stressed as little as possible, properly protected from the elements, and allowed to produce large litters of robust kittens that are free from disease.

The most essential step toward this goal is to have properly designed facilities. The second step is to manage those facilities in a proper manner. The third is to breed only genetically sound animals, regardless of what prevailing show standards might suggest. These 3 things require careful appraisal of the goals of the cattery and implementation of rules to see that those goals are met.

Management of a cattery can consume a great deal of time. It is important, therefore, to design and manage the cattery to lessen the time spent in management. Cattery management involves a variety of areas, including: cattery goals and rules; cleaning and litter disposal; disinfection; feeding and nutrition; breeding and production of kittens; medical care; (preventive and therapeutic); weaning kittens; litterbox training; teaching proper nail scratching; showing of kittens; preventing disease at shows; procurement and sale of animals; showing of adult cats; and purchase, leasing, co-ownership and sale of cats.

Population Control

Though the basic rules of cattery management vary somewhat according to the goals of the cattery, a few rules should be kept more or less sacred. The first and foremost rule is, "Never keep more cats than the facility can handle or the manager can

Figure 6A. Schematic drawing of small and large chalets.³⁵ Each chalet consists of an enclosed section and a contiguous open wire run. Each unit is positioned at least 2 feet apart to prevent aerosol contamination between runs. The single window in the enclosed section of the chalet opens into the wire run. The base of the chalets is raised by narrow plastic or hardwood blocks, creating a narrow space for the hosing off of waste materials and preventing water damage to the wood baseboards. Each chalet is joined by a perimeter or safety enclosure. Access to each chalet is through a door opening into the safety passageway. (Adapted from *Boarding Cattery Construction and Management*, by S. Hamilton-Moore and C. Cruickshank, courtesy of the authors and the Feline Advisory Bureau)

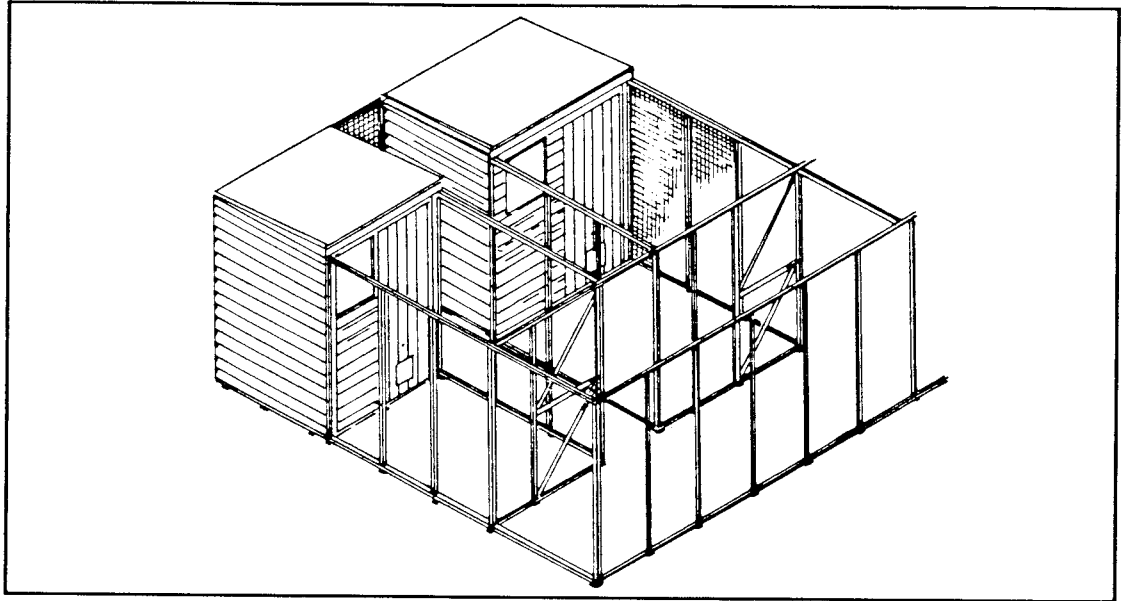
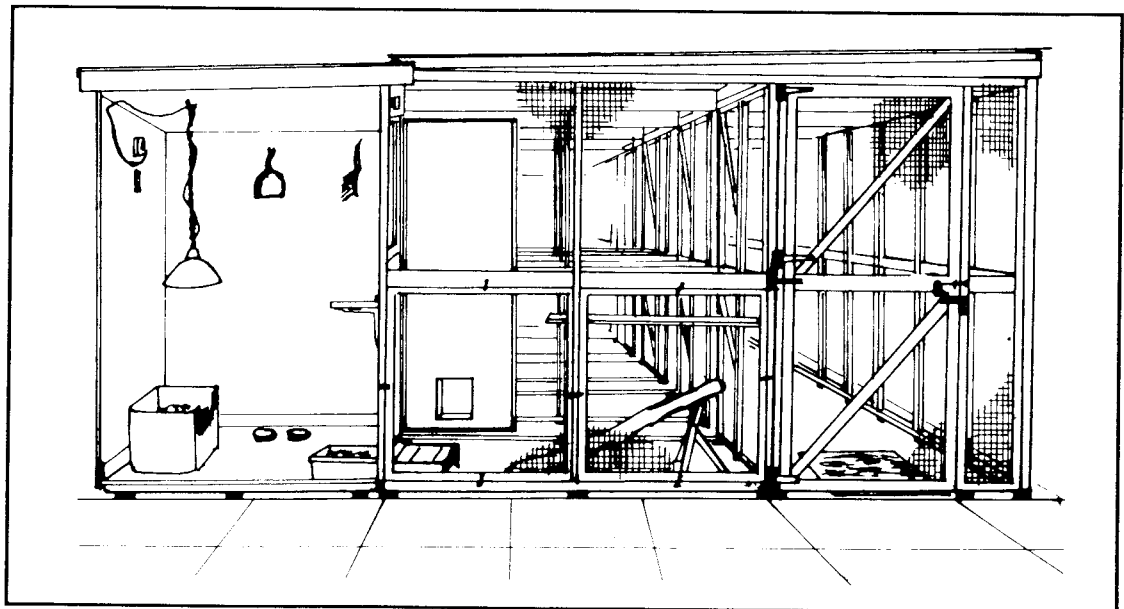
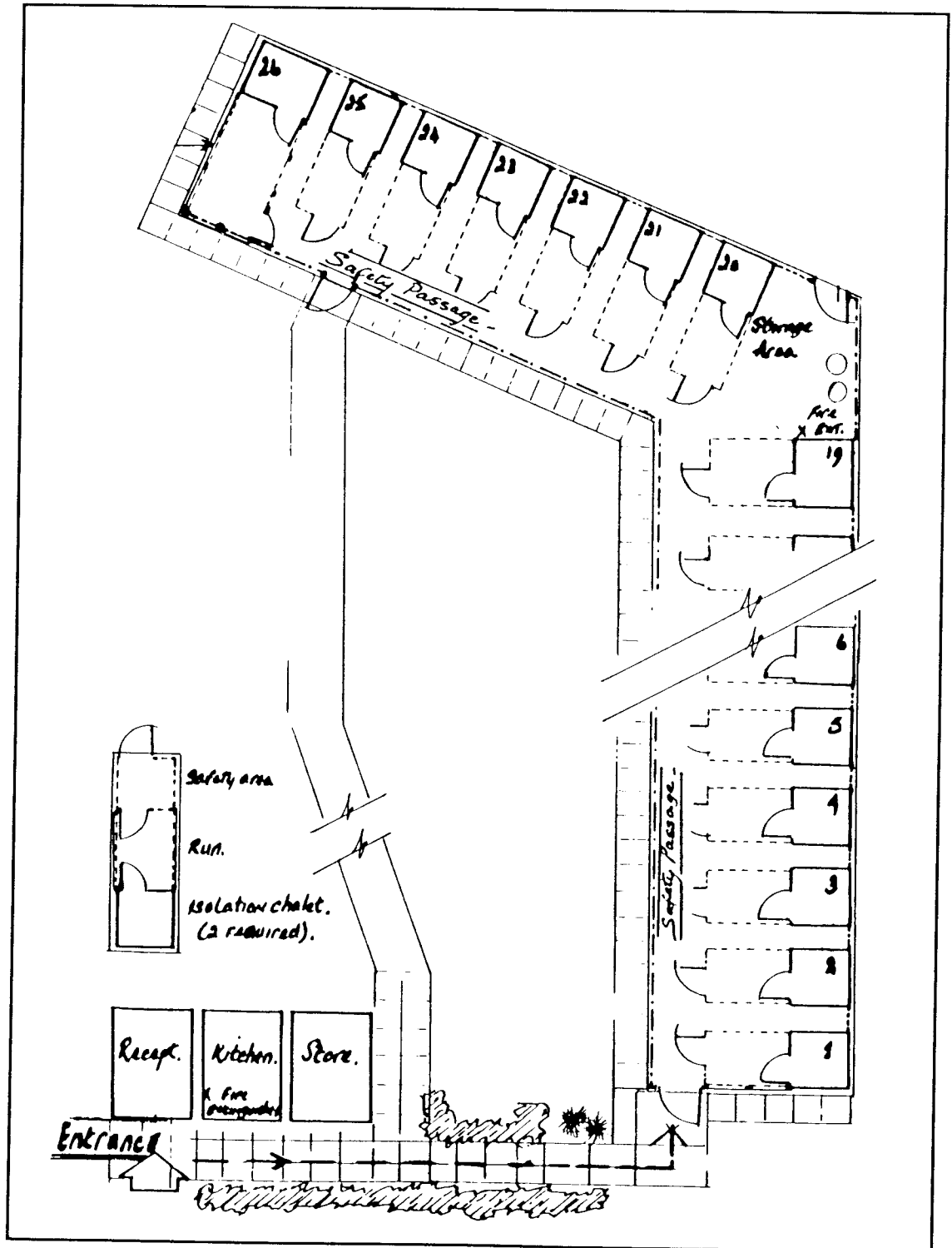


Figure 6B. An endwise cutaway view of a bank of chalets.³⁵ This view provides more details of the fixtures to be found within the enclosed section of each chalet. Note the heat lamp suspended from the ceiling; plugs and wires are not accessible to the animals. Also note the position of the perch, which is just under the window. The solid door has a smaller access door, which allows cats to move back and forth from one section to the other without opening the main door. The roof of the enclosed section is solid, while the roof of the open run and safety enclosure is made of semi-translucent plastic. This allows the runs to be illuminated and heated by the sun, yet protects against overexposure. (Adapted from *Boarding Cattery Construction and Management*, by S. Hamilton-Moore and C. Cruickshank, courtesy of the authors and the Feline Advisory Bureau)

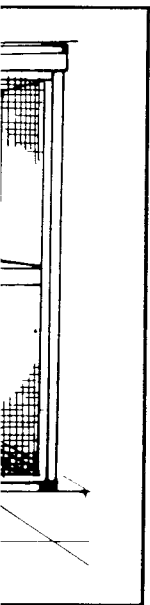


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Figure 6C. Schematic drawing of the layout of an L-shaped outdoor boarding cattery containing 26 chalets and several unattached rooms for ancillary functions.³⁵ The building is positioned so that the open runs have maximum exposure to the sun. Note the relationship of the safety passageway to the chalets. (Adapted from *Boarding Cattery Construction and Management*, by S. Hamilton-Moore and C. Cruickshank, courtesy of the authors and the Feline Advisory Bureau)



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properly care for, given the time delegated to the task." It is also important to allow for vacation or business time away from the cattery. The larger or more unmanageable the cattery, the more difficult to find good temporary help. Problems with disease and ill health increase dramatically as the numbers of breeding cats increase. Most cattery managers realize that the numbers of animals should be limited, but eventually compromise themselves by gradually accumulating more and more cats. The second rule is to maintain a closed cattery population. The third rule is to keep the numbers of young animals and kittens as low as possible. The fourth rule is to segregate litters of kittens from each other until they are at least 12-16 weeks of age.

Control of Cattery Population: Accumulation of too many cats is usually not planned. Cat breeders are often highly competitive, especially the newer breeders who have never experienced the long-term hardships of cattery management. In their quest for winning show cats, caution is often thrown to the wind. For instance, it is not usually prudent to breed cats with poor conformational traits. Too often, however, pedigrees are viewed as more important than physical attributes. The premise is that any relative of a winning cat, no matter how poor a specimen, has the genetic potential to produce an animal with winning characteristics. Marginal or unacceptable cats, if they have good pedigrees, often are kept for this reason.

There is also the tendency to breed poorly conformed queens to stud cats with winning conformation, especially if the queen is from the same winning bloodline. Unfortunately, this encourages inbreeding and retention of animals that would better be neutered and sold as pets. Doubly unfortunate, breeding marginal queens to show-winning toms occasionally pays off with show-winning kittens. This only encourages people to keep more and more queens, a decision that is more often based on gambling intuition and hunches than sound reasoning.

Another factor leading to accumulation of too many cats is the practice of keeping kittens until they are mature in the hopes that they will eventually develop winning form. While this may occur with some indi-

viduals, it often does not pay off. Cattery owners confronted with sexually mature cats with characteristics that did not develop as anticipated sometimes keep the animals rather than sell them. The fact that such cats are often more sound in pedigree than in reality ensures their maintenance in the cattery.

There is also the problem of kittens returned by the new owner for myriad reasons. If these cats are returned because of bad habits (poor litter box training, poor temperament), illness or for other reasons, the cattery owner is not anxious to place them in another home where the same complaints might arise. They also do not want to have them destroyed, and as a result these animals accumulate in the breeder's home as neutered pets.

Accumulation of too many cats also occurs when several different breeds or bloodlines within a breed are kept in the cattery. Successful cattery owners maintain the cats at healthful numbers. Good breeders usually concentrate on one breed of cats and a minimum of bloodlines. They also scrupulously cull poorer animals and carefully plan matings to increase the odds of producing good show-winning kittens.

The problem of too many cats in an environment is not unique to breeding catteries. Overcrowding also exists in many pounds, shelters and multiple-cat households. Extremely large households of cats exist in many communities, often comprising 20-60 or more animals. The owner of such a household is usually a middle-aged or older single woman who has dedicated her life to sheltering unwanted cats. The numbers of animals in such households increases rapidly to 20-60 or so animals, at which point such factors as disease, limited feed supply, and the owner's inability to provide even rudimentary care tend to hold the numbers steady. Cat numbers rise because of the tendency of feral or unwanted cats to leave areas of poor food supply and migrate to areas where food is more available.²⁰ It is an unfortunate fact that the more homeless cats that are fed in an area, the more homeless cats will move into that area.

Overcrowding is a serious problem for a number of reasons, but has a particular effect on the incidence of infectious diseases.

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Overcrowding imposes tremendous stress on animals that evolved as solitary and territorial creatures. Stress in cat populations not only causes a higher frequency of aberrant social behavior (fighting, urine spraying, defecation outside of litter pans), but also lowers resistance to disease.

Chronic stress affects the incidence of disease in 2 important ways. It makes cats more susceptible to infection and it increases the amount of pathogens shed into the environment. Depression of established immunity activates latent infections, especially herpesvirus, leading to virus shedding from the nasal passages. If the reactivation is particularly severe, clinical signs may recur. Active infections are also affected, leading to a higher than normal rate of microorganism shedding. Examples of these types of agents include calicivirus, chlamydia and ringworm. Overcrowding also increases the number of infected (asymptomatic or diseased) individuals in the area and provides a greater reservoir of susceptible animals. Because more animals are crowded into the same area, the chances for intimate contact and potential transmission of infectious agents increase.

Overcrowding can also influence nutrition. Though malnutrition is more apt to be seen in multiple-cat households than catteries or shelters, it can occur in any large animal population. If the owner has a limited income, which is commonly the case with individuals that keep large numbers of homeless cats, it becomes economically impossible to provide adequate nutrition to every animal. When there is not enough food to go around, pregnant queens, lactating queens, kittens and chronically ill animals are most vulnerable. They are often at the lower end of the social order, but have the greatest nutritional needs. Malnutrition has a profound effect on susceptibility to disease.¹⁹ Malnutrition is particularly devastating in kittens, which not only have the highest nutritional requirements but also are most vulnerable to infection.

Maintaining a Closed Cattery: The second rule for good cattery management is to maintain cat populations as closed as possible. Each population of animals has its own resident microbial flora, said to be enzootic or resident. Cats within such environments have a high state of resistance to the resi-

dent microbial flora, and this immunity is passed on to their kittens genetically (genetic resistance) and in the colostrum and milk (maternal immunity). New cats introduced into the environment bring with them their own flora.

If these new microbes are substantially different from the resident flora, infection and disease occur in resident animals. This infection spreads rapidly because of the uniform susceptibility of the population. Infections of this type are referred to as epizootics. Not only are resident cats susceptible to infection from newly introduced animals, but the new cat is susceptible to the unique flora of the resident cats.

Introduction of new animals can also have profound social effects on the entire population, transiently increasing the level of cattery stress. Cats have well-established social orders of dominance that are disturbed when new animals are introduced. This stress acts like other stresses in increasing the animals' susceptibility to infection and the level of pathogenic organisms shed into the environment. Given the problems with introducing new animals into the household, it is wise to minimize this.

Successful cattery managers recognize the problems with introducing new animals and limit the numbers of animals introduced into the cattery.

The number of animals that enter the cattery is best limited by having a well-conceived breeding program, rather than one that is entirely haphazard. Many cattery owners, especially newer ones, cannot resist the temptation to bring in new animals. This is done because of a desire to be competitive. The more cats brought in, the more bloodlines represented, the more breeds that are kept, and the greater the perceived chance of breeding show-winning kittens.

Control of the Kitten Population: The third rule of cattery management is to limit as much as possible the numbers of kittens reared in the cattery. Kittens are the most susceptible to disease, and are the major source of infection for other kittens. Adult cats, though they often carry many pathogenic microorganisms, rarely shed them in large numbers. The magnitude of environmental contamination is greatly magnified by infection of kittens. These infected kit-

tens shed many times more organisms than adult carriers.

Segregation of Litters: A fourth rule is to segregate each litter until the kittens are at least 12 weeks of age. Following weaning, the mother should be removed and the litter kept together in separate quarters. The greatest mistake made by cattery owners is to put all of the kittens from all litters together in a common area following weaning. Because various litters are seldom born at the same time, newly weaned kittens often are mixed with kittens of a wide age range.

Adult carrier cats (usually cats less than 2-4 years of age) are the source of many infectious agents, but infection is usually amplified in kittens. For instance, most kittens have maternal immunity to many organisms enzootic to the cattery. This maternal immunity can be overcome at a young age (6-10 weeks of age) if exposure is great enough. If exposure is mild, however, they may not become infected until their maternal immunity has waned (12-16 weeks of age). The first litter born is not exposed to other kittens, but rather to the adult cats. Because exposure is minimal, maternal immunity may not be overcome until the kittens are 12 weeks of age or older. The resultant disease is likely to be mild because of the small exposure dose and the age resistance. Though they do not show signs of illness, the older kittens may nonetheless shed far more of the pathogenic organisms than the adults that started the cycle.

If a second litter is then placed in the same quarters, these kittens are exposed much more severely than the first litter. They will likely show clinical signs of illness and shed even more of the pathogenic microbes than the previous litter. A third litter will be exposed to even greater numbers of organisms than the second, etc. If the exposure is severe enough, the maternal immunity may be overcome at a progressively younger age (6-10 weeks of age). Because younger kittens are much less immunocompetent, they become much sicker and may die.

To break this cycle, kittens should not be directly exposed to older kittens until they are at an age when their resistance is well developed, usually at about 12 weeks of age.

It might be inferred from this discussion that it is acceptable to put kittens of the same age together. This is also unwise because each litter of kittens and each individual in the litter develop differing levels of maternal immunity. One litter of kittens may still have considerable maternal immunity at 10 weeks of age, while another can be totally susceptible by 6 weeks of age.

Sanitation

Cleanliness is an absolute requirement for good health in catteries. Secretions, excretions and exfoliations must be removed from the environment to minimize the levels of potentially pathogenic organisms where the animals are kept. The term "potentially pathogenic" is used rather strictly. Many pathogenic organisms do not cause disease unless they are present in certain minimum levels. For instance, pathogenic doses of enteric bacteria may not be achieved until there are several million organisms per square foot of cattery surface. Levels below this are insufficient to cause problems. The object of cleanliness is to keep the levels of potentially pathogenic organisms below this threshold and not necessarily to eliminate them altogether. Complete elimination of organisms from the environment is practically impossible and potentially hazardous.

Note that an environment that is very neat and well organized can still harbor pathogenic accumulations of microorganisms, while less neat areas may be devoid of such accumulations. Organisms tend to reside in permeable surfaces, litter boxes, food, water, dishes, crevices, air conditioning ducts and other such areas. The objectives of good sanitation are to reduce the amount of microbes that enter the cattery and to limit the accumulation of potentially pathogenic microorganisms.

The amount of secretions, excretions and exfoliations that enter the environment can be limited by keeping the numbers and density of animals as low as possible. Removal of waste material from the environment is facilitated by frequent removal of litter, sweeping and vacuuming to remove gross and microscopic debris, and judicious use of hot soap and water to loosen adherent debris and wash it away.

Litter should be changed every 1-2 days to prevent the accumulation of microorganisms and spread of contamination from pans to floors, perches, food dishes and other pens. Cattery owners often use commercial types of litter that decrease odor and absorb a great amount of moisture. This type of litter, though most effective, has several limitations. First, the fact that it absorbs odor and moisture and is expensive means that it is less likely to be changed every day or so. Also, the absorptive particles can accumulate large numbers of microorganisms that can be readily tracked around the environment. Finally, odor-retaining litter tends to mask ammoniacal odors that indicate urine accumulation. Dust-free pine shavings, peat moss, redwood mulch, diatomaceous earth, vermiculite and other such material are inexpensive alternatives to clay-type litter. Many of these have the advantage of being biodegradable and useful for mulching. Their main disadvantage is that they can be easily tracked around the pens.

Litter pans should be as deep as possible to prevent spread of litter around the room. Litter pans with covers have been developed for such situations, though some cats avoid such covered boxes. Special covered litter pans are also available for cats that spray urine inside of the pan (Fig 7). Instead of the top's fitting over the bottom, the top fits inside the bottom. Urine then runs into the pan and not down the sides and to the outside. Litter pans should also not be overly filled. Less litter and more frequent changes are preferable to more litter and less frequent changes.

Urine spraying by male and female cats can be a major source of odor and contamination within a cattery or multiple-cat household. Spraying is defined as urination not in the litter box. It is usually directed at walls, windows and objects around the home. Spraying is usually brought about by psychological maladjustments (see chapter on behavior). Spraying by queens is often associated with estrus. It may also be caused by such stresses as overcrowding or sudden changes in their normal routine. Spraying in toms is particularly irritating, due mainly to the greater odor of tomcat urine. Toms begin spraying for various reasons. Toms housed in runs in view of

queens or other toms are often more prone to this behavior than toms that are visually isolated. It is important to take this into account when designing the cattery and assigning space. However, toms of some breeds, such as Persians, Manx and Siamese, may be content when kept in isolation but tend to become "hyper" when placed in view of other toms at shows.

Urine spraying by both toms and queens in catteries can be minimized by proper construction of the cattery. Queens should not be overcrowded and toms should not be kept in runs with a view of other cats. That is not to say that toms and queens need to be provided with their own private quarters. Many toms can be kept together without many problems with spraying or fighting, especially if they are raised with each other. The same is true for queens.

Owners may find that grouping certain cats together results in continual social problems. If 2 cats in the same run cannot establish a dominant-submissive "pecking order," the result may be constant tension among the entire group of animals. Cattery owners are usually knowledgeable and observant enough to control the problem before it gets out of hand. No matter how much effort is made in designing a cattery, some spraying is bound to occur. If the cattery is well designed, however, the urine is easily cleaned up. Cleaning sprayed urine and eliminating urine odors are virtually impossible if cats are kept in homes. This is yet another reason to provide the cats with their own quarters.

Defecation out of the litter box is more of a response to overcrowding and social stress than to sexual factors. If the litter boxes become too contaminated with excrement, there is more of a tendency to defecate on the floor. This situation is worsened by spilling of litter outside the box. Cats are more apt to defecate on the floors when some free litter is scattered about than if the floors are relatively litter free. Some breeds and some bloodlines within breeds may have more problems with improper litter box training than others. This suggests that genetics may also play a role in this type of behavior.

Cattery floors and perches should be cleaned daily if possible. The frequency of

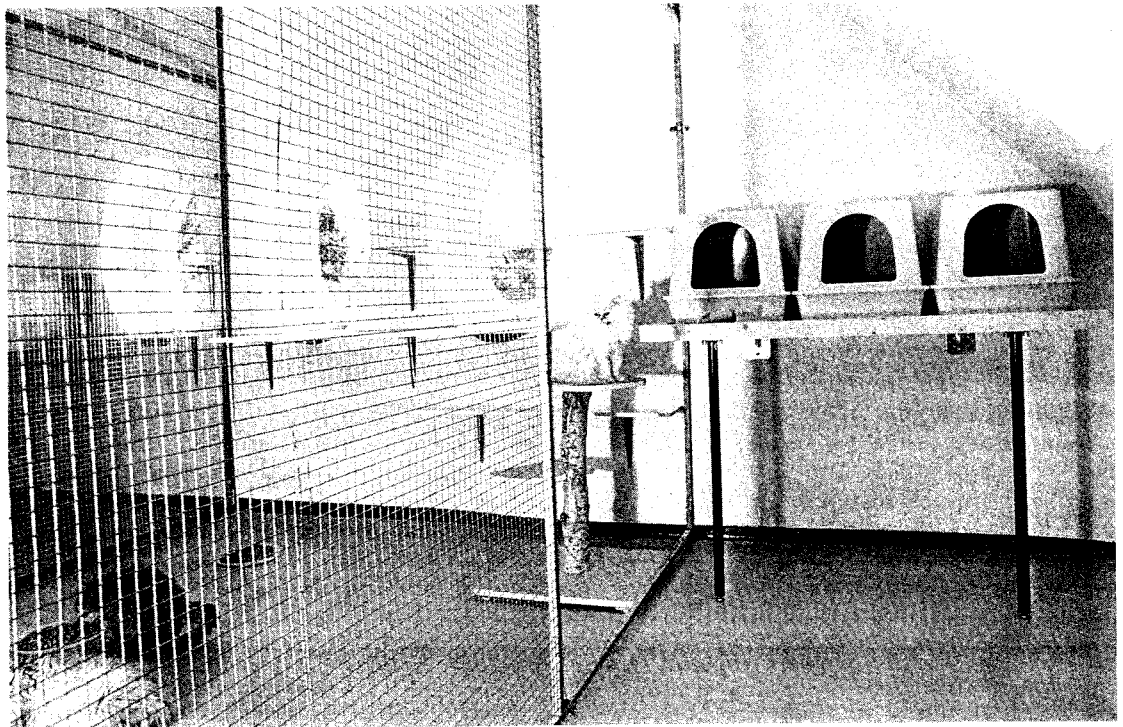
cleaning depends on the size of the facility and number of animals. Every few days, depending on the density of animals, the cattery walls, perches and floors should be washed with hot water and a dilute mild soap solution. This can only be accomplished if the runs are impermeable to water and adequate drainage is provided. Mopping is much less efficient than hosing, though it is still preferable to vacuuming and sweeping only. Impermeable surfaces also prevent accumulation of microscopic debris in porous surfaces.

Cleaning of well-constructed facilities can be relatively simple and rapid (Fig 7). Litter pans are usually emptied into a waste container and placed outside of the unit. Food and water pans can then be placed on the perches. A garage or shop-type vacuum is used to clean any loose litter, excreta and hair within the unit. The cats usually move to higher perches to watch the operation, so

there is usually no need to move the animals to different quarters during cleaning. Once or twice weekly the floors and walls should be hosed down with a hot, dilute, low-sudsing, soap and water solution applied with a high-pressure nozzle. High-pressure cleaning apparatuses used to wash cars are useful for this. The floors and walls can usually be rubbed with a rubber squeegee to remove puddled water. If gutters and drains are not part of the design, a shop vacuum with a noncorrosive plastic waste container can also be used for this purpose.

After the unit is cleaned, litter pans are hosed out to remove adherent material and refilled with clean litter. Washing down the unit with dilute soap and water is crucial for cattery health, especially if relatively large numbers of animals are kept in cramped quarters. Frequent removal of dirty litter and cleaning of floors, walls and

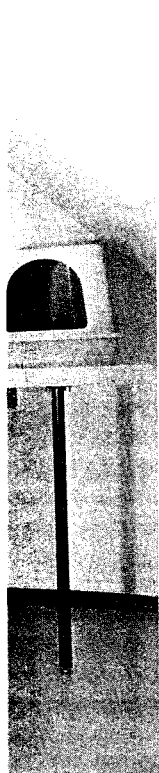
Figure 7. The litter boxes in this cattery are placed on tables to facilitate cleaning. Note that the top cover of the litter boxes fits inside the litter pan, so that any urine sprayed inside the box runs down the sides and back into the pan. (Courtesy of Elke and Norbert Deutschmann, Essen, West Germany)



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perches prevent accumulation of microorga-
nisms and parasites.

If the surfaces are permeable to excreta
and water, cleaning is not nearly as effec-
tive. One of the greatest disadvantages of
using human homes for catteries is that it is
virtually impossible to keep them properly
clean. Vacuuming may give the appearance
of cleanliness, but the myriad pores in
floors, carpets and wood cages provide innum-
erable places for accumulation of micro-
organisms.

Disinfection

Disinfection is employed when sanitation
measures have failed. It is, therefore, not a
substitute for proper cattery design or man-
agement, but rather an attempt to remedy
poor cattery practices. If not coupled with
sound management practices, disinfection
has minimal impact on cattery disease prob-
lems, can be a waste of time and money,
and may be potentially hazardous to the
health of animals.

The principles of disinfection have been
discussed elsewhere.⁹ The term "disinfect"
usually applies to destruction of pathogenic
microorganisms by chemical or physical
means. Disinfection is applied only to inani-
mate objects; one does not "disinfect" a cat,
but rather a pen, floor or litter pan.

Disinfection is not synonymous with ster-
ilization, though such an assumption is
often made. Disinfection usually reduces
rather than eliminates (sterilization) micro-
organisms from the environment.

Various factors determine the effective-
ness of disinfection. The pathogenic mi-
crobes in the environment vary greatly in
their susceptibility to disinfectants in gen-
eral and to different disinfectants in partic-
ular. Generally speaking, viruses are much
more susceptible to disinfectants than bac-
teria. Enveloped viruses are more suscepti-
ble to disinfectants than nonenveloped vi-
ruses, and RNA viruses more susceptible
than DNA viruses. Fungi are more difficult
to destroy by disinfection than other types
of microbes. The spore forms of bacteria
and fungi are the most resistant of all to
disinfectants. The concentration of disinfec-
tant needed to destroy microbes also varies
greatly, depending on the microbe and the
disinfectant. If the microbe is hidden in or-

ganic matter, such as excretions, secretions
or exfoliations, it is protected from the ef-
fects of the disinfectant. This is why it is es-
sential to precede all disinfection with thor-
ough vacuuming, followed by washing with
soap and water to remove as much gross
material as possible. Care must be taken,
however, to remove as much of the soap re-
sidue as possible, as this may inhibit the ef-
fect of some types of disinfectant. Special
solutions are available for use before appli-
cation of disinfectant. They are less likely to
interfere with the disinfectants.

Heat, especially if applied in the form of
steam, is the most potent disinfectant.
Steam applied under pressure requires spe-
cial equipment, however, and surfaces must
be resistant to such treatment.

Non-ionizing radiation, usually gener-
ated by ultraviolet lamps, is another form of
disinfection. The ionizing radiation in sun-
light also has a similar disinfectant prop-
erty. Though ultraviolet lamps are popular
among cattery owners, there is no evidence
that they have a significant disinfectant ef-
fect. Radiation produced by these units de-
creases with the square of the distance from
the source (the amount of radiation 4 inches
from the lamp is only one-fourth as great as
that at 2 inches, and the amount at 8 inches
is only one-sixteenth). Microbes must be
brought into close proximity to the lamps
before they are killed. This requires proper
positioning of the units as well as proper air
flow patterns. Even then, the low power of
most units, coupled with the short time that
microbes are exposed directly to the radia-
tion, provides only minimal disinfection.

Chemical disinfectants are the mainstay
of disinfection in most catteries. For rea-
sons of practicality, effectiveness and lack
of toxicity, only a few are routinely recom-
mended for catteries. The most popular are
the cationic surfactants or quaternary am-
monium compounds. They are more effec-
tive when used in warm than cold water but
are inactivated by soap residues, hard water
and large amounts of organic matter. Qua-
ternary ammonium compounds are effec-
tive against bacteria, enveloped viruses and
fungi, but not bacterial spores. Household
bleach, containing about 5.25% sodium
hypochlorite in water, is a commonly used
disinfectant. Household bleach, when di-
luted 1:32 in water, is effective against

many viruses, bacteria and fungi. Chlorine solutions are inactivated by organic matter but are not affected by hard water. Phenolic compounds, and many other types of common household disinfectants, are not recommended for use in catteries due to their toxicity. The potential for toxicity is increased by cats' grooming habits. Residues of the disinfectant get onto the cat's hair and are concentrated in the mouth by grooming. Disinfectant toxicosis is usually manifested by sloughing of the membranes on the tip of the tongue, roof of the mouth, and esophagus (see chapter on toxicology). Severe sloughing of tissue can be fatal.

Nutrition

Specific aspects of nutrition are covered in another chapter. General aspects of cattery nutrition are discussed here.

Cattery owners should be meticulous about the care and storage of food. Dried food should be left in the original bags, and the bag placed into vermin-proof containers. When the sack is empty, it should be discarded and replaced with a freshly opened bag of food. Dried food should not be poured from the bags into containers. Such a practice encourages the retention of residual amounts of old food in the cans, which in turn encourages mold growth in the food. Moldy food can be very toxic for cats and may lead to chronic ill health and liver degeneration. Dried food should be purchased in small lots so that it will be used up within a few days or weeks of its expiration date. Once bags are unsealed, they should be used up in a few days.

Food and water pans must be kept free of fecal contamination by being carefully positioned in the pen. They should also be cleaned out every week or so and disinfected. The amount of fecal contamination of the food is directly proportional to the amount of litter contamination. Cats carry litter on their feet after using the litterbox and often transfer it to their food and water dishes. If the litter is dusty, air-borne litter also settles into the water and food dishes. Cats often use food bowls and litter trays for sleeping, which further contaminates the food. Baby pig feeders can be used to circumvent this problem.

Kitten Production and Rearing

Production of kittens is the paramount goal of catteries. Paradoxically, kitten production is the most difficult aspect of cattery management. If done poorly, it is the most important factor responsible for cattery failure. Though the main cattery goal is to raise kittens, the numbers of kittens should be kept to a minimum. Kittens are both the greatest source and greatest target of disease. Limiting kitten numbers tends to minimize cattery disease.

Kitten production is also the greatest cause for cattery overpopulation. That is because a single queen can have as many as 8 or more kittens a year. It is important, therefore, to rear only as many kittens as necessary to accomplish the goals of the cattery for show and sale. A few exceptionally healthy kittens of outstanding quality do more for cattery reputation and economic health than many kittens of poor quality and ill health. Good-quality, robust kittens can only be obtained by carefully planned breeding of animals that are themselves healthy and robust, and have a history of weaning most of their kittens.

The final measurement of breeding soundness should be conception rate, average litter size at birth, average litter size at weaning, and average litter size at the time of maturity. Having a high average litter size at birth, but a high mortality between birth and adulthood, is not synonymous with good breeding performance.

Controlled Breeding: Breeding within a colony of cats is not as easily controlled as it may seem. Cats are seasonally polyestrous, which means that they come into heat repeatedly over a several-month period. In the northern hemisphere, the period ranges from early spring to late fall (under natural lighting). If the cat is not bred at one of the estrous cycles during this period, it eventually goes out of heat until the next spring. Ovulation is stimulated by coitus, and not by actual insemination. The cycle of rapid, repeated estrus can be broken, therefore, by inducing the cat to ovulate. Under normal breeding conditions, this is accomplished by breeding the cat. It can also be induced by mimicking coitus with a smooth, blunt probe that is thrust into the vagina. Such a procedure is not easily mastered, however,

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Queens selected for breeding should be fully mature. Cats are usually mated in either of two ways. Most breeders prefer to place the tom and queen together for 2

Towels can also be placed in the bottom of the box, though newspapers are more than adequate. Electric cords should be positioned so they cannot be chewed or urinated upon.

As parturition nears, the mammary glands of the queen begin to rapidly enlarge and milk can be expressed a day or so before delivery. The queen also begins spending more time in the box, and a day or so before parturition she may begin to claw and chew the newspapers lining the box. Parturition should be allowed to proceed with as little human interruption or assistance as possible. Though most kittens are born within a 12-hour period, the entire litter may be born over 24-48 hours. In rare cases, the last kitten may suddenly appear 3 or more days after the next to the last one.

Neonatal Care: Kittens should be quietly and quickly examined after birth. Young queens may not always chew off the umbilical cord and consume the placenta, as is normally expected for cats. If the umbilical cord is dried and placenta is still attached, the cord should be severed no closer than 1 1/2 inches from the abdominal wall and the placenta discarded. An intertwined mass of placentas, umbilical cords and kittens often develops if the queen does not sever the cords at birth. Under such conditions, the limbs of the kittens are often entangled by the dried and twisted umbilical cords. If the blood supply is compromised too long before the leg is freed, the limbs can develop dry gangrene over the next several days and slough off. Tangling of the umbilical cords can also lead to massive umbilical hernias and abdominal evisceration. Such lesions result from the kittens' pulling on the umbilical cord attachment.

Overattention of the queen to the umbilical cord can be equally damaging. Some queens chew off the umbilical cord at the abdominal wall. This leads to formation of a microabscess just inside the body wall due to infection of the umbilical stump by bacteria from the queen's mouth. If the umbilicus is chewed off further from the body wall, which is usually the case, it dries up and the remaining stump acts as an impermeable barrier for bacterial migration. Microabscesses in the intraabdominal part of the umbilical vein are often not detected

from the outside. They usually spread bacteria directly into the bloodstream of the kitten. If the umbilical cord is chewed off too short, the kitten should immediately be given an injection of long-acting benzathine penicillin. Failure to treat the infection before it becomes established leads to high kitten mortality.

Routine care of the umbilical cord is not usually required. Some cattery owners cut and tie the umbilical cord as the kittens are born and treat it with an antiseptic solution. This is only necessary if the queen fails to cut the cord. If the cord is cut too short by the queen, antiseptic solution applied to the stump may be helpful. This should not replace prophylactic treatment with penicillin, however. By the time the problem is noticed, bacteria from the cut edge of the cord have often reached the intraabdominal portion of the umbilical vein. Bacteria at this site cannot be eliminated by locally applied antiseptics.

The care that the queen gives to the kittens at the time of birth is crucial to the kittens' survival and a topic of some controversy among breeders. Most queens are very attentive to their kittens as each is born. They cut the umbilical cord, consume the placenta, and clean the kittens of fetal membranes and fluids. They lick the kittens' perineum to encourage them to pass meconium (digested amniotic fluid swallowed during fetal life). If strong and vigorous, the kittens immediately seek a nipple on which to nurse. Nursing is encouraged by the queen.

The time from birth to nursing varies greatly with different queens. Some spend endless hours with their newborn kittens, while others clean their kittens very quickly and then leave the box to roam about the cage. If the kittens are quiet and their abdomens distended, the queen has obviously done her duty. If, however, the queen fails to cut the placenta and clean the kittens following birth, or if the kittens are restless and crying with gaunt abdomens, the queen is not paying proper attention to her litter. Failure of the queen to properly care for her kittens at the time of birth is more common in primiparous (first-time) mothers. Some queens, if given a day or so, develop good maternal behavior. Such queens often need

Kittens acquire passive systemic immunity by drinking colostrum during the first 12 hours of life. Passive systemic immunity helps destroy pathogenic microorganisms entering the bloodstream and is essential for survival. Colostrum is the antibody-rich milk produced by the mammary glands during the first 24-72 hours after parturition. The intestinal tract of the kittens can absorb most ingested proteins during the first 12-24 hours of life. It is during this period that most colostral antibodies enter the kitten's bloodstream. The intestinal lining cannot absorb ingested proteins after this time, so antibodies from colostrum are no longer absorbed into the blood. Failure to ingest colostrum during the first few hours of life leaves the kitten without blood antibodies. These kittens are very susceptible to infections that enter the blood via the skin or mucous membranes of the respiratory, digestive or genitourinary tract.

By understanding passive local and systemic immunity, it is possible to prevent some of the undesirable consequences of fostering or hand rearing kittens. If a kitten is abandoned before it nurses its mother and is hand reared for more than 1 day before being fostered, it does not absorb antibodies from the foster mother's milk into its bloodstream. It receives passive local immunity as long as it nurses, but it is deficient in passive systemic immunity. If a kitten is abandoned before it nurses and is hand reared entirely, it will be deficient in both passive and systemic immunity. If a kitten is abandoned after having nursed for 12-24 hours and is hand reared thereafter,

A black and white photograph of a small kitten sitting on top of a cylindrical container, possibly a can of food or a small pot, against a textured background. The kitten is looking towards the camera with its mouth slightly open. The container has a dark band around its middle. The background is a mottled, textured surface.

it develops passive systemic immunity but is deficient in passive local immunity. Kittens that have received neither passive systemic nor passive local immunity are highly susceptible to overwhelming infections. Kittens that receive one or the other form of immunity are more prone to infection than normal kittens, but their chances for survival are fair to good.

If kittens are abandoned before nursing and cannot be fostered onto a queen in the colostrum phase of lactation (first 72 hours after parturition), they should be artificially provided with systemic antibodies and kept away from other cats until after they are weaned. Passive systemic immunity can be artificially provided by inoculating each kitten subcutaneously with 2-5 ml of sterile serum derived from blood collected from the queen or other adult cats in the cattery. Care should be taken that the blood donor is not carrying blood-borne viruses, such as feline leukemia, immunodeficiency or syncytium-forming viruses. The same treatment would be beneficial to newborn kittens fostered onto queens not secreting colostrum.

Hand rearing kittens requires a great deal of time and patience. In addition to providing passive systemic immunity, one must provide appropriate nutrition. This is usually accomplished with commercially prepared canine or feline milk substitutes. These usually mimic the higher protein and fat content of cat's milk (Table 3).¹¹ Substitutes should be given frequently, slowly and in small amounts during the first week of life. Eyedroppers are vastly superior to small bottles, plastic nipples and stomach tubes. Stomach tubing should be done only when the kitten is too weak to swallow.

Feedings are given faster, less frequently and in larger amounts during each subsequent week of life. Care should be taken when feeding milk substitutes by bottle, eyedropper or stomach tube to avoid feeding too rapidly. Rapid feeding may allow aspiration of milk into the lungs, which can cause severe and potentially fatal pneumonia. Care in feeding is particularly essential in weak kittens with a poor suckling response.

The estimated daily caloric intake for kittens increases progressively from 0.20 Kcal/g (5.7 Kcal/oz) of body weight in week 1 to 0.29 Kcal/g (8.2 Kcal/oz) of body weight in week 4.⁵ Commercial milk substitutes should be used in preference to whole cow's milk. If sufficient calories are provided, the diet can be balanced for all other essential nutrients. Kittens should obtain a substantial proportion of their dietary needs from regular foods by the fourth week of life and do not require complete milk supplementation after this time.

Medical Care of Kittens

After birth, the next most critical time in the life of kittens is the period between birth and 2 weeks of age. This time is referred to as the neonatal period, and kittens in this period are referred to as "neonates." The neonatal period is when diseases acquired either *in utero* or during birth are manifested. (The section on common cattery diseases contains a discussion of neonatal diseases.)

Since infectious diseases are inextricably linked with cattery design and management, excessive neonatal kitten losses can be related in turn to problems with cattery

Table 3. The composition of various milk sources for hand rearing kittens.

Source of Milk	Kcal/ml	% Solids	% Fat	% Protein	% Carbohydrate
Cat	0.9	19.2	25.0	42.2	26.1
Cow (whole)	0.7	12.0	30.0	25.6	38.5
Esbilac powder (1:3 water)	1.0	98.4	44.1	33.2	15.8
Esbilac liquid (4:1 water)	0.9	15.3	44.1	33.2	15.8
KMR	0.9	18.2	25.0	42.2	26.1

husbandry. Unfortunately, kittens that die at birth or during the first few weeks of life are seldom necropsied and the real cause of their death is seldom determined. Without such information, it is impossible to determine the main causes of kitten mortality and the steps needed to eliminate them. Catteries with a high incidence of neonatal kitten mortality should seek the services of veterinarians willing to do thorough necropsies. Tissues should also be sent to a diagnostic laboratory for microbiologic and pathologic analysis.

Diseases that occur in kittens from 2 weeks of age to adolescence (6-8 months of age) are the most amenable to prevention by good cattery design and management. One of the most important steps in limiting disease during this period is to keep litters segregated from each other (see previous section). This is the most effective mechanism for limiting infectious diseases within the cattery. Segregation limits exposure of the kittens to microorganisms carried only by the queen. Since immunity acquired from colostrum is most effective against organisms carried by the mother, the kittens are well protected.

Cattery owners frequently must provide basic health care for their animals. Indeed, many catteries are well stocked with vaccines and commonly used drugs. However, overreliance on home medical treatment can have repercussions that outweigh benefits. Treating animals improperly can enhance disease problems within a cattery rather than help resolve them. Use of antibiotics when they are not needed also encourages emergence of antibiotic-resistant organisms. It is important, therefore, for cattery owners to learn as much as possible about the common diseases they are likely to be faced with and to understand the rationale for treatment of these conditions. A large number of different disease problems can plague catteries, but fortunately only a few account for most of the problems (see section on common cattery diseases).

Home therapy, like hospital treatment, can be supportive or specific. Supportive care involves encouraging the cat to eat, keeping sick animals warm, dry and comfortable, and giving fluids to correct dehydration and electrolyte (salt) imbalances.

Specific care usually is limited to administration of specific drugs, such as antibiotics.

Encouraging sick cats to eat can be very difficult (see chapter on nutrition). As cats become ill, they progressively lose their appetite for various foods. If the disease is mild, a simple change of commercial food brands or flavors may keep the animal eating. As the illness becomes more severe, ill cats only eat their most favorite foods, often only in small amounts. They quickly lose their appetite for even these special foods, and must be constantly tempted with new and different foods. Generally speaking, cats with a poor appetite are more likely to eat foods of high palatability (flavor, aroma, texture), especially animal meats. Raw liver is especially palatable to many sick animals. Once the cat has completely lost its appetite, the owner must become more forceful about placing food in the cat's mouth, making liquid slurries of the food to be fed by syringe or eyedropper. If this is not possible, a stomach tube may have to be used. The final resort is placement of a gastrostomy or pharyngostomy tube.

The importance of keeping convalescing animals in warm, dry, stress-free quarters cannot be overemphasized. Sick cats should not be kept with healthy ones. They should be left alone as much as possible, being handled only when they are medicated and their condition reevaluated.

Many cattery owners are trained by their veterinarians to give fluid and electrolyte solutions subcutaneously with a large syringe and needle. Subcutaneous fluid therapy is only of benefit, however, if it is absorbed into the bloodstream. If the cat is not in shock, fluids are transported within minutes from the subcutaneous spaces to the blood. If the initial fluid bleb is still present hours later, or has shifted from the dorsum to the ventrum of the animal, it is not being absorbed and has no therapeutic benefit. Failure to absorb subcutaneous fluid is common in cats with a subnormal rectal temperature, shivering, and muddy, bluish-tinged oral membranes. Animals in shock have constricted blood vessels in the subcutaneous tissues to divert peripheral blood to internal organs. This peripheral constriction of blood vessels prevents absorption of subcutaneous fluids. Cats that are dehy-

drated and in shock must be given fluids intravenously.

Dehydration is usually manifested by a lack of elasticity of the skin. If the skin over the back is pinched up or tented, and falls back into place within a fraction of a second, the animal is not dehydrated. If the tented skin retains its shape for some seconds, then the animal is dehydrated. Dehydration is often associated with sunken eyes, shivering, subnormal temperature, and other shock-like signs. Dehydration cannot be measured accurately by skin elasticity, however, in badly emaciated animals. Emaciation causes a change in the normal skin structure and elasticity.

Specific drug therapy is the most abused aspect of home medical care. Many cattery owners believe that antibiotics can cure anything, and that all diseases are caused by microbes that are antibiotic sensitive. In truth, very few cattery diseases can be treated specifically by antibiotics. Injudicious use of antibiotics has a number of serious complications. First, antibiotics, especially if given to kittens, often depress the appetite, cause gastrointestinal upsets, such as diarrhea, and can be stressful. Second, some antibiotics cause serious side effects. For instance, some eye and ear preparations can also induce reactions in the ears and eyes that may mimic the very disease against which they are first used. Severe and potentially fatal reactions may occur in animals that have become sensitized to continued use of certain drugs. Finally, indiscriminate use of antibiotics encourages development of antibiotic-resistant strains of organisms within the cattery. Later, when an antibiotic is really needed, the offending organism may be highly resistant to therapy.

Weaning Kittens

Purebred kittens are usually sold when they are 12-16 weeks of age. This is because most breeders want the first 2 vaccinations completed before the kitten is sold. They also believe that older kittens adjust better to people in their new homes and that their immune systems are better developed. At 3-5 weeks of age, kittens are usually out of their nest boxes. Between 6-8 weeks, kittens tend to socialize mostly with each

other and do not like as much human attention. Kittens over 8 weeks of age are more apt to socialize with people. Breeders also keep kittens for a longer time so they can observe them for developing show characteristics.

Weaning time varies with different breeds but is usually at 8-9 weeks of age. This is on the average 2 weeks or more later than domestic kittens. It tends to be longer than this with such breeds as Abyssinians and shorter for such breeds as Persians. Therefore, these are kept in the cattery for an additional 4-7 weeks until they reach sale age.

Litter Box Training

Litter box training, like potty training of human infants, normally takes its own course. When the kittens are ready, usually at 5-7 weeks of age, they follow the example of their mother. Litter box training before this is futile. Moreover, the queen usually ingests most of the waste material during the first few days or weeks of life while the kittens are still confined to the birthing box.

It is important that kittens be trained with litter materials likely to be used by their new owners. Breeders of long- and thick-coated cats may prefer to use shredded newspapers for litter to prevent matting of litter and excreta on the perineum. Kittens litter trained to paper may be especially prone to improper litter box use when placed in their new homes. It is always disheartening to a cat breeder when one of their kittens is returned because of poor litter box use. The breeder may be reluctant to place this kitten in a second home, and equally reluctant to have it destroyed. Often these kittens become another unneeded member of the cattery population.

Teaching Proper Nail Scratching

Nail scratching is an early habit that can be minimized if it is not allowed in kittens. When the kittens come out of the box at 3-5 weeks of age, the tips of their claws should be clipped. This should be continued once a week until 4-5 months of age, when it can be done every 2-4 weeks. Also, there should not be any attractive scratching surfaces in the kitten area, such as posts or mats. Hav-

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ing such objects around encourages the kit-
tens to scratch. When the kittens begin
coming into the household or play area at
about 9 weeks of age, they are less inclined
to scratch, even when they see adults do
this. Scratching surfaces should be provided
for adults who have developed this habit, or
cats who scratch in spite of all efforts to
teach them otherwise.

Showing of Kittens

Showing kittens after weaning is fraught
with many problems. The earliest time that
kittens are allowed in the show ring is 4
months of age. Most are 4-8 months old.
Kittens, especially those closest to 4 months
of age, are often in the immediate postre-
covery stage of common infectious diseases,
such as herpesvirus infection, chlamydiosis,
mycoplasmosis and enteric infections.
Though they may appear relatively normal,
the internal recovery process is often in-
complete, and they still carry and shed a
great number of pathogenic organisms.

The stress of showing at this young age
can reactivate the original disease, prolong
the natural recovery period, or increase the
number of organisms shed. If the kittens
have not been infected before with these or-
ganisms, taking them to a show with kit-
tens from many different areas may lead to
initial exposure. Kittens coming back from
shows are often replaced immediately into
areas containing other young animals. If
the other cats in the cattery have never
been exposed to that organism, an outbreak
of disease may follow return of young ani-
mals from shows.

Preventing Disease at Shows

A number of precautions must be taken
at shows to limit spread of disease. Touch-
ing of cats by people other than the owners
is usually not allowed. Cats showing signs of
disease or parasitism usually are ejected.
These steps help reduce some disease prob-
lems. The biggest improvement at shows to
protect the health of cats was made several
years ago in the US, when routine veteri-
nary check-in examinations were abolished
by most cat associations. Paradoxically, vet-
erinarians would often use ungloved hands
(or did not use new examination gloves for
each animal) to examine the animals. The

examination often involved opening the
cat's mouth and examining the teeth, pal-
ate, oropharynx and tonsils for abnormali-
ties. Since many infectious agents are car-
ried in the mouth and are transmitted
primarily by the oral route, veterinarians
would unknowingly transmit disease organ-
isms from one animal to the next. In the
case of ringworm, contaminated hairs were
also transmitted from cat to cat on the
sleeves of examination gowns and tables.

The practice of show judges' "disinfect-
ing" their hands between handling each cat
in the ring is not just symbolic. It is mainly
done to eliminate odors on the judging ta-
bles, hands and holding cages so that the
cats do not become upset and hard to han-
dle. It is also done to keep the table and
cages clean. An important part of disinfec-
tion comes from the friction of wiping. This
friction tends to remove larger adherent
pieces of material that can harbor infectious
organisms. These principles underlie the
ritualized hand and table disinfection done
by show judges.

Because sneezing cats or other animals
with obvious signs of disease are easily re-
cognized and reported, the greatest danger
to show cats may be from ectoparasites,
such as fleas or mites. These types of organ-
isms are resistant to disinfectants and can
move some distance from the animal. As a
further precaution, therefore, experienced
exhibitors usually spray the benching tables
and floor with an appropriate insecticide be-
fore putting down the benching cage. They
often use dilute chlorine bleach (1:32 parts
water or less) to wipe down the benching
cage, particularly the front and top, which
are not covered with fabric. They often
spend extra money to purchase or construct
a "double" cage, providing a buffer space
between their cage and adjacent cages.
Some take a "grooming space" adjacent to
the benching cage; this further increases
the space between cages.

People that show cats are careful not to
leave their animals unattended, never share
grooming tools or surfaces, and prevent vis-
itors from putting their hands in the cage to
touch cats. Some people put up a sign tell-
ing visitors why the cats should not be
touched without permission. They also wipe
their hands with dilute chlorine bleach be-
fore handling anyone else's cats and let

some time elapse before touching other animals.

Show rules require that any cats showing signs of illness be reported to the show manager. These cats are examined by a veterinarian and may be required to leave the show hall. Show cats should also be kept away from other cats when returning home, and all clothes and show fabrics washed before reuse.

Procurement and Sale of Animals

Critical to the success of cat breeding is the ability to start with the highest-quality cats available from the selected breed. Ideally, original stock should come from a breeder with a well-established and successful breeding program, a reputation for honest kitten quality evaluation, excellent cattery conditions and consistent production of healthy, well-mannered cats that are fine examples of the breed.

Unfortunately, it is almost impossible for a novice breeder to buy from such a person. In most breeds there is a high demand for "top show" quality and "breeding" quality cats from experienced and reputable breeders. The cost of such kittens is likely to be very high, therefore. These breeders also tend to be highly particular in their kitten evaluation and often consider as few as 1 in every 10 kittens from the best of pedigrees as "show quality." They also have stringent criteria for sale of breeding stock and place their cats only to people who are dedicated to improvement of the breed and who will properly care for the cats. In addition, waiting lists of 1-2 years are not unusual for kittens from a respected cattery. All of this makes it difficult, therefore, for an unproven person to be considered as a potential owner of top-quality cats.

Many well-meaning but impatient people begin their breeding experience by being badly burned through dealings with less than reputable sellers of kittens and stud service. As they start to learn, they find that their first purchases are often of poor quality and sometimes carrying disease or parasites as well. Another discouragement faced by novice breeders is the reluctance of established people to accept mediocre females for stud service to their quality tomcats. Breeders more interested in stud fees than

breed improvement may easily take advantage of those not familiar with stud service procedures and contracts. It is no wonder that newcomers sometimes give up after a few expensive and frustrating years.

Few people plan initially to become serious breeders and to develop a bloodline of cats within a breed. They are attracted to a breed and think it would be fun to have 1-2 litters of kittens or perhaps show a top cat. Since there is no plan and often the poorest of starts, it is only through hindsight that they learn. In spite of these drawbacks, the enjoyment and challenge of working with purebred cats help to overcome the setbacks of the first years for persistent cat lovers, and many novices develop into respected breeders.

Though it takes time, the best way to start is by careful study. Novices should read about their selected breed, analyze the show standard, go to cat shows and watch the judging, and talk with breeders and veterinarians about the good and bad qualities of the breed. Most breeds have local and/or national breed clubs with regular meetings or informative newsletters. The usual membership requirement is to be the owner of at least one registered cat of the breed. Various cat books and magazines offer information for new cat breeders. Breeders from different countries also need to consider magazines and books written for their specific geographic areas.

Such preparation leads to the second step in the learning process. Breed club membership, as well as showing a cat, helps determine if the breed and its breeding is an activity suited to the person's financial means and lifestyle. It is not difficult to obtain a show-quality male kitten for showing in the "Premiership" class, which is for altered animals. Breeders sell few of their male cats as studs, no matter how good their quality. They also do not keep many studs because of urine spraying and the problem of finding confinement space. It is possible, therefore, to buy a good-quality male, provided the new owner signs a written agreement that the cat will be neutered and be kept only as a pet.

Veterinarians are good sources of names of local breeders. They often have at least one client who is a well-respected breeder.

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This person will, in turn, have the names of other reputable breeders. Attending a cat show is another excellent way to locate an experienced breeder with a suitable kitten. Breeders are anxious to have their fine neutered males exhibited, and can provide invaluable grooming and show conditioning tips. Knowledge about bloodlines and refinements of the breed standard can be absorbed better through listening and watching at shows and meetings than through reading.

Buying for the First Time: When the time finally comes to obtain the first breeding cats, the experience of showing and the contacts made are valuable assets. Most important, the new breeder is no longer considered a novice and reputable breeders are much more willing to provide them with the "perfect cat." It also is more evident to the "seasoned novice" that the perfect cat of any breed is an illusive creature. The seasoned novice is also less likely to purchase too many cats.

The initial cats purchased should be the best quality females possible from 2 top but diverse bloodlines and strong linebred pedigrees. Sound health and good personalities must be the highest priorities because these cats will provide the foundation for the desired kittens to come. The inevitable flaws of each female should be offset by the strengths of the other. If these cats could be molded together, an ideal example of the breed would be the result. Quality females in any breed are expensive, however. Part of the cost is for the seller's general assistance and guidance in selecting proper mates.

A wise way to start is to buy at least one proven female. Because she is mature, her qualities and flaws are apparent and her show achievements are known. There is assurance that she can produce and raise kittens. All of the unknowns of buying a kitten are then avoided. Occasionally it is possible to lease a top female for one litter, or co-own the cat with the seller. This may be a cat from a breeder who would like to reduce the number of litters born in their premises.

A new female kitten destined to be the basis of the breeding stock should be approximately 5 months old, and preferably already a show winner. In this way the

chances of disqualifying faults, either currently going unrecognized or those developing later, are minimized.

For the beginner, use of an outside stud cat is preferable to owning one. Because the ability to pass on desired genetic characteristics seems to be stronger in male than female cats, stud cats are the heart of the cattery breeding program. There are considerable risks in buying a young unproven male kitten. Finding an available top-quality adult stud, as well as the stress of introducing him to new quarters, is also trying. By mating the foundation females with different males, it is usually possible to determine the compatibility of bloodlines. This method gives greater flexibility for future breedings and allows eventual mixing of the foundation bloodlines without close inbreeding. Use of outside stud services usually involves a contractual agreement between both parties (see Appendix for sample agreement).

Purchase, Leasing, Co-ownership and Sale of Cats: Purchase, lease or co-ownership of breeding cats, as well as arrangements for stud service, must involve written agreements to avoid misunderstanding (see Appendix for sample agreements). In addition, the greatest of care must be taken when sending cats for breeding to avoid exposing them to diseases and parasites. Sending out cats for breeding and introducing new cats are among the greatest health dangers for a cattery.

All agreements should include provisions requiring that the cats are examined by a veterinarian and certified free of any evidence of contagious disease or parasites, and tested for feline leukemia virus. As an additional precaution, it is good practice to isolate a cat accepted into a new cattery for at least 2 weeks to watch for signs of ill health. Females arriving in heat for breeding should be exposed only to the selected stud cat. Many breeders have "closed catteries," which means they do not offer stud service at all. They do this to protect the health of their males. Others allow stud service only to females belonging to a few people with whom they are very familiar.

With good planning and cattery management, eventually there are litters of healthy kittens to sell. Integral to the sale of

kittens is an understanding of breeder ethics, which helps build a cattery's reputation and generates referrals and repeat customers. One of the most important considerations is honest and objective kitten evaluation. The main purpose of breeding purebred cats is to preserve the distinguishing features and history of the breeds, and to strive for continuous breed improvement. Only the finest animals should be kept or sold for breeding.

Most of the litters, because of various faults defined by the breed standards, are sold as pets with a "Conditional Sales Agreement" (see Appendix for sample sales agreements). This ensures that the kittens will be altered when mature and not used for breeding. Ethical breeders are conscious of their responsibility to protect their breed, deter exploitation of purebred cats, control overproduction of pet kittens, and prevent use of their cats in mixed-breed matings. Registration papers are provided to the new owner, if desired, only after receipt of a certificate of altering from a licensed veterinarian. Most breed clubs have a written code of ethics that lists these restrictions and prohibits breeding to non-registered cats.

Kittens displaying potential for breeding and/or show should be retained until they are 4-6 months of age or older, depending on the breed. It is unfortunate for a seller to misrepresent a kitten as show quality, when later it is disqualified for a fault that was either overlooked or not apparent because of immaturity at the time of sale. Kittens determined to be "breeder quality" are usually those with overall good conformation and without serious faults. They may carry several weaknesses, however, that hinder show competitiveness. Breeder-quality cats can be valuable in a breeding program if they excel in some feature that is needed by the breed or a bloodline. They do best when used by experts who know how to select complementing mates and have the contacts necessary to locate and use such animals.

"Show-quality" kittens are those exceptional few who can stand up to the high competition of today's cat shows. A "top show" kitten is one that can become a grand champion and is a consistent finalist. Ethical breeders do not guarantee potential

wins of a kitten. Show success depends partially on the new owner's ability to keep the cat in proper weight and condition. Estrous cycles in females and maturity in studs affect show cats in unpredictable ways, both in condition and show hall temperament.

In all kitten sales, breeders have an obligation to provide proof of testing for feline leukemia virus infection, accurate registration and health records, and to advise a new owner of any known problems that may affect future breeding use. Previous health conditions that could be reactivated should also be disclosed. Probably the most common problem that breeders must deal with is the kitten that appears healthy on the day of sale but becomes ill within a few days or weeks. Ringworm, enteric and upper respiratory diseases and ectoparasites, such as ear mites, are the most usual conditions that affect newly purchased kittens. Often these are recurrences of earlier infections brought on by stress of adjusting to a new home, or former illnesses thought to have been cured.

Sometimes a disease originating from the original cattery can occur months or years after sale. Feline infectious peritonitis, feline leukemia virus (FeLV) infection, or anomalies of genetic origin are examples. Though some infectious diseases can be troublesome, they may be eventually overcome. Serious but inapparent conditions are potentially devastating to a new owner. With the availability of accurate tests for FeLV, there is no excuse for this disease to exist in a cattery and for infected kittens to be sold. However, there still are careless breeders who allow the disease to enter their cattery. Feline infectious peritonitis (FIP) is the most troublesome chronic disease of cattery cats. Though infection occurs within the first few weeks of life, clinical manifestations of disease may not always occur until many months later. By this time the cat often has been exposed to numerous other cats, so that the source of the infection is not always traceable. To complicate matters, the disease may originate in catteries that have never had clinical cases of FIP in their resident animals.

Disorders of genetic origin, including amyloidosis, intraventricular septal defects, hip dysplasia and patellar luxation, may also be manifested months later. Because

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many of these problems become widespread throughout an entire breed, it is difficult for an individual breeder to feel assured that any kittens they sell will remain disease free. The mode of inheritance of some genetic disorders is not entirely understood. The severity and time required for clinical manifestation may also vary greatly from one affected individual to another.

Though a breeder must be forthright about known problems, it is unrealistic for a breeder to be expected to offer guarantees for the overall quality or the future health of a kitten except at the time of sale. Many breeders allow a kitten to be returned within a few days or a week if the buyer is not satisfied for any reason. If a buyer insists on special long-term assurances, these should be outlined in a written agreement. However, even when there is no specific agreement, many breeders compensate the new owner in various ways for a later development that affects the health or breeding capability of a cat. This could include a partial refund of money, a replacement kitten or free stud service. Return of an unhealthy kitten is rarely possible, except within the first few days following a sale. Breeders often allow return of kittens with behavior problems. When a mature cat or stud is sold for breeding, it is usually with a guarantee for reproduction, and its return is allowed only through mutually agreed terms in a written contract.

Alternatives to Catteries

As a breeding program expands, it is important for a cattery owner to constantly reevaluate whether or not the home cattery is adequate. After a few years of breeding, the cats usually require some confinement because of estrual behavior, spraying and health considerations. With determination and imagination, a breeder can easily improve his or her home, with respect to cattery management, at minimal expense. Extra bedrooms can be subdivided by temporary solid and wire partitions to create containment units for kitten delivery and rearing. Many homes have screened porch areas or decks for exercise space. Large prefabricated bird aviaries equipped with trees, plants and platforms make excellent garden structures suitable for cats during the day. It is not difficult to leash train some cats,

especially when young, and this offers an expanded world for a stud cat in areas free of fleas.

Before a home cattery becomes unmanageable, steps should be taken to prepare for building a separate structure to accommodate the optimal number of cats necessary for a planned breeding program. In some cases this is not feasible due to space, time or financial constraints. However, several methods can be used to continue breeding without overcrowding and jeopardizing the health of the cats.

Co-ownership of Studs

Breeders in America are beginning to follow the example of those in Europe, where housing is often not as spacious, by sharing ownership of a stud cat among 2-3 people. The male lives with one person who can provide good facilities. All of the partners have exclusive breeding rights, provide compensation for the cat's care, and by mutual agreement decide on all matters concerning the cat's use for outside stud service and sale of his kittens. Sometimes a co-owned stud lives for 6 months with each owner. Not all males are content to be moved from their home, so this solution should be undertaken only after consideration is given to the well-being of the cat.

Cattery Partnerships

It is not unusual for 2-3 people to work together as partners on all cattery aspects. One person's primary contribution may be travel to shows, another may be responsible for raising litters, while a third may keep several stud cats, maintain cattery records and handle correspondence, advertising, kitten sales and contracts. Though there is a certain degree of cat exchange, it is among a closed group, and this minimizes introduction of disease. This method has worked well even for breeders living in different parts of the country.

Cooperative Breeding

Sometimes several separate small catteries have a loose cooperative arrangement in which they all exchange breeding cats to increase their ability to outcross without having to buy more cats. The group has similar goals and the assurance that all partici-

pants have clean and well-managed catteries, and they never add a new member or exchange cats with outsiders without everyone's approval.

Obviously, aside from an ability to work well with each other on a long-term basis, people entering into any cooperative cattery arrangement must be willing to abide by rules set up in a written contract. Their dedication to improving the chosen breed also must take priority over the desire for individual recognition, since all bloodline and show achievements are shared.

Leasing or Co-ownership of Queens

An individual cattery owner has a few alternatives that allow adding new bloodlines without increasing numbers of cats kept. Leasing a proven queen to another breeder eliminates rearing of one or more litters, and may help provide new genes for the other breeder's line or make it possible for a novice breeder to get started. At the same time, this arrangement enables the queen's owner to receive the pick or second pick of the litter and bring in some new qualities.

Special care should be taken to ensure proper care of the female while in the other cattery. Any queen to be sent away for an extended time must have superior vigor and an adaptable temperament.

By selling a female on a co-ownership basis, the original owner gains access to the best of her kittens without having the cat as a cattery resident. The cat has the advantage of being permanently settled in a new home. Usually the buyer pays a reduced price and either returns a kitten from each litter or has ownership of every other litter. Selection of studs for the breedings is mutually decided. Often full ownership is transferred to the buyer at a later date.

When co-ownership or leasing is with a novice breeder, the seller usually has full control in selection of the stud, evaluation of kittens, and kitten sale decisions until the time of ownership transfer.

As in any other enterprise, it is very important to have contractual agreements between participating individuals (see Appendix for sample agreement). Written contracts help prevent misunderstandings on the conditions of the agreement.

Pet Cats as Breeders

A few breeders have found that placing queens in the homes of relatives and friends who enjoy them as pets helps prevent cattery overpopulation and provides the breeding females a pampered life. According to one breeder, who is also a veterinarian, "Our foster program is designed so that cats live in the home as pets. I provide stud service for the females, take care of all veterinary costs, and vaccinate the kittens and cats as needed. In exchange for keeping and loving the queen and caring for the kittens until they are 9 weeks old, the foster owners get half of any money from sale of the litter, minus the pick of the litter, which is ours to keep or sell as we see fit. At 9 weeks, the kittens move into my house. This gives me a better chance to evaluate the litter on a day-to-day basis, and the kittens learn to adjust to environmental and social changes, thus making the move into other homes at 12-13 weeks much smoother."^{11,12}

Such a program avoids many of the health problems associated with a large cattery; however, it must be undertaken with some caution. Often pet owners are not accustomed to females in estrus and do not understand the extra care needed to prevent the queen from escaping the house while in heat. The new owner must also have the expertise and time to assist delivery of kittens in case of problems, and the ability to feed a queen and her litter 3-4 times daily.

It seems inevitable in cat breeding that the numbers of cats will be extended to the limit no matter what the circumstances, especially during when breeders are trying to establish a reputation through show wins. Sometimes the very limitations of space, time and money, which force a breeder to be highly selective, may actually benefit the health of the cats as well as the goals of purebred cat breeding.

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