

# Chapter 7: Guidelines for Horse Husbandry

Guidelines in this chapter apply generally to all domestic and feral equids. Accommodation dimensions and area recommendations should be downsized appropriately for ponies.

## FACILITIES AND ENVIRONMENT

### Indoor Environment

Dimensions of indoor occupancy should be sufficient for a horse to make normal postural adjustments at will. A reasonable area allowance for a single horse is twice the square of its height at the withers (Zeeb, 1981), which permits essential movements, including lying down in sternal or lateral recumbency. Although horses can engage in slow wave sleep while standing, rapid eye movement sleep occurs only when the horse is recumbent (Dallaire and Ruckebusch, 1974; Ruckebusch, 1975).

Box stalls should be large enough to permit the horse to lie down, get up, turn around, and not lie in, stand on, or eat from areas contaminated with its own feces or urine (Table 7-1). The recommended minimum area, including dimensions, for straight or tie stalls (including space for the manger) is shown in Table 7-1. A 3.7-m × 3.7-m (12-ft × 12-ft) stall should accommodate any size horse.

General guidelines for metabolism stalls are in Chapter 2. If possible, horses should be removed from the stalls daily for short periods of exercise to minimize edema of the lower limbs.

Stall doors may be sliding, hinged, or divided (Dutch). Divided doors allow the horse to have, in effect, a larger stall when it puts its head out, yet permit visual isolation of the horse when so desired. Care must be taken when Dutch doors are used so that the horse cannot reach light switches, electrical cords, or outlets. Stall doors should either be solid or made of material in which the horse cannot become entangled. Doors should be wide enough (1.1 to 1.2 m or 3.5 to 4 ft) to permit the horse to enter and leave its stall comfortably, but should not block adjacent alleys when open. Hinged or divided doors should open into the alley, not into the stall.

Suitable flooring materials for indoor stalls include rubber mat, artificial turf, packed clay, gravel, stone dust, asphalt, concrete, sand, and wood. Floor material should be selected for ease of cleaning and for sanitation, comfort, and safety of the horse. Slippery floors can lead to injuries, and hard surfaces can cause lameness. The harder floorings require deeper bedding, especially for larger horses. Concrete floors with a rough broom float surface that slope

to a floor drain or exterior door are suggested for wash areas, alleys, and feed and equipment storage areas.

Solid walls are suggested for foaling stalls to prevent aggression by the postpartum mare toward horses in adjacent stalls (aggression that may be redirected toward her own foal).

An opening 2.5 cm (1 in) wide and 75 cm (30 in) above the floor in walls and partitions aids stall ventilation and can be closed with a removable filler strip. Open guards 1.4 to 1.5 m (4.5 to 5 ft) above the floor between box stalls may be made of 1.3-cm (.5-in) steel rods, 1.9-cm (.75-in) pipe spaced not over 10 cm (4 in) apart on centers, No. 4 gauge welded-steel fencing, flattened expanded 9-gauge metal, No. 9 chain-link fencing, vertical hardwood slats, or comparable material.

Ceilings, when present, should be made of a moisture-proof material, preferably one that is smooth with a minimum of exposed pipes and fixtures. Minimum ceiling height should be at least .3 m (1 ft) higher than the horse's ears when the head is held at its highest level. Commonly used ceiling heights are 2.4 to 3.1 m (8 to 10 ft) for stall areas and 4.3 to 4.9 m (14 to 16 ft) for riding areas.

Windows or unglazed openings are recommended but are not essential if adequate lighting and ventilation are supplied by other means. Full-size doors with expanded metal screens may be used as windows in exterior stall walls. A tip-in or removable 61-cm × 61-cm (2-ft × 2-ft) window in each box stall aids lighting and natural (non-mechanical) ventilation in warm weather. The bottom of breakable barn windows should be 1.5 m (5 ft) or more above the floor, and windows should be protected to prevent breakage. Plexiglass windows that can be opened are preferable to fixed translucent panels installed as part of the wall sheathing because such panels are difficult to maintain. Skylights or translucent panels in the roof are useful to let more light into stalls.

Tropical and subtropical climates require stall arrangements that are very open to the outside. Commonly used are shed row barns in which the stalls open to the outside under an overhanging roof. Added ventilation is encouraged by stall doors with openings to the floor and slatted or nonsolid stall walls. If barns without these features are used in these environments, those barns should be large and constructed with thick concrete block or well-insulated walls, very high ceilings, and extensive roof venting, unless complete climate control (air-conditioning) is planned.

An alley should be provided between rows of stalls to allow room for horses to pass, for feed and bedding to be

**TABLE 7-1. Recommended Dimensions of Housing and Transportation Accommodations for Horses and Ponies Used in Agricultural Research and Teaching.**

	(m)	(ft)
<b>Indoor facilities</b>		
Box stall	3.7 × 3.7	(12 × 12)
1.8 m <sup>2</sup> /100 kg of BW <sup>a</sup> (9 ft <sup>2</sup> /100 lb of BW)		
Straight or tie stall, including manger	1.5 × 2.7 <sup>b</sup>	(5 × 9)
.82 m <sup>2</sup> /100 kg of BW (4 ft <sup>2</sup> /100 lb of BW)		
<b>Alleys, width</b>		
Between rows of stalls	2.4–3.1	(8–10)
Behind rows of stalls	1.8	(6)
In front of single row of stalls	1.2	(4)
<b>Outdoor facilities</b>		
<b>Fencing height for</b>		
Horses	1.4–1.8	(4.5–6.0)
Ponies	1.1–1.5	(3.5–5.0)
Outdoor pen	3.7 × 3.7	(12 × 12)
Pasture	≥.4 ha	(≥1 acre)
<b>Trailers</b>		
<b>Ceiling for horse height</b>		
Up to 1.5 m (15 hands) <sup>c</sup>	1.7–2.0	(5.6–6.5)
1.5–1.6 m (15 to 16 hands)	2.0–2.2	(6.5–7.0)
<b>Width</b>		
Single of tandem	1.2	(4)
Two horses abreast	1.7–2 × 1.8–3.1	(5.6–6.6 × 5.9–10.2)

<sup>a</sup>Body weight.

<sup>b</sup>Lengths up to 3.7 m (12 ft) are used; length is measured from the manger front to the rear of the stall.

<sup>c</sup>One hand is about 10 cm (4 in).

handled, and for manure to be loaded; an alley located behind a single row of stalls and in front of a row of stalls allows for feeding and moving horses and allows for people to pass. Alleys in horse barns should be wide enough for the horse to turn around (2.4 m or 8 ft), or, if narrower, should have exits to the outside at both ends. Alley doors to the outside may be overhead, swinging, or sliding and should be sized appropriately to the alleyway. A wider alley is suggested where Dutch doors permit horses to have their heads in the alley.

**Bedding.** The type of bedding should be consistent with the comfort of the horse and with proper sanitation. Acceptable beddings include wheat, oat, or rye straw, grass hay, dried pasture clippings, wood shavings, peat moss, sawdust, paper, shredded cardboard, and sand. Horses fed a complete pelleted diet should not have sand bedding because they tend to ingest the sand and suffer from intestinal impaction. Bedding should be free of toxic chemicals or other substances that would injure horses or people. Black walnut shavings (Ralston and Rich, 1983), fresh cedar shavings, cocoa husks, and wood that has been pressure-treated have caused illness. Cocoa and cedar can also result in abnormal blood and urine profiles. Rubber mats alone may be used when the experimental or instructional protocol does not permit traditional bedding or for horses that are

hyperallergic or suffering from chronic obstructive lung disease. Otherwise, rubber mats should be used only with bedding.

**Temperature and Ventilation.** The horse can acclimatize to subzero air temperatures, but needs wind protection such as a windbreak or a run-in stall. Newborn foals need more protection because of their relatively high lower critical temperature. Relative humidity in horse quarters should be 50 to 80%.

Ventilation air changes must be related to environmental temperature, outside humidity, atmospheric vapor pressure, total weight of horses, and heat and water vapor production (from animals, equipment, and bedding) in the barn. Ventilation rate capacity should be at least .7 to 2.8 m<sup>3</sup>/min per 450 kg (25 to 100 ft<sup>3</sup>/min per 1000 lb) of horse; the lower rate is for outdoor temperatures –18 to –7°C (0 to 20°F), and the higher rate is for outdoor temperatures –1 to 10°C (30 to 50°F) (MWPS, 1987). Additional ventilation capacity, plus air circulation, is needed for hot weather. Supplemental heat may be needed with cold weather ventilation, and insulation is recommended for warm housing. Flat ceilings aid air distribution and reduce heating needs for mechanical ventilation in warm barns. Relative humidity should be below 80%, and ammonia concentration should be below 10 ppm.

**Lighting.** Lighting should permit inspection of the horses and condition of bedding. Illumination of at least 200 lux is recommended for alleys, handling, and feeding areas (Currence and McFate, 1984). One 100-W incandescent lamp (approximately 1600 lumens) per 8 m<sup>2</sup> (90 ft<sup>2</sup>) of floor or for each box stall is adequate to produce 200-lux illumination intensity (MWPS, 1987). There is some evidence that total darkness in a horse barn should be avoided (Haupt and Haupt, 1988); it is recommended that windows or another light source be present at night to avoid injury. Luminaires and lamps, or tubes, as well as all electrical wiring and switches, should be recessed or otherwise protected against damage by or to the horses.

**Sanitation and Waste Disposal.** Stalls should be cleaned as needed, usually daily, to keep horses clean and dry and the air suitably free of dust and odors, especially ammonia. Gutters, drains in the alley, or some other means for drainage of urine and spilled water should be provided. Gases emitted during storage, handling, and treatment of manure should be assessed. A 450-kg (1000-lb) horse produces about 20 kg (45 lb) of manure daily, plus spilled water, bedding, and other waste. Although manure as deposited is composed of about 80% water, it is relatively dry to handle (MWPS, 1987).

Horses should not have access to manure storage areas because of the danger that they might acquire gastrointestinal parasites. Manure should be either spread and incorporated into cropland or composted before being spread directly on pasture to be grazed by horses. Refuse should be disposed of appropriately.

## Outdoor Environment

**Pastures, Paddocks, and Corrals.** In general, horse pastures, paddocks, and corrals should provide a reasonably comfortable environment, including sunshade, wind-break, and firm soil upon which to rest; sufficient area for normal postural adjustments and an appropriate resting place; and an enclosure that confines the horses safely and is free of trash, holes, and other dangerous objects, but that avoids unnecessary physical restraint. These outdoor accommodations should also provide for the biological needs of the animal (e.g., feed and water, exercise, reproduction if appropriate, and freedom to avoid contact with excreta).

The requirement of the horse for space in paddock and corral areas may vary considerably, depending on environmental situations (e.g., soil type, climate, forage availability, and drainage), size and type of animals (ponies, light horses, or draft horses), and, in certain cases, temperament of the individuals in a group. The minimum area for an individual in an outdoor pen is 3.7 m × 3.7 m (12 ft × 12 ft), but a larger area is suggested so that the horse can exercise, roll, and avoid groupmates. More horses may be accommodated in a larger enclosure. In wet, muddy conditions, area allowance should be increased to minimize churning, and elevated areas should be provided for the animals to lie down. Tight spaces and sharp corners or

projections should be avoided in the pens to reduce injury and the chance of dominant animals trapping subordinates. The pens should be cleaned as needed to ensure proper sanitation and pest control. Continuous long-term maintenance of horses in the minimal area should be discouraged because it does not allow for sufficient exercise, especially for young horses.

In temperate climates, horses may often be confined to paddocks or pastures without shelter other than that provided by terrain, trees, wind fences, or sunshades. Shelters should be provided in very hot, very cold, or wet environments. A separate feed and creep area should be provided for foals (see Feed). Depending on age, weight, feeding level, acclimatization status, and husbandry system, no additional shelter may be necessary. Still, in certain cases, bedding may be required to enable the horse to keep warm and dry. Insulated sunshades or access to a ventilated stable should be provided in areas where summer temperatures reach 29°C (85°F) or higher if adequate natural shade is not available.

Three-sided or run-in sheds are suitable shelters (see Table 7-1). The minimum shelter area per horse is two to three times the minimum straight stall dimension. Drainage systems should direct water away from areas of heavy use (e.g., near feeders, watering troughs, run-in sheds, and shades).

**Fencing and Gates.** Guides to fencing dimensions and materials are available from the MWPS (1986), Ensminger (1969), and other sources. Fencing may be made of various materials, including wooden posts and rails, solid boards, wire (including high tensile wire), metal pipe, plastic, rubber, and V-mesh or chain-link fencing. It is not necessary to paint or seal fences, except when the protocol requires it. Barbed wire fencing should be avoided. Fences should be constructed to avoid features injurious to horses, such as sharp, protruding objects (e.g., nails, wires, bolts, and latches), and, if possible, narrow corners (e.g., less than a 45° angle) in which a horse can be trapped by a groupmate and kicked, bitten, or otherwise injured.

Fence heights for horses are given in Table 7-1. The bottom of fences and gates should be at least 25 cm (10 in) above the ground or extend to the ground to prevent the horse from catching a leg under the fence or gate, especially when rolling.

Electric fencing may be used for horses under certain conditions. Electric fence controllers should have been approved by Underwriters Laboratories or other accepted testing organizations. A single wire used for fencing should be set .8 to 1 m (30 to 40 in) above the ground, depending on the size of the animal (Ensminger, 1969). Strips of white or colored textile material or metal should be attached to the single strand of wire to improve visibility. An alternative to electric wire is highly visible, conductive plastic tape.

Gates may be constructed of several different materials, including wooden boards, pipe, sheet metal, and wire. The height of gates should be similar to that of adjoining fences to discourage animals from attempting to jump over the lower point. The width of gates should not leave a space

in which an animal may become caught and injured. The bottom of gates, like the bottom of fences, should either extend to the ground or be 25 cm (10 in) or more above the ground.

## FEED AND WATER

### Feed

Horses housed inside or where they cannot graze should be fed and watered at least twice a day. For horses confined inside or in areas where they cannot graze, roughage in the form of hay or other fibrous feedstuffs should be provided to reduce the incidence of colic and stable problems (e.g., cribbing, wood-chewing, tail-chewing, or ingestion of bedding) and to approximate the natural diet more closely.

Horses should be fed so that they are neither underweight nor overweight (see Carroll and Huntington, 1988 for body condition scoring). To maintain normal body condition and health, a horse should be fed to meet the current NRC (1989) requirements for its class using feeds that are suitable for horses. Nutrient requirements of horses on pasture may be provided from forages available in the pasture or by a combination of pasture forage plus supplemental feeding of roughage and grain. During certain periods of the year, growth of forages may be greatly reduced, or the forage may become less palatable and digestible, thus necessitating supplemental feeding. Also, it is important to consider the effect of the environment on energy requirements, which increase significantly during periods of cold, wet weather (NRC, 1989). At other times, depending on stocking rate, little if any supplemental feeding may be required. Salt must always be available on pasture. When horses are feeding only on pasture, the trace minerals known to be deficient locally should be added to the salt source.

If horses are expected to meet their nutrient needs solely from pasture, care must be taken to ensure that the pasture can indeed support their requirements. Pasture stocking density varies from .4 to 4 ha (1 to 10 acres) or even more per horse, depending on the type, concentration, and growth stage of the forage and the season (Hintz, 1983). Good pasture management is required to optimize utilization of improved pastures. Care should include regular fertilization and clipping (mowing) of excess growth to increase the nutrient value and palatability and the control of parasites through manure removal or pasture dragging to break up the manure piles.

If supplemental feeding is required in pasture situations, fence line mangers, buckets, or boxes may be used to allow feeding from the adjoining road. Multiple sites (buckets or boxes) are preferable to a single site to decrease the risk of injury during aggressive competition for feed.

**Feed Containers.** Feed containers may be constructed of metal, plastic, rubber, concrete, wood, or any other material that is safe, sturdy, and cleanable. Hay may be fed from mangers, bags, nets, and racks or on the floor. Horses appear to prefer eating from the floor (Sweeting et al.,

1985), and, in a properly cleaned stall, relatively little danger exists of parasite transmission. Ingestion of sand from a sand floor, however, can lead to sand colic.

Hay racks should be free of sharp edges and corners. The usual distance between the ground and bottom of the rack is .9 to 1.2 m (3 to 4 ft) when outdoors. Grain may be fed in buckets, in the lower part of many hay racks, or from separate troughs or boxes. Feed containers should permit the horse to insert its muzzle easily. A 30-cm (12-in) diameter is commonly used. Examples of acceptable dimensions of hay mangers and boxes have been published (MWPS, 1986), but these do not represent minimum dimensions. It is important to monitor feed containers daily to be sure that they are clean, free of moldy or wet feed, and not broken or damaged. Pastures should be inspected routinely for growth of unusual or poisonous plants (Kingsbury, 1964; Oehme, 1986), especially when pastures are overgrazed.

Freestanding hay racks may also be used for groups of horses. These racks may be placed away from the fence or adjacent and perpendicular to the fence, thus allowing them to be filled from the other side of the fence. Drainage away from the feeder should be provided to minimize mud during rainy weather. Alternatively, feeders can be placed on rubber or cement aprons. When horses in paddocks or corrals are fed from the ground, the potential for parasite transmission is greatly increased because of fecal contamination of the feed, and hay wastage is high. Feeding hay at ground level is desirable, however, because it provides for a more normal eating posture and respiratory drainage; hay can be placed in a 1-m (3-ft) deep container about 1 m (3 ft) wide positioned on the ground or in a rubber truck tire. The container should be cleaned out regularly.

Creep feeders may be used for foals. These feeders may consist of an enclosure located in the pasture (usually near the hay manger) with openings too small for adult horses to enter, but large enough for foals to enter. Creep feeders, like other feeders, should be clean, free of sharp protrusions, and in good repair, and the feed should be kept fresh.

Feeding space for horses has not been well defined and may vary considerably depending on the size, number, and temperament of the individuals that must eat from the same feeder simultaneously. Sufficient bunk space or feeding points should be provided to preclude excessive competition for feed. An extra feeding point (one more than the number of horses) reduces aggression toward, and stress upon, the lower ranking of horses in the dominance hierarchy. This extra feeding point is particularly important if the feed ration is restricted. Hay racks that provide 1 m (3 ft) of eating space per animal and a continuous opportunity for consumption should be placed down the center or long side of the pen. The feeding of grain should be avoided in large groups, unless the horses are separated into individual feeding slips with head dividers or stalls to reduce competition by dominant horses (Holmes et al., 1987). There should be at least 5 to 6 m (16 to 20 ft) between individual grain feeders for group-fed horses.

## Water

If a natural water source is used, care must be taken to ensure that flow rate is sufficient in dry weather, that water is not frozen in cold weather, and that supplementary water sources are provided if necessary. Watering devices used in pastures or corrals should be durable and require little maintenance. The water source should be clean and safe; NRC (1974) recommendations for livestock water quality may be used as a guide in determining suitability for use.

Water should be continuously available or made available at least twice daily. The requirement for water depends on several factors, such as environmental temperature, animal function, and diet composition. In general, however, a horse needs 2 to 4 L (2 to 4 qt) of water/kg (2.2 lb) of dry matter intake (NRC, 1989). A horse fed to maintenance in a thermoneutral environment may need 15 to 35 L (4 to 8 gal) daily, but a horse that is working and sweating or a lactating mare may need 50 to 80 L (12 to 18 gal) daily. Signs of dehydration are sunken eyes, skin that tents (remains compressed when pinched), and increased capillary refill time at the gums.

**Water Containers.** Several widely spaced waterers or a large water trough should be provided in each pen. Waterers may vary from simple buckets to troughs or automatic drinking devices. Waterers should be free of sharp edges. Automatic waterers must be functional, clean, and able to be operated by the horses. Waterers that operate by a pressure plate pressed by the horse require several days for most horses to learn to operate them. Foals and horses with very small muzzles may not be able to operate these devices and may instead drink dry the water from the reservoir under the pressure plate without pressing it. Also, the noise of some waterers as they refill frightens some horses initially. It is wise to provide a water bucket under the waterer until the horses learn. Waterers should be inspected daily (more often in hot weather) to be certain that they are operating properly and are free of foreign material. Water troughs should be cleaned as needed to prevent algae or dirt from accumulating. Water should be heated to prevent freezing in cold weather and be inspected daily to ensure that it is free of ice. Provision of warm water increases intake in cold weather (Kristula and McDonnell, 1994). Proper installation of heating devices is necessary to prevent electrical shock. A float or stick may be placed in a trough to allow birds and other animals that fall into the trough to escape. Waterers should be positioned in a manner to prevent horses from injuring one another, and preferably not against the fence line.

## SOCIAL ENVIRONMENT

Horses are herd animals. The average feral herd contains five to seven adult mares, a stallion, foals, and juvenile offspring (Waring, 1983; Berger, 1986). When possible, horses should be kept in groups (which may be considerably larger than the feral norm) to reduce the incidence of behavior problems and to eliminate injuries incurred when

an isolated horse tries to join others. Total isolation of individual horses who have previously lived in a group, even for a few hours, causes immune changes (Mal et al., 1991). Although horses in most groups are compatible with one another if sufficient space is provided, observation is necessary to detect situations in which one or more horses are being injured or deprived of feed or shelter because of aggressive behavior. Mares and geldings may be housed together, but some geldings—despite complete castration—continue to behave like stallions (Line et al., 1985) and may fight with other geldings or injure foals during the breeding season. No more than one stallion should be kept with a group of mares.

Care should be taken to prevent horses from becoming injured when they are first introduced to one another or when they are crowded. Introduction should take place in daylight, when the horses can see the fences and when the caretaker can observe the horses. A horse is most likely to be injured when it cannot escape from an aggressor.

## HUSBANDRY

Horses should be treated with an anthelmintic as often as needed to reduce environmental contamination with parasitic ova. The type of anthelmintic administered should be rotated to prevent anthelmintic resistance from developing. Horses should also be protected from external parasites when necessary (*Horse Industry Handbook*, 1993). All horses should be vaccinated for tetanus. Vaccinations for other diseases such as rabies and equine encephalitis are appropriate in areas where these diseases occur. Teeth should be examined annually and floated if necessary.

**Management.** Horses groom themselves by rubbing against stationary objects and engaging in mutual grooming with another horse. Horses confined to tie or metabolism stalls, where they cannot perform those behaviors, should be groomed by animal care personnel at least once a week or more frequently if shedding. Hooves should be cleaned weekly and trimmed every 6 to 8 wk as necessary to prevent lameness and infection.

With proper husbandry, horses may be kept in an indoor stall for several months at a time if necessary, but those standing for prolonged periods in either box or tie stalls may develop edema of the lower limbs (stocking up) or abdomen, especially if pregnant. Healthy horses in box stalls should receive a minimum of 30 min of free time (turn out) or 15 min of controlled exercise per day. More time for exercise should be provided if the horses are confined to tie stalls. Stall walking, weaving, and cribbing are all more likely to occur in confined horses.

## Noise

Horses are sometimes disturbed by sudden noises, and background white noise or music is often used to mask or habituate the horses to unexpected sounds that might otherwise startle them. Noise control should be considered in

facility design for the benefit of the horses and personnel. Some horses seem to perceive ultrasound, so devices producing these high frequency sounds should be avoided.

## STANDARD AGRICULTURAL PRACTICES

Castration may be performed on horses at any age from a few weeks to many years of age. Surgical castration is performed, and anesthesia must be used at all ages.

## HANDLING AND TRANSPORTATION

### Handling and Restraint

General guidelines for the restraint of animals are presented in Chapter 2. Horses may be minimally restrained with halters and bridles, and extra control may be gained by the chain of a lead shank over the horse's nose. A horse may be restrained by hobbling, that is, by strapping the foreleg in a flexion. As a form of restraint, a twitch may be used on the horse's upper lip. Horses also may be restrained by crossties attached to the halter, but these should have safety releases, especially if the procedure to be performed is painful or if the horse is unaccustomed to restraint. Slip knot lassos should not be used to restrain horses.

Horses may also be restrained in stocks and chutes. A stock may be as simple as a single L-shaped pole, or it may have solid doors in front and back. Chutes should have either solid sides or sides that end 25 cm (10 in) above the ground. The chute should be able to be opened from either side in case the horse falls or injures itself.

Chemical restraint is effective when it is administered by a qualified person, but care should be taken because, when some drugs are used, an apparently sedated horse may react suddenly and forcefully to painful stimuli (Tobin, 1981). General or local anesthesia should be administered by a qualified person, preferably a veterinarian, for castration and other painful procedures.

### Transportation

The typical vehicle used to transport horses accommodates from one to several horses that may or may not be tied. During transportation, attempts should be made to minimize trauma and anxiety of the horses. Considerations include loading, manner of driving, interior space, footing, ventilation, and possible interior padding.

Horses are sometimes transported in groups in trucks. It is preferable that horses not be transported in mixed-sex or mixed-size groups. They should not be placed in double-decker conveyances designed for cattle because these trucks do not meet the height requirement.

**Trailers.** Trailers deteriorate with use and exposure. Floorboards should have a framework of sufficient strength

to bear twice the weight of any horse to be transported. Floor planking and metal floor braces and door latches should be inspected before every trip.

The required dimensions of a trailer depend on the size of the horses being hauled (Table 7-1). Stock trailers with or without enclosed fronts or roofs may be used. Stall-type horse trailers should have a butt chain or bar. The rear doors may either be hinged (horse steps up into trailer) or have loading ramp doors, or both, with a strong fastening bar on the door to prevent rear doors from opening during transit. If a partition is used, it should be 1.25 to 1.5 m (4 to 5 ft) high and should extend to within .5 m (1.5 ft) of the floor. However, in two-horse trailers that are narrower than 1.7 m (5.6 ft), only a partial partition less than 0.3 m (1 ft) wide or a bar should be used. The horse should be able to spread its legs enough to achieve proper balance. If a partial partition is used, legs should be protected with wraps or bandages. Flooring should not be slippery. Sand, bedding, or a nonslippery mat should be used to provide better footing and thus reduce anxiety and injury.

Horses should be tied using a quick-release knot in transit in one- or two-horse trailers to prevent turning and to stabilize them in case of accident. To prevent accidents when horses traveling as a group shift during transit, they should not be tied. Horses travel with less injury and possibly less anxiety when hauled in slant load or rear-facing trailers (Cregier, 1982a,b; Clark et al., 1993; Smith et al., 1994).

Regulation of air movement through the trailer is essential to avoid thermal stress or excess exposure to exhaust fumes. Adequate ventilation is especially crucial during extremely hot or cold weather. In hot weather, horses should not be left in parked trailers because heat stroke is likely; in cold weather, horses in moving trailers may need to be provided with blankets, especially if the air flow through the trailer cannot be controlled well (as in stock type trailers that are not fully loaded). A horse that is moving around excessively in the trailer is probably in trouble and should be checked.

Lighting in the trailer facilitates animal handling at night. Care must be taken to avoid injuring horses when transporting mixed sexes or sizes.

Horses may need to be fed and watered during a trip. They should not be expected to travel more than 18 hr at one time without leaving the trailer, and feeding and watering are recommended every 12 hr (Cregier, 1982a,b). Removal of horses after this period to allow them to move about helps to prevent colic, founder, and lower leg edema. Many of the respiratory problems that occur during shipping stress can be avoided by ensuring that the head is not elevated above the point of shoulder and by feeding hay below chest level during transit or by taking breaks that allow the horse to lower its head at least ever 6 to 8 hr (Racklyeft and Love, 1990). Leg wraps, tail wraps, bell boots, or tranquilizers are not necessarily required, but they may be beneficial for some horses during transit.

## EUTHANASIA

Euthanasia should be performed using intravenous sodium pentobarbital. In emergency situations, gunshot to the brain may be used by trained personnel; precautions should be taken for human safety. Paralytic agents such as succinyl choline must not be used for euthanasia.

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