

the rhino in performing the desired behaviors if they are not otherwise performed regularly (e.g., weekly blood collection for hormonal analyses). In the absence of regular performance, this variable reinforcement will help prevent the behaviors from extinguishing.

## RHINOCEROS SHIPPING PROTOCOL



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The crating and shipping of rhinos is one of the most difficult shipment procedures in zoos. While rhinos themselves are fairly hardy, the limitations of temperament, peculiarities of chemical immobilization, and rigorous shipping equipment necessitates a strict yet flexible protocol for optimizing successful crating and shipping.

### PRE-SHIPMENT MEDICAL PROCEDURES

Communication at the veterinary level between receiving and shipping institutions prior to rhino translocations is essential in order to discuss specific institutional and/or state requirements. Standard medical procedures for all moves should include the following: (1) a TB test within 6 months of shipment or as particular state, federal or international requirements dictate, (2) brucellosis serology, (3) a visual physical examination, (4) two negative fecal screens 30 days prior to shipment and (5) a review and update of inoculations. (See the Health chapter.) In addition, medical or research protocols defined by the SSP should be reviewed during the planning process.

### CRATING

Crating is the recommended transport method, although transport in trailer stalls has also been successful. It is important in the latter case that a reinforced trailer be used. In all situations, the animal's behavior and conditions should be constantly monitored. Typical problems that can occur in shipping include the following: (1) animals destroying and/or climbing out of the crate top; (2) animals becoming inverted in the crate and unable to right themselves; (3) animals destroying end panels or doors, resulting in eye, horn or facial injuries; and (4) prolonged, excessive exertion resulting in hyperthermia and/or myopathy.

### DESIGN

The International Air Transport Association (IATA) crate design specifications are illustrated in Figure 4. Crates are usually constructed of wood or wood with steel reinforcements. Crate dimensions should be determined by the animal's size (Table 14), but in general, the crate should be 0.3 m (1 ft) longer and wider than the animal when it is lying on its side. Crates with bars situated at the head end will decrease injuries to the head and face. Horizontal bars at the head end should be avoided, as they tend to cause horn breakage and/or damage. Crates with bars and doors at both ends are optimal.

**TABLE 14. Approximate crate dimensions by species (modified from IATA, 1995)**

Species	Length	Height
Black rhino	271 cm (107 in.)	191 cm (75 in.)
White rhino	475 cm (187 in.)	221 cm (87 in.)
Greater one-horned rhino	335 cm (132 in.)	201 cm (79 in.)

Crate dimensions should be determined by the animal's size, but in general, the crate should be 0.3 m (1 ft) longer and wider than the animal when it is lying on its side.

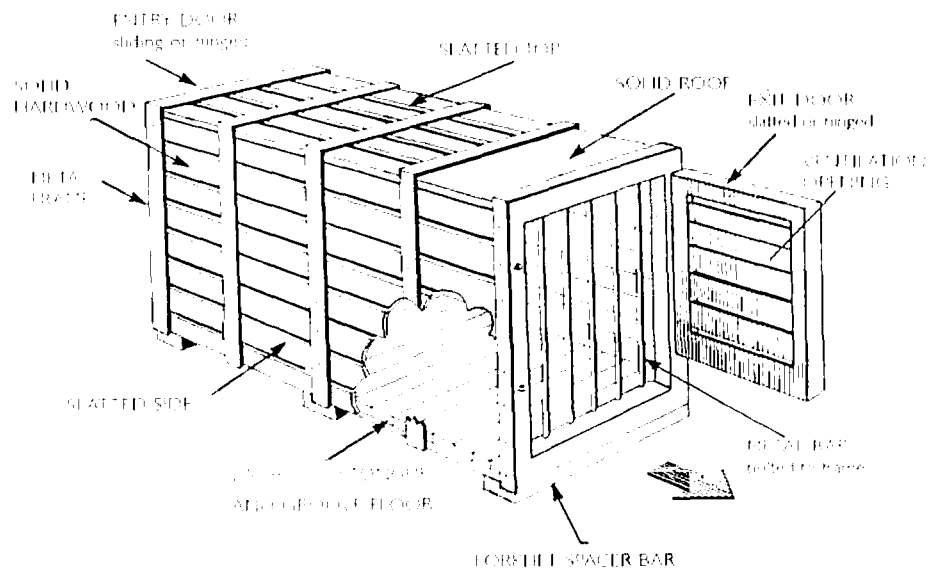


Figure 4. Rhino crate design specifications (modified from IATA, 1995)

#### MATERIALS

- metal
- hardwood

#### PRINCIPLES OF DESIGN

- Strong metal frame lined with solid hardwood sides. Vertical metal bars should be bolted in place at entry and exit with sliding or hinged wooden doors to the exterior of the bars. The upper third of the wooden doors must have ventilation spaces or openings. IATA specifies that the roof must be solid over the animal's head and slatted over the loin and hindquarters for ventilation. For ground transportation, however, removable panels or hinged doors over the animal's head can be useful in administering to medical needs and monitoring the animal. Hatches also allow for more ventilation when an animal is standing calmly.

- The interior must be smooth with no projections.
- Entry and exit doors must be closed and bolted in strategic places to be strong enough to resist the animal.
- The floor must be at least 2.5 cm (1 in.) thick tongue-and-groove or its equivalent and be provided with a non-slip surface.
- The container must be constructed in such a way that the floor and lower sides are leak proof.<sup>a</sup>
- In view of the diversity in size, strength and temperament of rhinos, the size and strength of the container must be sufficient to restrict the movement of and restrain the animal. Dimensions must be large enough to prevent cramping without allowing unnecessary movement. In general, the crate should be 0.3 m (1 ft) longer and wider than the animal when it is lying on its side.
- Only nuts and bolts should be used in the container.
- At the front of the container, there must be provisions for water and food access at the base of the door and between the bars, if present. This access point must be clearly marked FEEDING and be adequately secured when not in use.<sup>a</sup>
- A water container must be provided and must be sufficiently large for the entry of the animal's muzzle.
- Entrance and exit must be clearly indicated.<sup>a</sup>

<sup>a</sup> for airline transport only

The above recommendations are modified from IATA standards to include specifications for ground transport. Before shipping by air, consult the current IATA specifications and/or the airline.

### ACCLIMATION TRAINING

Crate acclimation can require 2 to 6 weeks, although several zoos have crate-trained rhinos in 7 days or less. Training should be completed by a method of approximation (with reinforcement given as rhinos approximate desired behaviors). The first step is to introduce the crate as a non-interactive part of the animal's environment. Gradually, the food is moved toward and finally into the crate. If the animal acclimates to the point of completely entering the crate and will allow the door to be shut, the door should be left closed for short acclimation periods under close observation. If the rhino does not completely acclimate to entering the crate, partial immobilization (standing restraint) may need to be utilized for shipping.

In situations in which crate training is not possible, immobilization should be incorporated. Forced crating without training or immobilization is strongly discouraged.

### CRATING WITH CHEMICAL IMMOBILIZATION

Immobilization offers a fairly simple way of crating a rhino. First, it should be noted that the usual pre-immobilization procedures (e.g., fasting, detainment in an adequate holding area, etc.) should be observed for any procedure requiring the use of chemical immobilization/tranquilization agents. For rhinos, entorphanine (M-99) remains the drug of choice, although several alternatives are available. For specific drugs and dosages, refer to the Health chapter of this publication. The duration of immobilization without the administration of an antagonist may range from 30 min to 2 hr.

Following crating, all rhinos should be held for 24 hr at the loading location for observation or accompanied by a veterinarian during transport. This step is necessary because renarcotization is common in hoofed animals, especially rhinos, given opioids. This step, however, may not be necessary if the butorphanol+detomidine anesthetic protocol is used (Morris, pers. comm.). Trained personnel should be present to administer the correct reversal agent(s) in the likely event of a renarcotization. Any other complications of crating can be managed more easily and effectively in-house rather than en route.

### TRANSPORT

Numerous options for transporting rhinos are available. Each method has its advantages, and each should be scrutinized by evaluating the distance to be traveled, the personnel needed and the temperatures to which the animals will be subjected. A flat-bed truck and open trailer is temperature-restrictive. Note that a crate within an open trailer should be protected from excessive wind, rain and sun. Enclosed trucks or trailers are other options that are necessary in extreme hot or cold temperatures. In any case, the transport vehicles must be climate controlled. Air transport, rather than ship transport, is the preferred option for any transoceanic translocation. Transport by ship is undesirable because of the excessive time at sea, variable conditions and more intensive personnel requirements. When transporting by air, it should be noted that some airlines may require the rhino crate to be placed in an aluminum air cargo box, which can restrict ventilation and subject the rhino to excessive heat buildup during both the airplane-loading process and transport.



Crating is the recommended transport method for rhinos. Crate acclimation can require 2 to 6 weeks, although several zoos have crate-trained rhinos in 7 days or less. (Photo: S. Murray, Fort Worth Zoological Park)

During all rhino shipments, the shipper must be aware that any animal that has been immobilized (and to a lesser extent, some that have not) will be less capable of thermal homeostasis than a normal animal. If the shipper cannot provide adequate climatic conditions for the animals under these circumstances, he or she should be held solely responsible for any injury or death resulting from shipment. If during the course of a transport procedure a situation arises in which the safety of the animal may be jeopardized, a decision should be made through the appropriate channels to postpone or cancel the shipment. Leaving the decision of whether to transport an animal to the transporter or the recipient may be disadvantageous to the animal's welfare. In many cases, the shipper is ignorant of pertinent medical facts and practical husbandry information, and recipients are at a disadvantage because they are often not present.

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