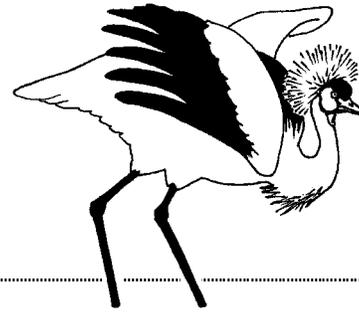


# Facilities



SCOTT R. SWENDEL AND RICHARD W. BESSER

## Incubation and Hatching Facilities

Incubation and hatching areas should be in different rooms with **separate air supplies**. Positive air pressure in both rooms is important to insure that air flows out of the room, rather than in, when a door is opened. Air conditioning helps control relative humidity, thereby allowing the incubators and hatchers to maintain a more constant environment. Air conditioning becomes especially important on hot summer days.

These rooms should also have surfaces that are easy to disinfect (e.g., formica counters and smooth walls) and a central floor drain. **Emergency power** sources are imperative. Gasoline or propane generators may serve this purpose.

## Chick Rearing Facilities

### Hand-rearing Facilities

**SERVICE AREA.** The service room for the chick-rearing facilities should be an insulated and heated room with hot and cold running water. In torrid environments, air conditioning is advisable. The walls and floors should also be readily cleaned, and a floor drain in the center of a tiled or concrete floor is important. An exhaust fan may be used to reduce humidity in the room after cleaning.

Two **sinks** are recommended: one should be mounted on a counter, and a second one should be a 1 m<sup>2</sup> floor basin with 15-cm high sides. The small sink is used for washing food and water containers, while the floor basin is used for washing large items such as brooder box carpets. Splash zones on walls near the floor basin should be sealed to prevent water damage and to avoid septic conditions.

The service room should also include **shelves and cabinets** (for storing equipment and medical supplies) and a small **refrigerator/freezer** (for storing vitamins and medicine). Another nearby room should house a one-month **food supply** (less in warm, humid weather) in paper bags on wooden pallets. Opened food bags may be emptied into a sealable steel or plastic container. In some areas, air conditioning will be required to keep food dry.

**BROODER ROOM.** The brooder room, like the service room, should be insulated, heated, and easily disinfected. The floors should be tile or sealed concrete. The walls should be painted with enamel or epoxy-based paint, or otherwise sealed. Electrical outlets and light fixtures should be able to withstand periodic hoseings. Counter space should be provided for record keeping, preparation of medicines, and weighing chicks.

**Brooder boxes**, if portable, should be elevated to avoid the cold floor. Floor brooders should have insulated substrates. Electrical outlets should be placed where they cannot be contacted by the chicks. Brooder boxes (Fig. 12.1) should be at least 0.5 to 1 m<sup>2</sup> and have fine mesh screen or plexiglass sides to enable chicks to see their neighbors but to prevent them from fighting and injuring one another. The inside com-



FIG. 12.1. Brooder box with a hatchling chick.

PHOTO ICF

partment should be at least 35-cm high for small chicks and 50-cm high for larger ones.

Avoid using rough or **abrasive surfaces** for walls inside the brooders to minimize chick injuries. Provide opaque dividers if neighboring chicks are incompatible and install a wall **mirror** to promote proper sexual imprinting of isolated chicks. If one end of the box has a hinged door, design it to swing up or to the side (but *not* down, because gravity could cause poorly-latched doors to fall and injure a chick). It is also advisable to place a **chick guard** that provides a 15-cm high rim in front of the door so that chicks cannot fall out when the box is opened. The top and/or sides of the box should be well **ventilated** to prevent overheating, to promote air circulation, and to hasten the drying of wet surfaces.

Any reliable **heating system** may be used, but we suggest **electric coil heaters** suspended in the sheet metal roof and controlled by **solid-state or wafer-operated** switches. A **back-up thermostat** set a few degrees above the desired temperature prevents overheating in case the main thermostat fails. This is

especially important if wafer thermostats are used. The heating coil should be at **least 35 cm** above the box floor to prevent chicks from touching the coil with their heads as they grow taller. A **thermometer** should be mounted on one side of each box to allow frequent temperature checks. If the brooders are placed near windows where they receive sunlight, install **adjustable shades** (venetian blinds work best) over the windows to prevent the boxes from overheating.

Non-toxic **carpets**, cut to size, cover the floor of the boxes. Carpets should have relatively short fibers that do not abrade chicks. Rubber-backed carpeting is preferable, because it will not slide on the smooth brooder box floor. Two carpets are needed for each box to allow for replacement during daily cleaning. These carpets can be readily cleaned by hosing them on an inclined surface.

**CHICK PENS** (Figs. 12.2 and 12.3). When chicks are 3-14 days old, they may be allowed access to **outdoor pens** (see Chapter 5). A door separates the inside and outside runs so chicks can be locked inside at night or

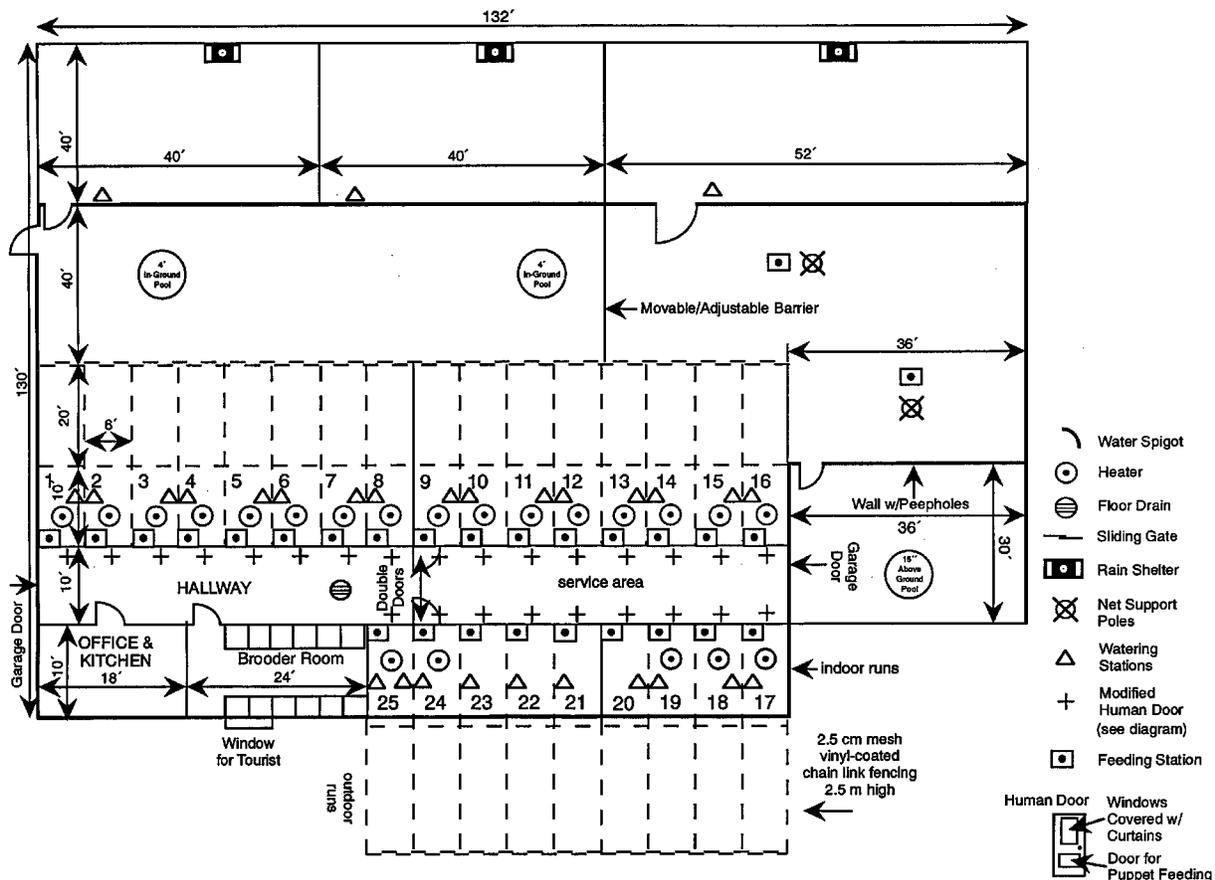


FIG. 12.2. Diagram of chick-rearing building at ICF; runs are termed pens in Fig. 12.3.

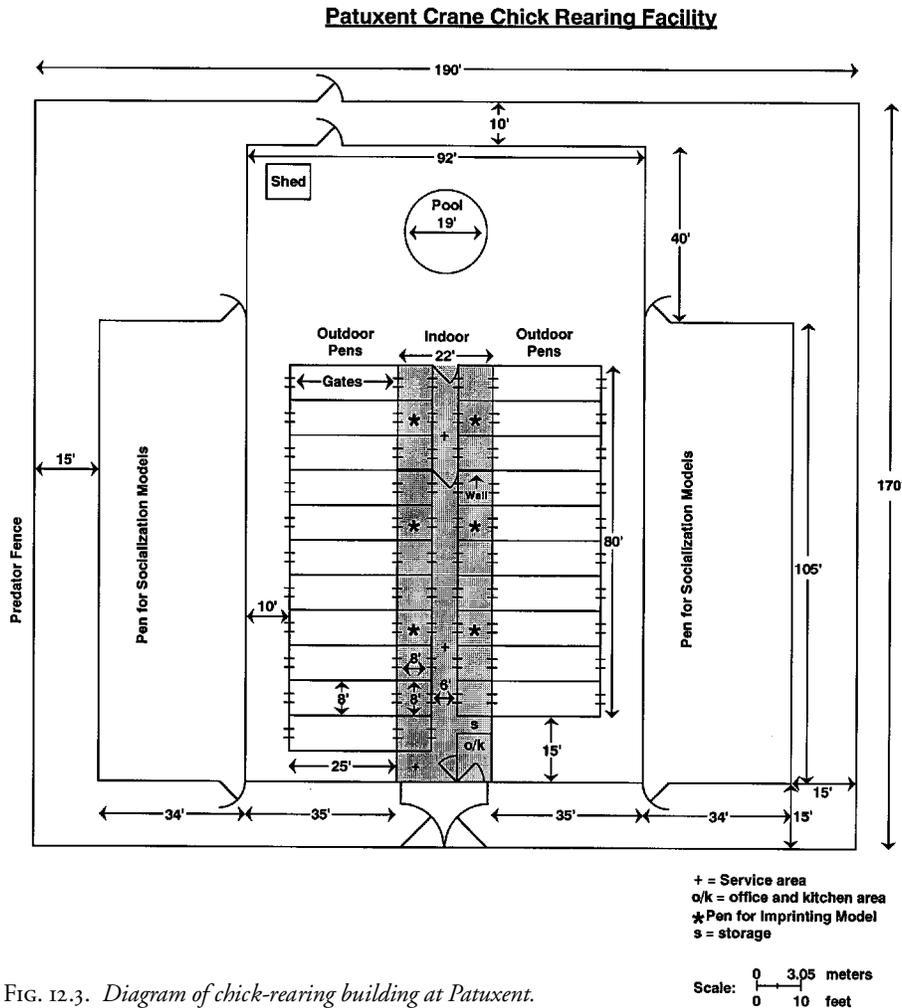


FIG. 12.3. Diagram of chick-rearing building at Patuxent.

during inclement weather. Pens should be placed in a series to provide visual contact between chicks or with imprinting models (adults).

**Inside runs** should be at least 2 m wide and 2-4 m long to provide adequate exercise space when the chicks are kept inside for much of the day. Outside runs should be the same width but 5 m or more long to give the larger chicks room to exercise. If the chicks do not have access to a large exercise area during the day, their outdoor pens should be larger (e.g., 2.5 x 8 m). Pens should be 2 to 2.5 m high, with net-covered outside runs.

The roof of the chick building should project (>0.5 m) over the edges of the outside runs and have a gutter to catch rainwater. This overhang prevents water from flooding the indoor pens and also provides additional shade.

Indoor chick pens should have **mesh no larger than 2.5 cm** separating adjacent pens. Chicks can get their heads caught in gaps larger than this, and small

predators such as weasels (*Mustela* sp.) or the paws of some larger mammals can pass through 3 cm gaps. **Vinyl-coated welded wire or chain link** can be used for the outside run, while finer mesh vinyl fencing is better for inside runs, where small, nervous chicks often pace the fence and would damage their bills on rougher fencing. If existing pens are constructed with uncoated chain link, hardware cloth, or chicken wire, attach smaller mesh (1-2.5 cm) vinyl fencing material or sheets of plexiglass to the lowest 0.5 m of fencing using stainless steel hog rings or plastic ties. These measures prevent injury from either aggressive chicks or imprinting models (adults) in neighboring pens.

Chick pens should not have **sharp projecting edges** and should be easily cleaned. **Eliminate gaps**

where chicks can get their heads, bills, or feet caught.

Ideally, a door operated remotely by a rope inside the service area allows chicks to pass between their indoor and outdoor runs. This door should be large enough to allow a person to pass through it while bending over (ca 50 cm x 120 cm). The door between the service area and the chick runs should have a window in it to allow observation of the chicks without disturbing them.

The indoor pens should have an overhead **light** and two electrical outlets for operating two **heat lamps** or space heaters. The heat lamps should be on separate circuit breakers to ensure that both heat lamps in one pen do not go out when one circuit fails. Small chicks should also have two lamps in case one bulb burns out (fails). Heat lamps, hung from the ceiling on **adjustable chains**, can be raised as the chicks grow taller. These lamps may be thermostatically controlled, or they can be adjusted in height above the ground and checked each day.

Clear or red 125 or 250 W heat lamps work well. Stone lamps, which do not produce visible light, should not be used for small chicks because the chicks may become chilled. Stone lamps are acceptable for chicks that are more than 40 days old.

**CHICK EXERCISE YARD.** Hand-reared chicks benefit from a large pen (Figs. 12.4 and 12.5) where they can be socialized and exercised. This yard gives chicks running room and space for short practice flights. If the yard is **near the outside chick runs**, it is easy to transfer the chicks between their pens and the yard. The chick pens and exercise pen should have gates that stay open and have no high objects to step over. The exercise pen should have at least two gates, or one gate for every 50 m of perimeter. Several gates are needed for rapid pursuit of fledging chicks. Exercise pens should be at least 10 x 20 m, but preferably larger (20 x 40 m).

Walls of the exercise yard should be **soft, 2.5-cm mesh fence** like that recommended for outdoor chick runs. The pen need not have an overhead net if the chicks are well supervised (Fig. 12.5). The fence should be **1.2-1.5 m high** if it is not covered, or **2.5 m high** if it is flight netted. Place fence posts outside the fence so that they do not project into

the pen. Place **shade trees** in the exercise pen to protect the chicks on hot days. Small (1.5-2 m diameter) **pools** with washed gravel drainage systems allow the chicks to bathe and cool off during hot weather. These should be drained daily and disinfected periodically. The yard should have a grass or dirt surface. During warm or humid weather, remove grass clippings after mowing to prevent the growth of *Aspergillus*.

**SWIMMING POOL.** Swimming therapy (Fig. 12.6) can be used to provide exercise for any chick, but is especially important for chicks that show leg growth problems. The pool should be at least 0.7 m deep and 3-5 m in length to accommodate large chicks. The pool must have a filtration system, should be **cleaned regularly**, and be kept properly **chlorinated**. Pools may not be needed frequently so are optional for small crane breeding operations.

**CHICK TREATMENT PENS.** The chick house should contain one or more pens where sick or injured chicks can be isolated from disturbance. This pen should be 2 x 1.5 m. The room should have a window for viewing the chick without disturbing it. The pen should have a ceiling-mounted **heat lamp or other heating system**.

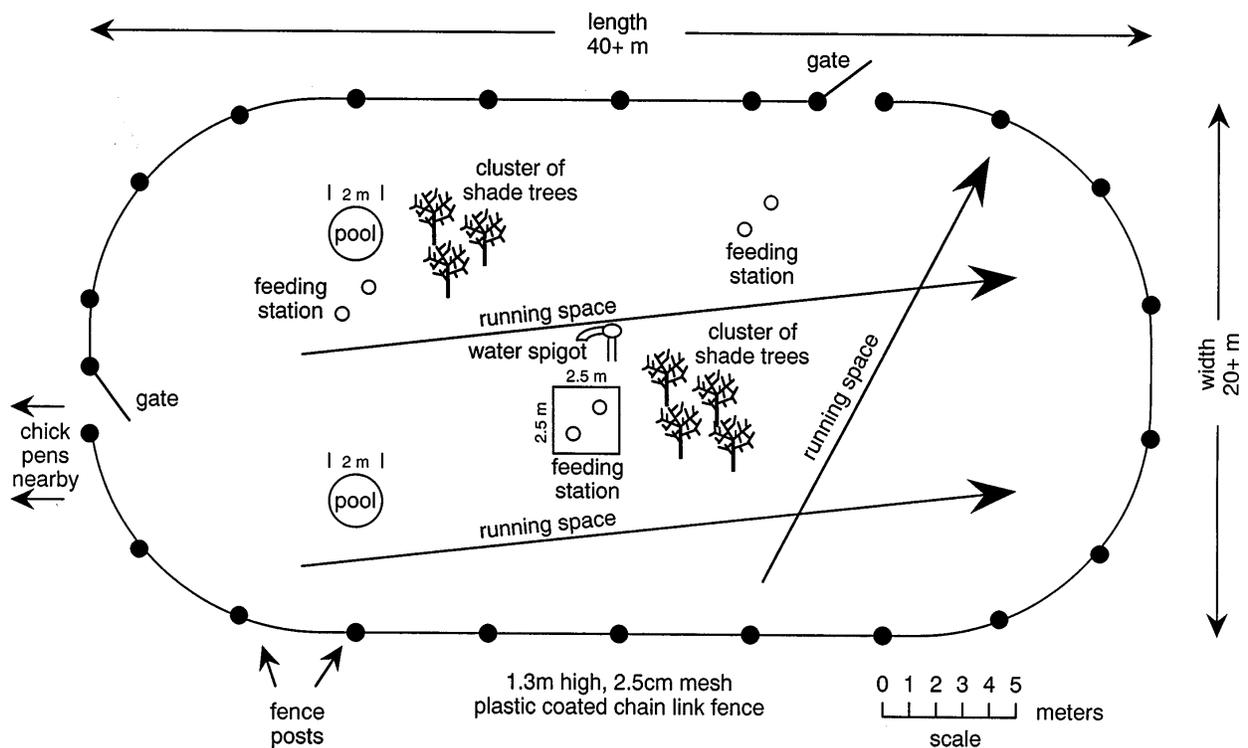


FIG. 12.4. Diagram of chick exercise yard at ICF.



FIG. 12.5. *The chick exercise yard at ICF is also used as an interactive center (Susan McDonald demonstrates use of the puppet head).*

PHOTO DAVID H. THOMPSON



FIG. 12.6. *Marianne Wellington attends to chicks during aqua therapy.*

PHOTO DAVID H. THOMPSON

### Costume-rearing Facilities

The rearing of chicks in isolation from humans requires special facilities that allow people to hand raise chicks using the proper imprinting cues while preventing the chicks from seeing uncostumed humans (Chapters 5 and 11D). At ICF, the brooders and pens are equipped with **one-way mirrors** and small **feeding doors** within the larger door or wall to allow caretakers to see and reach the chicks without being seen themselves. Two one-way mirrors in the door are recommended: one 0.6 m high for watching the chicks during feeding, and one 1.2 to 1.4 m high to allow standing persons to easily check the chick's status. One-way mirrors must be covered with a lightweight opaque cloth to prevent the human caretaker from being seen by the chick when light intensity is greater in the service area than in the pen.

The door for feeding chicks (Figs. 12.2 and 12.7) has an 18-cm diameter hole covered by a small hatch that swings outward into the service area. This door should be 30 cm above the ground. A person should be able to reach nearly any place within the brooder through the feeding door or use a puppet to lure the chick near the door for capture.

At Patuxent, the pen walls along the service area are not opaque but are covered by a tennis-netting visual barrier. This allows the costumed caretaker to view the chicks easily, but it partially obstructs the chick's view of the caretaker. Chicks are fed by costumed caretakers in the pen itself. Small, plexiglass pet incubators are used for the chick's first day; they are kept covered by an opaque cloth unless a costumed caretaker is feeding the chick with a puppet head.

At ICF, we provide an **exercise yard** adjacent to the outdoor chick runs (Fig. 12.2) and accessible from each chick pen. Here chicks can also approach live adult socialization models, a pair or a few subadult conspecifics penned next to the exercise yard. The pen for these models should span the length of all the outdoor runs so that all chicks can see the cranes when outdoors (Fig. 12.3). This pen should be 10 m or less in width to ensure that the adults are near the outdoor runs and constantly in view. Because the adults will often try to attack the chicks, it is imperative to have either a two fence barrier (Fig. 11F.3) or a plexiglass or fine mesh wire barrier to separate the chicks from the adults.

The perimeter fence around the costume-rearing facility should be opaque or should have some visual barrier (e.g., tennis netting) to prevent the chicks from seeing uncostumed humans. Where practical, the costume-rearing pen complex should be adjacent to a wetland so chicks learn to use natural habitats.



FIG. 12.7. *Props for rearing a chick in isolation from humans.*

PHOTO ICF

## Parent-rearing Facilities

Pens in which adult cranes raise chicks must be modified for safety of caretakers and chicks. **Flight netting** (Fig. 12.8) is important in areas where aerial predators are a serious danger. Because chicks are not thermo-competent, they also benefit greatly from **shade and wind shelters** (Fig. 12.8). **Safety features** to protect caretakers from the extreme aggression of some parent cranes should be built into pens for chick rearing. Food and water can be supplied inside a shelter when the adults are locked out, or supplied outside when the parents are locked inside. Remotely operated (either vertically or horizontally) sliding doors (Fig. 12.9) are ideal for this purpose. Locking one or both parents in the shelter when their chick is still outside allows safer capture of the chick for health exams.



FIG. 12.8. A flight-netted pen showing shade shelter (near) and food/wind shelter (far).

PHOTO JONATHAN P. MALE

Chick safety is further facilitated by having the lowermost 30 cm of the fence covered by a fine mesh (0.5–2.5 cm) **chick-proof fencing** (Fig. 12.10) which also prevents chicks from getting their heads caught in the fencing or being injured by cranes in adjacent pens. This finer mesh should be extended at least 10 cm underground to prevent



FIG. 12.9. The sliding door on a Red-crowned Crane shelter can be operated remotely.

PHOTO PATTY MCCOURT

the adult cranes from digging beneath it. An alternative chick proofing system uses opaque tennis netting that reaches all the way to ground level, preventing chicks from getting out below it (see Visual Barriers and Capture Corners).

## Adult Crane Facilities

### General Features of Crane Pens

**MATERIALS AND SPECIFICATIONS.** Recommended fence height for pens is 2.3–2.6 m. Vinyl-coated 16 gauge over 11 gauge **chain link** is the safest fencing material for large cranes. Perhaps the most practical fencing material for crane pens is 5 cm mesh 11 gauge **galvanized steel chain link** (Fig. 12.10). **Aluminum chain link** is much more expensive but is otherwise better than **galvanized steel** because it is smoother and causes fewer injuries. Specify “knuckled” when ordering chain link to avoid the hazard of twisted barbs at the top or bottom of the fence. **Poultry wire** (16 ga or thicker) is an acceptable alternative but causes more cuts to bills, wings, and legs. Small mesh (2.5 cm) poultry wire causes fewer injuries and is stronger than 5 cm mesh.

**Fences** should be supported at 5 to 8 m intervals with steel posts or pressure-treated (i.e., rot resistant) wooden posts preferably set in concrete. Where possible, **posts** should be placed along the outside of the pen or at least outside of two walls of the pen. Corner posts require stabilization. Place support braces outside



FIG. 12.10. Chain link fence. Photo also illustrates 0.5 m tall chick guard, and Patuxent's new double-door, feed/wind shed.

PHOTO GEORGE F. GEE

the pen whenever possible; when they must be inside a pen, make sure they lie against the fencing so that a crane's head or foot cannot be caught behind them.

Toprite XL, 5 cm mesh, nylon **flight netting** is recommended (see Appendix). For smaller species, 2.5-3 cm netting is recommended. Flight netting is attached to the pen perimeter and supported by **guy wires** crossing the pen at 4-5 m intervals (Figs. 2.1 and 12.8), depending on the size of the pen and anticipated snow loads. Larger pens require more guy wires per unit area, and require internal fence posts at 8 m intervals to support the guy wires. Guy wires should always cross fence boundaries over a fence post.

Flight netting must be **strung tightly** and without gaps along the fence and guy wires. The flight netting should be attached at 5 to 10 cm intervals along fence tops. Some institutions leave the netting free along the wires, while others attach it to wires at 20-40 cm intervals using small hog rings. If you anticipate the need to remove a net, secure it by hooking it over the cut end of the chain link fabric (Fig. 12.11). Otherwise, stainless steel hog rings or plastic clips can be used to permanently attach flight netting to fences.

**VISUAL BARRIERS AND CAPTURE CORNERS.** Some pairs of cranes require visual barriers on one or more sides of their pens to reduce **disturbance** from humans or neighboring cranes. Visual barriers also help prevent injuries when introducing cranes into new pens or when capturing cranes. Barriers can be made of **tennis netting** (Fig. 12.12) or **reed mats** tied or clipped to the fence. The flexibility of these surfaces helps prevent trauma to cranes when they collide with the fence or try to attack something on the other side. In cases of extreme aggression between neighboring cranes, a visual barrier between them must be combined with a gap of more than 1 m between the adjacent pens to prevent stress-related pacing or fence pecking. Ropes or cables are the best permanent attachment system, but clips are preferred for temporary attachment.

Cranes that are handled frequently for AI or some other purpose may require a **capture corner**. This is a portion of the pen wall that is padded or covered with a soft material (such as tennis netting) to prevent cranes from becoming injured during the capture process (Figs. 2.4 and 12.12). Discarded Christmas trees tied to the fence extending 3 m in each direction from a corner work well for this purpose.

**LANDSCAPING.** Cranes adjust better to pens with **natural cover and shade**. In netted pens, shrubs or artificial shade structures are needed. Tennis netting or



FIG. 12.11. Nets are attached for easy release by hooking the mesh over the cut-ends of the chain link fabric. PHOTO GEORGE F. GEE

reed mats with an area of 10 m<sup>2</sup> attached to the top of the flight netting works well in summer; remove them each autumn before the first snow. A 2.5 x 2.5 m aluminum shade roof (Fig. 12.8) supported by four posts is an alternate method. Open-topped pens allow for larger shade trees. Landscape pens to prevent **standing water** where pathogens are likely to develop.

Cranes prefer seclusion during the breeding season so it is best to **mow grass after the breeding season**. If short grasses (like buffalo grass, *Buchloe dactyloides*) are used, little or no mowing is required.

**PREDATOR PROOFING.** Crane pens should be built to exclude digging predators (dogs, foxes, etc.) and climbing predators (raccoons). Pens should be surrounded by a perimeter fence with **electrical wires** (Figs. 11F.2 and 11F.3). The wires can be supported by fiberglass rods or attached to insulators on support brackets projecting from the fence posts or chain link fabric. At ICF, electrical and ground wires alternate at 5 cm intervals on brackets that extend 30 mm out and 45° up from the point of attachment.

The perimeter fences (Fig. 11F.3) of crane pens should be **buried** 0.5 m in the ground and be back-filled with 5 mm washed gravel. The base of the perimeter fence includes a 50-cm wide skirt of 2-cm mesh fencing **extending horizontally** outside the perimeter fence to deter digging predators.

**SHELTERS.** A shelter provides a dry place for the food and protects the cranes during inclement weather. For cold-hardy cranes a **3-sided shelter** is sufficient. A fully **closed shelter** (Fig. 12.12) is useful for locking cranes inside during heavy snow or ice storms, when pen repairs are needed, for medical



FIG. 12.12. Crane City at ICF. Breeding pens are provided with tennis netting visual barriers that also create non-abrasive capture corners.

PHOTO DAVID H. THOMPSON

confinement, or during brief periods when there is excessive risk of nocturnal predators. If the shelter is primarily or solely a feeding station, only a simple structure that keeps the food dry is required (see Fig. 12.10).

If warm climate cranes are kept at temperate latitudes, they require **insulated shelters** with ca 10 m<sup>2</sup> of floor space per crane. Some cranes require heated shelters. A 1300-1500 W heater hung from the ceiling is enough to heat a 4 x 4 m insulated shelter (see Table 2.1 for guidelines on when to lock cranes inside or provide heat). Insulated shelters also offer the advantage of staying cooler during the summer. If cranes will be confined for days or weeks at a time (e.g., during quarantine), shelters must be well ventilated.

Shelters should have sloping roofs and adequate drainage. A non-breakable window should be provided for viewing cranes and for natural light when cranes are locked inside. An overhead light may also be necessary for some servicing activities and to provide supplemental light during extended confinement. **Sliding guillotine doors** (Fig. 12.9) operable by ropes or wires from outside the pen are useful for controlling access without having to enter the pen.

Some shelters require **floors**. Concrete is both durable and easy to wash, but requires a soft bedding (e.g., 5 cm of wood shavings or sand, or 10-15 cm of wood shavings during extremely cold weather). A heat pad may be buried in the floor if the climate demands it. Slope the floor slightly toward the main service door to provide drainage.

#### SPECIAL PEN FEATURES.

Some cranes may breed better with a pool in their pens. Pools can be constructed of concrete or plastic. The floor of the pool should slope gradually to a depth of 20 to 60 cm. Each pool should have a **drain**, unless water flow is sufficient to prevent stagnation. Pools with natural vegetation are more likely to stimulate normal reproductive behavior. Pools

without water circulation should be drained and cleaned every few days. Even pools as small as 3 m in diameter may be effective. At Patuxent, continuously **flowing water** is provided in stainless steel cups (Fig. 12.13).

Overhead **sprinklers** (Fig. 3.3) controlled by timers have been used to simulate a **rainy season** (LaRue 1979) and promote breeding in Brolgas. A durable hosing such as 16-mm polyvinylchloride (PVC) must be used if the cranes can reach the pipes. The hose can be attached to overhead wires and have **sprinkler heads** connected at ca 8-m intervals to sprinkle a large area. Be sure that sprinkled pens have **adequate drainage**.



FIG. 12.13. A specially fabricated stainless steel VanEs water cup (15 cm x 15 cm) and Sandhill Crane. Water rises from a supply line at the base of an inverted cone, and drains through holes at water line. Each supply line has a valve accessible through the drain line.

PHOTO DAVID H. ELLIS

**Photoperiod lights** (Figs. 2.1, 2.3, and 3.2) are sometimes needed to simulate the long days experienced by arctic and subarctic nesting cranes and thereby promote breeding. The recommended **light intensity** at ground level is an average of 16 foot-candles (Gee and Pendleton 1992). However, lights are somewhat effective at intensities as low as 1 foot-candle. Either many small light bulbs or one large one can be used. Ten 125 W incandescent light bulbs mounted 2.3 m high (just below the flight netting) around the perimeter of a pen or two 400-1000 W metal halide bulbs mounted 8-10 m high in opposite corners of the pen will adequately illuminate a 200-300 m<sup>2</sup> pen. Be aware that light spillage into adjacent pens may affect non-target birds. Metal halide bulbs are very expensive, but they use less energy than incandescent bulbs. **Electric timers** can be used to control the duration of artificial light.

### Types of Pens

**BREEDING PENS.** Paired cranes should be provided with two adjacent outdoor enclosures and a shelter accessible from both outdoor pens and from a service area. This arrangement allows for annual **pen rotation** (see Chapter 2). Separate pens allow paired birds to be separated if they become temporarily incompatible (due to injury, etc.). We recommend that breeding pens be at least 150 m<sup>2</sup> for smaller species, and 200-300 m<sup>2</sup> for larger cranes.

For some purposes, flight-netted pens are required. We recommend that flight netting be 2.5 m high. This height is a compromise: if nets are higher cranes can do more flying and dancing, but they can also attain higher speeds thereby increasing the chance of injury. In regions where there are no aerial predators of concern, pens may be left unnetted for flightless cranes.

Some pairs benefit from larger pens. Birds that are full-winged and fly frequently should be kept in smaller pens to prevent injuries. Nervous birds that require **more privacy** may breed better if given larger pens with more visual barriers along the perimeter and screening vegetation within the pen. If the pens are in rows, leave a 5-10 m **buffer zone** between rows.

**GROUP PENS.** Subadult cranes may be kept in groups of 2-15 in larger pens, such as 30 x 60 m. Standard breeding pens are also adequate for small groups (2-5) of compatible subadults. The pen size should be proportionate to the number of cranes occupying it. Group pens must have **two or more feeding stations and water sources** (see Chapter 6).

Pens should have an 80-100 cm wide **service gate** through which mowers and other equipment can pass. Gates should not have a sill that would impair a hasty exit when escaping from an aggressive crane or that would impede movement of equipment.

**PAIRING PENS.** Pens intended for use in establishing **new pairs** should be built so birds can be **easily moved between pen halves**. Doors between the pens should open a full 180°. This enables nervous birds to be moved between adjacent pens without handling and allows a crane to retreat to its own pen if it fears its prospective mate. If the cranes share a common shelter, it is useful to have a door between the two halves of the shelter. Pairing pens should be at least 15 x 15 m. If pairs of cranes have two pens to allow for rotation, place cranes in **alternate pens** rather than in the halves of a single pen. If this arrangement results in same sex birds sharing a common fence, a visual barrier is normally required.

**EXHIBIT PENS.** Because cranes that are on display are frequently not intended to breed, their pens have fewer design constraints. If exhibit cranes are intended to breed, their pens must provide a “safe” place for the nest. Elongated pens (Fig. 12.14) allow cranes to stay further from the public and are more likely to result in breeding (see Chapter 6).

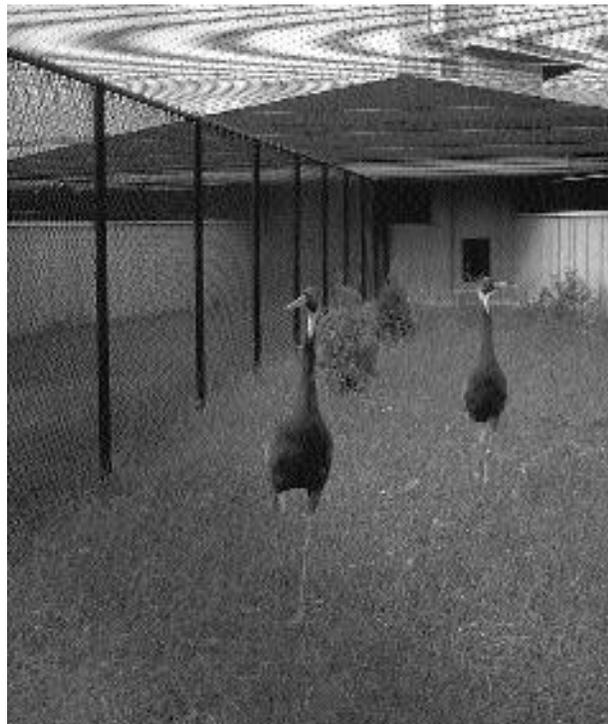


FIG. 12.14. *The display pod at ICF showing a wedge-shaped pen with a pair of White-naped Cranes.*

PHOTO DAVID H. ELLIS

Exhibit pens should allow the public to view cranes without overly disturbing the birds. Breeding pens, described earlier, can make good display pens if no visual barriers are erected on the public viewing end. When people approach, some cranes choose to stay inside their shelters and must be locked outside during viewing hours. Feeding the cranes at the viewing end of the pen encourages them to stay near the visitors. This practice also confines disturbances to one area, leaving the back of the pen secluded for nesting.

Cranes can also be encouraged to stay closer to the public if their shade is near the public end of the pen. For pens that have elevated viewing points, use the type of shade that does not block the view of the cranes. Moated pens or pens with elevated viewing points make good displays. However, elevated viewing points offer less of an opportunity to appreciate the size of cranes.

Tall grass and shrubs obscure the view of cranes but help make the pen look more natural and can be placed to promote a sense of security in the resident cranes. Water pools (Fig. 3.5) make pens appear more natural and allow cranes to exhibit their aquatic tendencies, but may increase the risk of disease (see Chapter 3).

## Special Facilities

### Quarantine Facilities

New arrivals are quarantined before being housed near other cranes. Ideally, the quarantine facility should be located at least 1 km **away from other crane pens** and should be serviced by separate personnel or be **the last area serviced each day**. The walls and floor should be **easy to disinfect**. A **sealed concrete floor** is advisable. The quarantine facility should either have **no outside run** to avoid long-term contamination of the soil, or the contaminated soil should be left idle for at least one year before reuse (see Chapter 2).

### Pens for Holding Release Cranes

Crane release projects usually require an acclimation pen where the cranes are kept for the last few weeks before transfer to a release site. These pens are normally flight-netted and should be large enough to

allow for the entire release cohort (5-15 birds) to be housed together. The details of pen design depend on the type of release (see Chapter 11D).

### Veterinary Facilities

The hospital facility should include a small **surgery room**, and a series of small **treatment pens** (ca 3 x 2 m) with outdoor runs (ca 5 x 2 m) where cranes can be readily captured for frequent treatments. These pens should have lights and heat lamps. A small (ca 3 x 2 m), easily darkened **recovery room** (may be the same facility as the treatment rooms) should have indoor-outdoor carpeting with a thick rubber backing.

Crane **hospital equipment** should have as a minimum: a walk-on scale with 125 kg capacity, a gram scale with 0.01 g accuracy, a 400 X (preferably 1000 X) microscope, a micro-hematocrit centrifuge, and an autoclave. Larger facilities should have: a radiograph machine, anesthesia equipment, a centrifuge, a medical laboratory that contains additional diagnostic equipment, and an incinerator.

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