Chute Construction
For Black Rhinoceros at Zoo Atlanta

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Introduction

Zoo Atlanta's rhino facility fulfills the majority of the needs to adequately care for 1.1 eastern black rhinoceros, but we felt that a rhino restraint or "chute" could further benefit our program. One of the first challenges of the project was to keep the cost as low as possible and still have a safe and adequate environment for the rhino and staff.

Chute Design History

Zoo Atlanta built its current rhino exhibit in 1989. The facility consists of a barn with two stalls and a shared transit corridor into a single corral. The corral connects to a single exhibit yard.

Keeper staff implemented an operant conditioning program in 1994 to facilitate movement of the rhinos between enclosures. Their success paved the way for on-going training that has allowed new staff to accomplish reliable transfer of animals, immunization and manual blood collection from the male, limited foot-work, full ophthamological examination of the male, oral exams, daily saliva collection from the female, daily tail bandaging of the female for over 3 months, and regular treatment of skin lesions.

With the accomplishments of these training efforts and support of the management staff, in 1995 Zoo Atlanta began looking to build a rhino chute. The zoo submitted a grant proposal to the Institute of Museum Services for a restraint. The grant was part of a metabolic research study led by Dr. Vaughan Langman from Louisiana State University-Shreveport and in conjunction with the Denver Zoo. The budget for the restraint was approximately $25,000. We did not receive the grant and the restraint was not built that year.

In 1996, the Animal Restraint Company was brought in for consultation and was asked to submit a proposal for a hydraulic squeeze restraint. Their original design would have cost approximately $45,000. They were asked to cut back some of the cost and redesign.

After compromising on the design the final estimate was $38,000. A restraint was not built that year either.

In 1999, with new staff and new ideas, Zoo Atlanta began thinking about the design of a rhino restraint once again, but this time it was a little different. It was going to be designed and built "in-house."

We were particularly interested in safer, more routine immunizations, blood collections, skin care, footwork, and health exams/treatment. We also hoped the chute would facilitate new veterinary procedures, including transrectal ultrasonography, semen collection/evaluation, and possibly artificial insemination efforts. Coupled with a scale and custom fabricated platform we expected to obtain body weights regularly in the chute. It would also assist Dr. Vaughan Langman's research efforts with routine rectal body temperature measurements and by conditioning acceptance of facemasks that would allow accurate sampling of exhalations for metabolic studies.

Design process

Rich Sartor, Assistant Curator of Large Mammals, was the project manager. Jim Mitchell, former zoo welder, assisted with design and was the principal fabricator. Todd Maki was a key project assistant. We relied extensively on the support and teamwork of all our maintenance and Large Mammal Department staff.

We wanted to design a basic chute that would be manually operated, steel framed, confine the rhinos into a smaller more secure space, give us 360 degree access to them, and keep the budget low.

"Before you purchase or build something new....first talk to someone who has one!!!"

Having the opportunity to travel and visit other zoological institutions throughout the United States, we had the opportunity to see a few of the restraints that were currently being used. We were able to see, talk to the staff, and get ideas about rhino chutes at Fossil Rim, Glen Rose, TX; Kansas City Zoo, Kansas City, MO; Riverbanks Zoo, Columbia, SC; Denver Zoo, Denver, CO; Milwaukee County Zoo, Milwaukee, WI. After sharing the information with everybody working on the project, we decided that many of these ideas, once modified, would work for what we wanted.

Ground Breaking

We would have preferred to have a run-through chute or a side that opened up into another corral, but we had to keep in mind a limited budget and available space. We decided on a walk-in and back-out design.

One of our own ideas was to make it transportable in case the current space was to be used for other construction in the future. We embedded ¾-inch anchor bolts "L" shaped (Figure 1) into a 15-ft X 12-ft X 6-inch thick concrete pad. This gave us the capability of fastening the frame of the chute to the pad without it being permanently secured into the concrete.

Frame Work

For the frame we took in consideration the design from the Riverbanks Zoo. The frame stands 7-ft high X 9-ft long X 4-ft wide. We used 4-inch X ½-inch steel plates across the bottom to secure to the anchor bolts, 3½-inch steel square tubing for the top and corner rails, and 3-inch diameter steel pipes positioned vertically 12 inches apart for the sides. All steel is Schedule 40 thickness (Figure 1, Figure 2).

Movable Sides

Six of the seven vertical steel pipes (3-inch diameter) that make up each side are coupled together making 3 separate movable sections. Every other pipe has a 3½-inch diameter X 4-inch long steel pipe sleeve around the top and the bottom. The sleeved pipe is welded to the framework. The next pipe is connected to the sleeves by 3½-inch square steel tubing at the top, and a 3½-inch X ½-inch steel plate at the bottom, making swinging horizontal armatures. The movable pipe can be secured to the top of the framework and to the concrete pad by 1-inch solid steel pins (Figure 1). This enables us to have three pipes on each side that can be swung open and away from the chute giving us a larger opening to examine the rhino or to maneuver large equipment.

Head Chute

The head of the chute was designed in two sections.

The bottom section is based on the design used for the sides of the chute at the Riverbanks Zoo. It is constructed of three 2½-inch diameter X 3-ft long steel pipes positioned vertically and 12 inches apart. A piece of 3½-inch diameter square steel tubing 4-ft long was secured horizontally 3-feet off the concrete pad. The bottoms of the three steel pipes are hinged to the framework, while the tops are secured to the horizontal square tubing using 1-inch solid steel sliding pins (Figure 2). This feature allows us to lower these pipes, and gives us more space to examine the front feet and chest of the rhino.

The top section was based on a design at the Milwaukee County Zoo. Here we used three 2½-inch diameter X 4-ft long steel pipes positioned vertically and 12 inches apart. The 1st and 3rd pipes were welded at the top to the framework and at the bottom to the horizontal 3½-diameter square tubing. The center pipe was made removable by welding a 3-inch diameter X 3-inch long steel pipe sleeve to the outside of the framework for the top and to the outside of the horizontal square tubing for the bottom. The sleeve secured to the horizontal square tubing also had a steel plate welded underneath to make a cup to hold the bottom of the removable center pipe.

Extending from the outside of the horizontal square tubing and centered with the removable pipe, we attached a 15-inch X 21-inch shelf or chin rest constructed of 3-inch diameter square steel tubing (Figure 2b). This gives us the ability to bring the rhino farther into the chute by extending their heads through the front of the chute. In this position we are able to fully examine the features of the head. The design also protects anyone examining the front feet from a rhino lowering its head.

Back Gate

The back gate evolved from many contributing ideas, starting with the design from the Riverbanks Zoo, with an additional concept from Fossil Rim and an added feature of our own.

The back gate's frame is 4-ft X 7-ft and constructed of 4-inch diameter square steel tubing. It is suspended by two 1-ton trolleys from an 8-ft long, 6-inch steel I-beam. A 1-inch square steel tube was cut diagonally in half to make a triangular strip and then welded to the bottom of the I-beam. The trolleys were attached to the top corners of the back gate using ½-inch X 3½-inch steel plates. The wheels slide along the triangular track guiding the top of the gate as it slides up and down the I-beam. It also prevents the rhino from lifting the gate upward. On the gate's bottom piece of square tubing, a ½-inch X 9-inch steel plate was welded to both sides, overlapping the bottom edge by 1½-inches. The gate then slides over a 2-inch X 3-inch X 7-ft long rectangular steel tube that is secured to the concrete pad. This works to guide the bottom of the gate and prevents it from swinging back and forth. A 1-inch diameter solid steel pin, which slides through 1¼-inch diameter steel pipe, was fastened to the bottom, outside portion of the gate's framework. This pin slides into four holes cut into the bottom track at one-foot increments, giving us the ability to secure the gate in different positions (Figure 3). Using the gate one-third closed gives us a barrier to work behind the rhino for rectal examinations, and gives the rhino the comfort of not feeling trapped (Fossil Rim).

An original design feature was added to the back gate by crafting a slide gate within the gate itself. It is a 2-ft X 6-ft secondary gate using 3-inch diameter square tubing built into the main gate's frame. The bottom of this secondary gate slides along steel rollers held by the ½-inch X 9-inch steel plates that are welded to the square steel tubing of the main gate's frame. The top of the secondary gate slides along steel rollers held by ½-inch X 6-inch steel plates that are welded to both sides of the square steel tubing that makes up the top of the main gate.

The secondary gate has three 2½-inch diameter steel pipes. The center post can be removed. To secure it in place, the ends of the pipe are inserted into 3-inch diameter X 3-inch long steel pipe sleeves that are secured to the underside of the top steel square tubing and the topside of the bottom steel square tubing of the secondary gate (Figure 3). This added feature was designed as a safety device. During a rectal examination if the rhino shifts sideways the secondary gate can then be moved in the direction of the shifting rhino. This would prevent the examiner's arm from being pressed against a stationary pipe. The removable post gives more available space for examinations and equipment.

Shade Structure

We added a 10-ft high X 15-ft X 12-ft pitched roof, supported by 4 X 4 wooden posts (Figure 1). The shelter keeps the direct sun and rain off the rhinos, equipment, and staff

Privacy Fence

We added a 6-ft wooden privacy fence around two sides of the chute that faced the service road (Figure 1). This prevents visual distraction from anything moving along the road.

Electricity

The final touch to the chute was to have electrical outlets installed. giving us opportunity to power exam equipment.

Scale/Platform

To weigh our rhinos we purchased a RB-100P portable platform GageTek scale. The scale includes four stainless steel Helix Load Cells, display console, cabling sufficient for 10-ft X 10-ft platform, and a rechargeable battery pack power supply. The RB-100P scale has a maximum capacity of 15,000 lbs.
(www.gagetek.com) (916)853-1265

We designed a 4-ft X 9-ft platform of 4-inch square tubing and double sheets of ½-inch aluminum sheeting, with the heaviest pieces weighing 80 lbs. The platform can be assembled and disassembled into ten pieces by one person.

For more details about rhino or giraffe platform designs contact us by phone or e-mail.

Cost

Projected budget, to which we mostly adhered...

Steel chute on a concrete pad	$5,000
Electronic scale (GageTek)	$2,500
Weighing platform	$2,500
Shade structure	$3,000
Total	$13,000

Video

- Zoo Atlanta's Rhino Facility
- Pre - rhino chute training
- Walk through of rhino chute design & operations
- 1st rhino introduction to chute
- Rhino one year later with chute
- 1st attempts at closing back gate 100%
- Scale & platform assembly
- Rhino weighing

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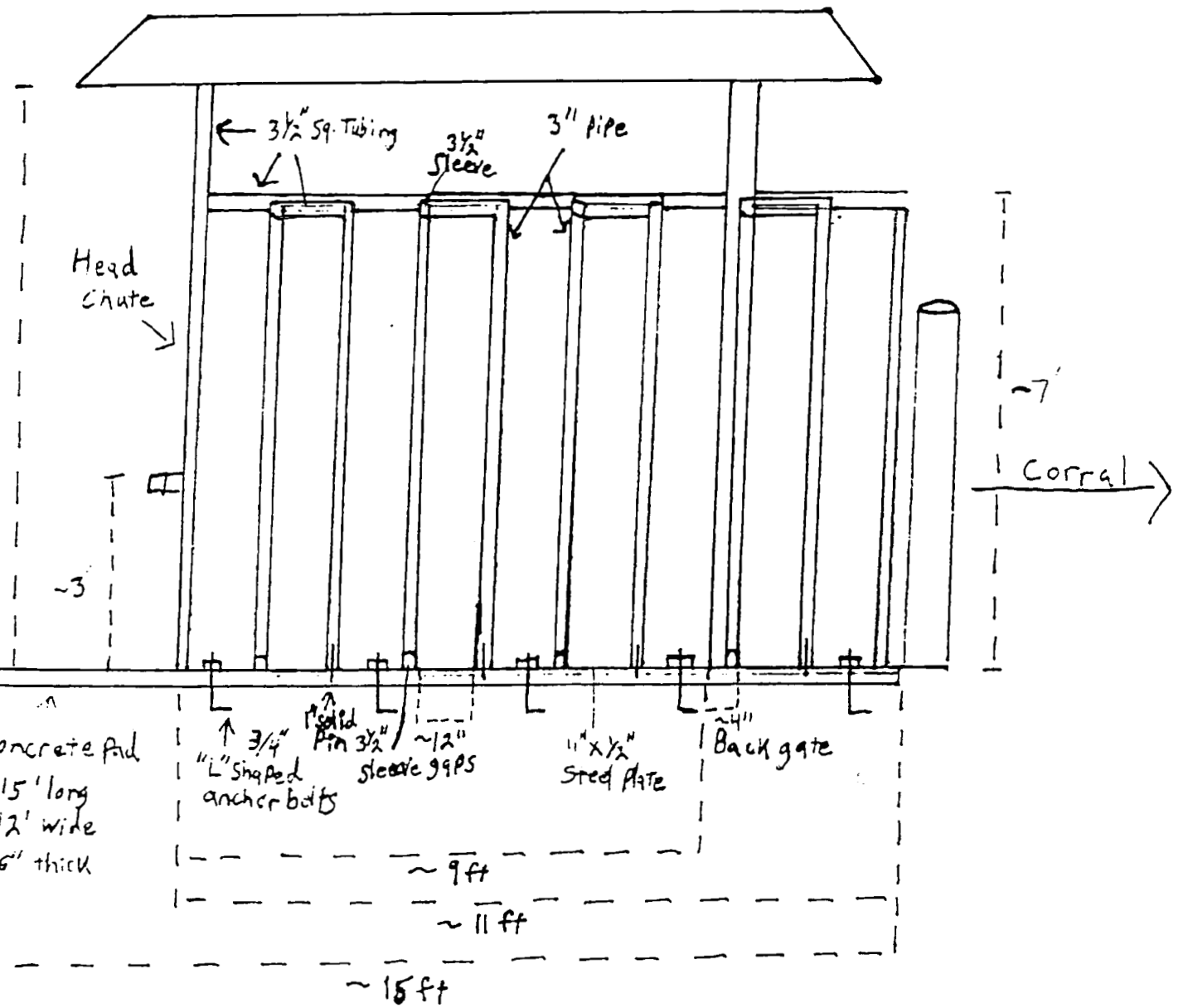
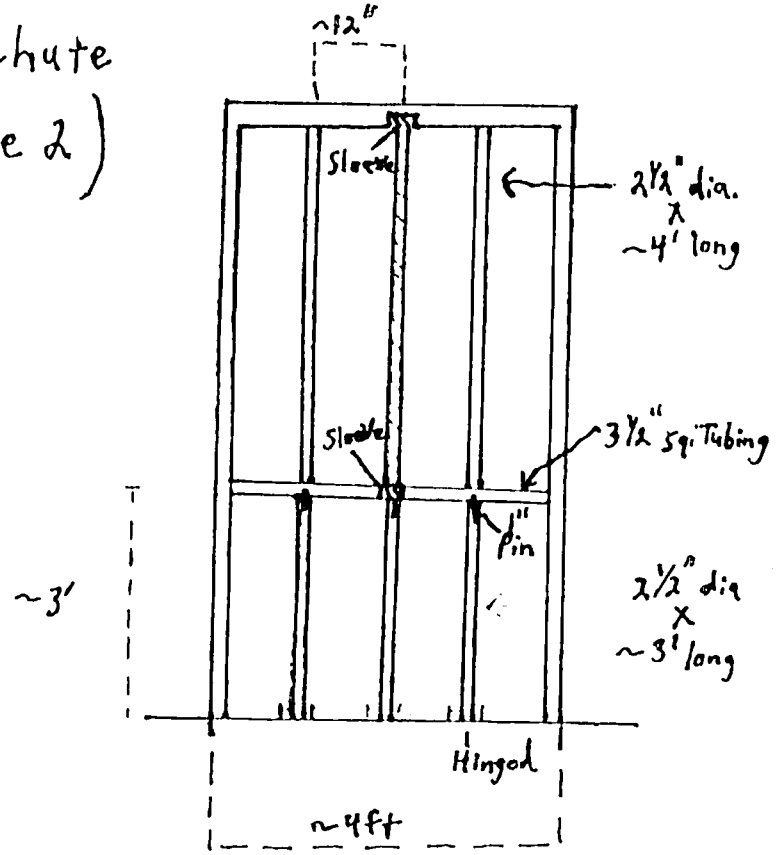
- Fossil Rim, Glen Rose, TX
- Milwaukee County Zoo, Milwaukee, WI
- Dr. Vaughan Langman, LSU-Shreveport, LA
- Zoo Atlanta Conservation Action Resource Center (ARC)
  - Richard Hezlep

(Figure 1)

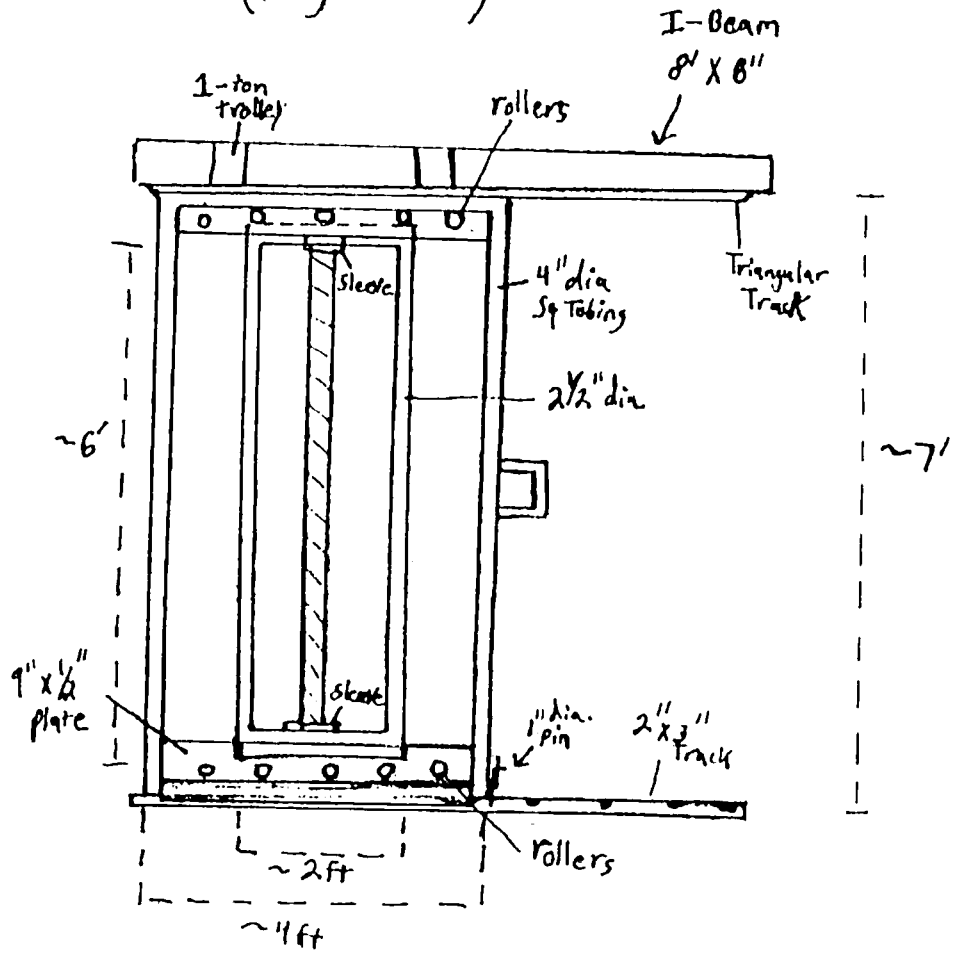
* All Steel - Schedule 40 thickness



Head Chute
(Figure 2)



Back Gate
(Figure 3)



Head chute
(Figure 2b)