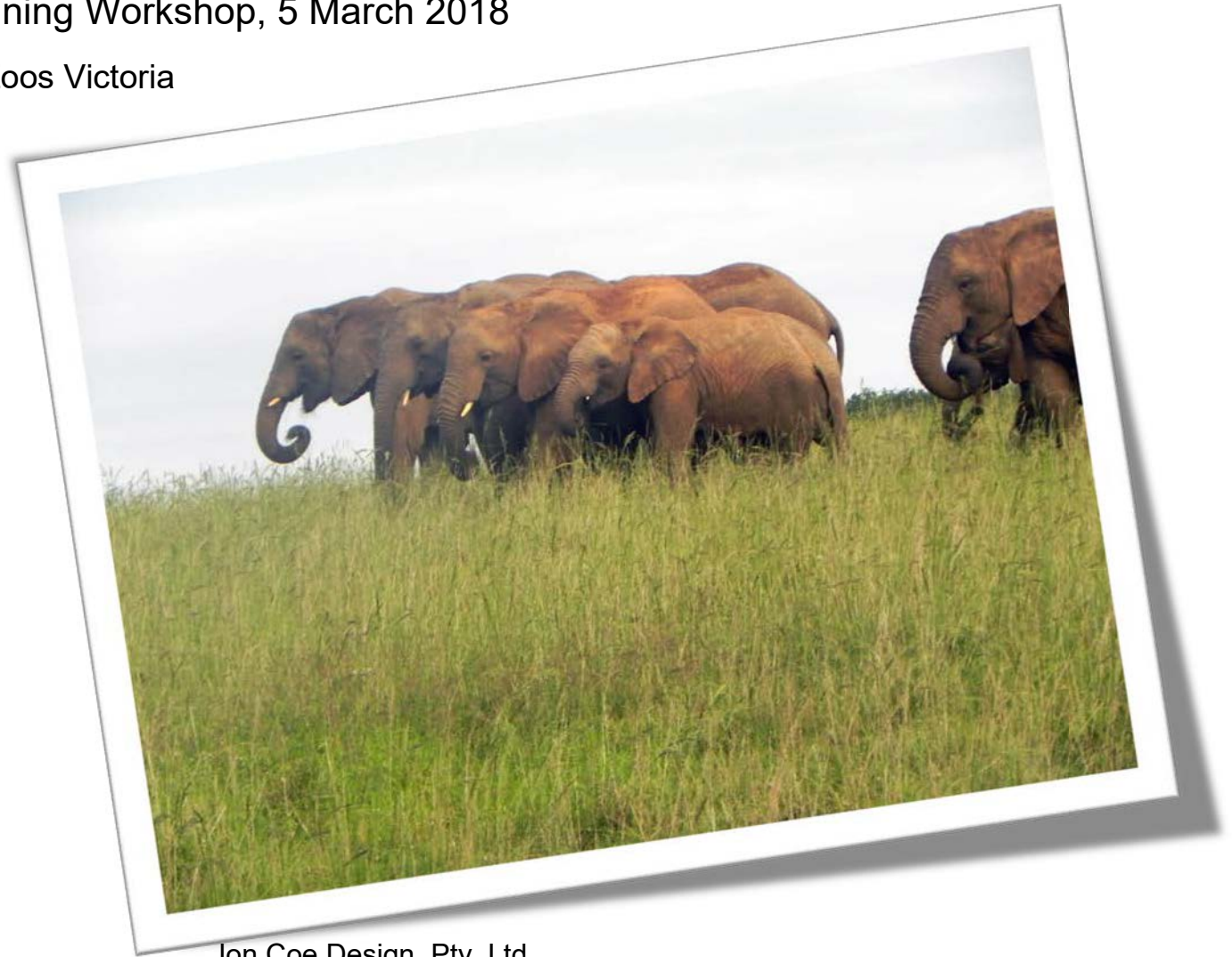


# **WORZ Asian Elephant Facilities and Management Study**

Prepared for Elephant Planning Workshop, 5 March 2018

Werribee Open Range Zoo – Zoos Victoria



Jon Coe Design, Pty. Ltd.

## EXECUTIVE SUMMARY

Werribee Open Range Zoo has a unique, once-in-a-lifetime opportunity to create the world's best zoo elephant display and management system. It has the expansive site, agreeable climate, motivated and capable staff and most of all the animal welfare mandate to achieve this goal while creating a world-class visitor experience and adding essential research findings benefiting elephant managers the world over. Global populations of wild and traditionally managed elephants are plummeting and the need for self-sustaining insurance populations has never been greater. Thus, this program supports both Zoos Victoria's animal welfare and wildlife conservation mandates.

Many in both the global modern zoo community and animal welfare groups agree that despite notable recent progress, zoo elephant facilities and management systems are still not good enough. This realization, supported by recent research and massive public support in many cities, has led to a new Golden Age in zoo elephant design and management, with breakthrough facilities recently across in the US and in Europe.

This study profiles research findings from nine ground-breaking international zoo elephant facilities ranging from smaller, urban and intensively managed facilities such as those in Copenhagen and Dublin to expansive and more passively managed exhibits at Borås Djurpark in Sweden and the very green open range facility at North Carolina Zoo. It includes facilities displaying elephants with other species (Dallas Zoo, Borås Djurpark) and exhibits where elephants, rhinos and other species rotate (time share) in ever-moving circuits (Denver Zoo). Research included telephone interviews with leading elephant managers, Mr. Gerry Creighton, Dublin Zoo, Mr. Otto Fad, Precision Behavior, and Mr. Alan Roocroft, Elephant Business Inc. They were asked to describe both what they found to be most successful in their present ground-breaking work and what could contribute to a new, next-generation of elephant programs.

Appendices include detailed zoo elephant exhibit profiles contributed by colleagues Mr. Jeff Sawyer, CLRdesign and Mr. Nevin Lash, Ursa International, as well as an excellent Power Point presentation and a post-occupancy interview with the Dallas Zoo Elephant Director, also by Mr. Sawyer.

Based upon this research, this study recommends a checklist of key considerations and opportunities<sup>1</sup> underpinning the design of a next-generation elephant facility and management system in preparation for the future move of elephants from Melbourne Zoo to Werribee Open Range Zoo. It will be used by zoo staff and consultants to help frame planning discussions and as a check on evolving design concepts.

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<sup>1</sup> See page 7

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## Introduction

We are entering a Golden Age for zoo elephants. The rapidly growing concern of animal welfare among animal care staff and the public, increasingly supported by field and zoo-based science and new technology is propelling a rapid revolution in elephant management and display. While a full presentation of elephant management history isn't required here, some important features of this evolution are important to understanding where we are and where we want to go.

## Evolution of Management Systems

1. Asian elephants have actively been captured, trained and worked since the 4<sup>th</sup> Century BC<sup>2</sup>. This was entirely based on imposing the dominance of the trainers over the will of the elephants. Animals are motivated by avoidance or discomfort. Although kindness and rewards were used as training tools, severe deprivation and punishment are basic to the method which has come to be known as 'free contact' management. This human dominant approach remains the norm across Asia, in circuses and in most zoos globally
2. In the 1989 then marine mammal trainers Tim Desmond and Gail Laule, working with elephant management expert Alan Roocroft at the San Diego Zoo Safari Park introduced both protected contact (PC) and positive reinforcement training (PRT) to two 'killer' bull elephants, 'Chico' (African) and 'Ranchipur' (Asian) being kept in no-contact isolation. Animals are motivated by anticipation of reward. After nine months of training both males were cooperating with their trainers on protected contact foot treatments and blood draws. In 1991 Desmond and Laule presented their paper<sup>3</sup> describing their PC methods to the AZA Annual Convention in San Diego. Acceptance by the zoo community however has been very slow. It was not until 2014 the American Zoo and Aquarium Association mandated PC and PRT for elephant management. In Australia, Melbourne and Taronga Zoos did likewise in 2014.
3. Intensive elephant management. Most zoos have limited space for elephants or cold climates restrict the animals to small areas for extended periods. Herd sizes tend to be small. Larger traditional zoos often have elephant shows using circus style training and behaviors. Progressive zoos use PRT and environmental and behavioral enrichment to intensively manage their animals. In both cases management is intensive, requiring sufficient caregiver time and training.

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<sup>2</sup> [http://webcache.googleusercontent.com/search?q=cache:http://www.colyerinstitute.org/pdf/feems1.pdf&qws\\_rd=cr&dcr=0&ei=r-WNWpufKYrK8wWbwL\\_IAQ](http://webcache.googleusercontent.com/search?q=cache:http://www.colyerinstitute.org/pdf/feems1.pdf&qws_rd=cr&dcr=0&ei=r-WNWpufKYrK8wWbwL_IAQ)

<sup>3</sup> [https://www.researchgate.net/publication/265108547\\_Protected-contact\\_elephant\\_training](https://www.researchgate.net/publication/265108547_Protected-contact_elephant_training)

4. Extensive elephant management. Large elephant sanctuaries and a few zoos with larger elephant enclosures use more passive management. Basic PRT training remains essential for husbandry and movement, but elephants tend to be kept in large groups and 'entertain themselves'.
5. I've found there to be both a practical and philosophical distinction between 'hands-on' and 'hands-off' management styles, even within the PC/PRT community. I suggest the best policy is a middle ground with both larger and more complex areas and herd composition and active enrichment activities using remote and randomized technologies, so the elephants don't associate enrichment directly with caregivers. This avoids problems such as learned helplessness.
6. Melbourne Zoo changed to PC on 14th Jan 2014 and the transition to continual reinforcement training (CRT) will be completed soon.

## Evolution of Exhibit Systems

1. The introduction of the 'landscape immersion' exhibit design philosophy in 1976<sup>4</sup> extended the philosophy of 'Nature is the model'<sup>5</sup>:

*"The closer we can recreate the conditions in which an animal evolved, the more likely we are to meet animal needs we didn't even know existed"*<sup>6</sup>

This represents a *biocentric*, nature-centered approach to design and management in contrast to the *anthropocentric*, human-centered, functionalist philosophy common to most zoo exhibits and especially to elephant facilities. This nature-based approach also has strong implications for public enjoyment and conservation education<sup>7</sup>.

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<sup>4</sup> Jones, G, Coe, J. & Paulsen, D. 1976, Long-Range Plan for Woodland Park Zoo, Jones & Jones for the Seattle, Department of parks and Recreation, Seattle, WA.

<sup>5</sup> Hediger, H. 1950, Wild Animals in Captivity, Butterworth, London.

Hancocks, D., 1980. Bringing nature into the zoo: inexpensive solutions for zoo environments. International Journal for the Study of Animal Problems, Vol. 1 (3): 170-177

<sup>6</sup> Coe, J.

<sup>7</sup> Coe, J. 1984. <http://www.joncoedesign.com/pub/PDFs/BringAllTogether1982.pdf>

Coe, J. 1985 Coe, Jon C. 1985. "Design and Perception: Making the Zoo Experience Real" in *Zoo Biology*, 4:197-208.

*“An animal cannot be isolated, even conceptually, from the particular environment to which it has become adapted during eons of geologic time without a serious misunderstanding of its true nature” (Akeley 1936).<sup>8</sup>*

2. ‘Themed’ and ‘Functional’ exhibits. Until recently most elephant exhibits were designed with fully functional off-display management areas. Display areas may have had perfunctory themes, such as use of mock rock barriers rather than steel post and cable barriers. More recently the Thai Elephant Forest at Woodland Park Zoo, the elephant exhibit at Taronga Zoo and Trail of the Elephants at Melbourne Zoo were highly themed in both landscape and cultural immersion. But in each case, elephant yards were barren paddocks rather than lush landscapes. In the Taronga Zoo example, the setting was a simulated sandy river bed, explaining the bare substrate. Nevertheless, barren appearing elephant yards greatly diminished the naturalistic thematic intention. Recently Toledo Zoo opened a new elephant exhibit based on the concept of creating a highly functional and highly enriched facility with no distinction between management and public areas. I visited this facility in 2012 with a group of animal welfare students from Canisius College. I expected them to be delighted with this significant embodiment of animal welfare and enrichment philosophy. However, even these knowledgeable welfare-oriented visitors complained the facility ‘...didn’t look natural enough.’ Steel posts, cables and concrete ‘enrichment walls’ dominated the view and seemed to send a signal of human control rather than animal freedom and independence. For this reason, we should combine naturalistic display settings with abundant, naturalistic enrichment features and practical management equipment, combining the best features of functionalism hidden within a habitat-based visitor experience.
3. Functional Examples. Recent facilities combining active naturalistic elements within an architectural, functional setting (my opinion):
  - a. Toledo Zoo
  - b. Copenhagen Zoo
  - c. Western Plains Zoo
4. Semi- naturalistic or cultural themes (but not very realistic recreations) with active management.
  - a. Denver Zoo (multi-species rotation with Asian rhinos and tapirs).
  - b. Dublin Zoo,
  - c. Oregon Zoo
  - d. Zoo Zurich
  - e. Los Angeles Zoo

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<sup>8</sup> Akeley, W. 1974, Restless Jungle, National Travel Club, New York.

5. Naturalistic or cultural theme with functional elements within a landscape/habitat- based system.
  - a. Boras Djurpark
  - b. Taronga Zoo
  - c. Dallas Zoo
  - d. North Carolina Zoo
6. Very large, highly naturalistic area with more low-intensity management
  - a. PAWS Sanctuary, California
  - b. Elephant Sanctuary of Tennessee

## **Next Generation Management Fundamentals**

The following are recommended by the experts I spoke to, Gerry Creighton, Dublin Zoo, Otto Fad, Precision Behavior, and Alan Roocroft, Elephant Business<sup>9</sup>. Melbourne Zoo elephant care staff also have considerable experience and expertise which will added to this information during upcoming elephant planning workshops.

1. Develop a 50-100-year elephant management succession plan with 5-10-year updates based upon elephant generations. This projected chronology includes staff and even zoo director succession correlated to very long-term elephant program evolution<sup>10</sup>.
2. Provide 24-hour outdoor access to some enriched areas.
3. Spend more time on enrichment activities, such as renewing and reshaping their environments and less time on managing animals.
4. Constantly create novelty and opportunities for exploration.
5. Maintain a multi-generational herd and allow them to manage themselves to the extent possible.
6. Don't isolate individual unless absolutely necessary.
7. Don't intervene in the elephant hierarchy.

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<sup>9</sup> See Appendix for interviews

<sup>10</sup> Source: Alan Roocroft

8. Caregivers should act as facilitators of natural elephant behavior.
9. Provide animals with increased control, choice and competence.
10. Provide browse and branches with bark ad lib 24/7.
11. Use training as needed to introduce unfamiliar enrichment opportunities.

## Next Generation Facility Fundamentals

1. Providing more usable space is generally beneficial, but large size isn't everything. The quality of the space, from the elephants' viewpoint, is more important than the size. Important qualities are 'soft', materials manipulatable by the animals, physical and multisensory complexity, variety, novelty and challenge suited to animal's capacities.
2. Provide safe, accessible indoor and outdoor areas that are stimulating, challenging and ever-changing.
3. Provide abundant opportunities for the elephants to modify ambient climate including lighting and to rearrange furnishing and features themselves.
4. Minimize hard paving and walls and hard sounds and smells in the elephants' sensory environment.
5. Optimize the acoustic, tactile and olfactory environments.
6. Provide indoor and outdoor access for large equipment for frequent log and earth moving and habitat renewal.
7. Use hydraulic gates.
8. Elephant restraint devices (ERDs) are very expensive and not needed<sup>11</sup>. All necessary procedures can be accomplished using protected contact (PC).
9. Provide adjustable and programable overhead feeders (hay nets, browse, pellet dispensers) in a variety of locations.
10. Provide opportunities for heavy, sustained exercise (log rolling, swimming, large, linear enclosures with sustained, positive motivation to keep moving or long-distance raceways and rotation).
11. Consider opportunities for herd cooperation and self-directed elephant collaborations.
12. Provide for a variety of water play opportunities including some operated or manipulated by the elephants. Provide a variety of water conditions, shallow and deep, quiet and fast moving, warm and cool, fog and mist.
13. Use artificial lighting to simulate dawn, dusk and photo-period of 20-30 degrees latitude in indoor areas<sup>12</sup>.

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<sup>11</sup> Otto Fad.

<sup>12</sup> Source: Otto Fad



## **Symbiotic Benefits.**

Achievement of a thriving elephant herd is of course basic to this work. However, staff safety and convenience, memorable visitor experience, profitable business return on investment and community and environmental citizenship are equally important. The best plans optimize outcomes for all stakeholders.

# Comparative Studies of Elephant Exhibits<sup>13</sup>

## 1. Denver Zoo - Toyota Elephant Passage



Denver Zoo Asian elephant, rhino, tapir, etc. rotation exhibit. Photo *Google Earth*.

YouTube:

<https://www.youtube.com/watch?v=jP4tpUf-bZw>

(Note invisible underwater ledge barrier)

**Opened:** 2012

**Overall Size:** 4 ha (10-acre site)

**Elephants:** 5 cows

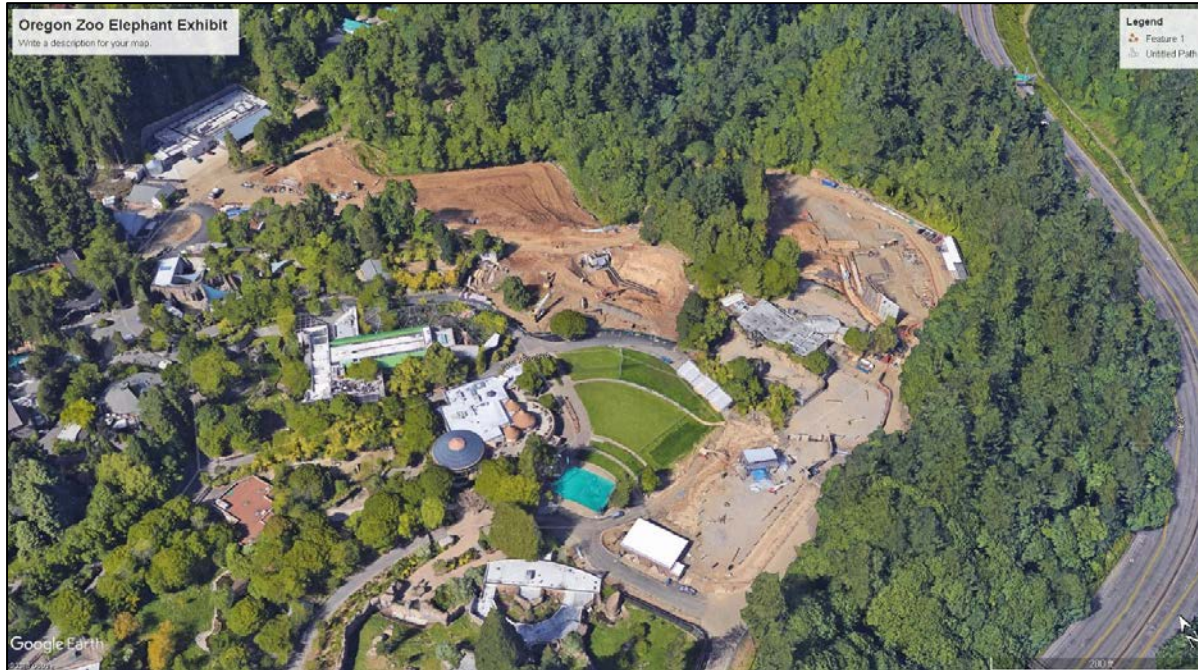
**Type:** Predominantly a habitat transect model with multiple species (Asian elephant, Indian rhino, Malaysian tapir, gibbon, clouded leopard, crane, stork, otter, fishing cat)

**Driving Concepts:** Create a facility to manage multiple bull Asian elephants. Tell the story of animals in Asian culture. Animal flex/rotation through large outdoor habitats.

**Key Elephant Features:** 8,000 sqm (2 acres) of Elephant habitats (55% land & 45% water), divided into 5 outdoor flex habitats for elephants and other species ranging from around a 1,400 sqm (one third acre to over 2,000 sqm (one-half acre). Long transfer chute connections for by-passing habitats behind the scenes. 3 crossings of pedestrian pathways including one elephant overpass. 4 large full depth elephant pools; 3 outdoor heated elephant pools; 1860 sqm (20k sf) elephant holding building with natural substrates, 235 sqm (2,500 sf) herd room and splash pool/shower.

<sup>13</sup> First three examples adapted with permission from a paper given by Jeff Sawyer, CLRdesign, Philadelphia at the 2017 Elephant Conference in Jacksonville Florida. North Carolina Zoo example adapted with permission from Ursa International, Atlanta. Others show approximate areas taken from Google Earth aerial images.

## 2. Oregon Zoo – Elephant Lands



Oregon Zoo Elephant Exhibit (under construction). Photo: *Google Earth*

You Tube:

<https://www.youtube.com/watch?v=YRDrmn19UWk>

(Note 'hot grass' barrier)

<https://www.youtube.com/watch?v=U3ZGFTvTnZ8>

<https://www.youtube.com/watch?v=hPZQFsST7Dk>

(Note high velocity water in pool)

**Opened:** 2015

**Overall Size:** 3.2 ha (8-acre site)

**Elephants:** Number unknown at printing

**Type:** Activity Based Habitat model with Asian elephant.

**Driving Concepts:** Elephant activity 18+ hours per day. Design promoting herd socialization always throughout the complex.

**Key Elephant Features:** 1 ha (2.5 acres), divided into 3 habitats. Transfer chutes to bypass habitats. 1 crossing. 1 full depth pool and 1 splash pool. Elephant holding building with natural substrates, 1000 sqm (10,750 sf) herd room. Over 20 feeding/foraging options.

**Barn:** 3200 sqm (34,000sf)

### 3. Dallas Zoo – Giants of the Savanna<sup>14</sup>



Dallas Zoo elephant, giraffe, zebra, etc. exhibit. Photo *Google Earth*.

Zoolex:

<http://www.zoolex.org/zoolexcgi/view.py?id=1595>

YouTube:

<https://www.youtube.com/watch?v=iR-UmXUq5U8>

<https://www.youtube.com/watch?v=IAIXeUH--DA>

<sup>14</sup> See Appendix for more information

**Opened:** 2010

**Overall Size:** 4 ha (10-acre site)

**Elephants:** 1 bull, 9 cows

**Type:** Combination of Habitat Transect & Activity Based models with mixed species (zebra, impala, ostrich, giraffe, guinea fowl in with elephants).

**Driving Concepts:** Full immersion African savanna experience. Flex habitat spaces to mixed or separate species.

**Key Elephant Features:** Almost 1.6 ha (4 acres) of habitats, divided into 3 habitats that can be used by elephants. One full depth pool & 3 partial depth pools.

**Barn:** 900 sqm (10,000 sf) elephant barn with natural substrate and small herd room. 3 keeper/elephant activity stations.

## 4. North Carolina Zoo



North Carolina Zoo Elephant Facility. Photo: *Google Earth*

You Tube:

<https://www.youtube.com/watch?v=tF2jsj2BDEA>

(note use of hidden dry moats and\_borrowed landscape. Very green landscape)

**Major Renovation:** 2006

**Overall Size:** 4 ha (10 acre)

**Elephants:** 2 bulls, 4 cows

**Type:** Naturalistic landscape with enrichment

**Driving Concepts:** two large, naturalistic turfed areas, each of 1.5 ha (3.5 acres)

**Key Elephant Features:** Hanging feeders

**Barn:** 900 sqm (10,000 sf)

## 5. Los Angeles Zoo



Los Angeles Zoo Elephant Exhibit. Photo: *Google Earth*.

YouTube:

<https://www.youtube.com/watch?v=-HxFgo5K2hs>

(Note automated hay feeder, feeders under waterfall. Good video)

**Opened:** 2008

**Overall Size:** 20,000 sqm (5 acres)

**Elephants:** 1 bull, 2 cows

**Type:** Activity Based Habitat model with single species of Asian elephant. Rotation through all display areas

**Driving Concepts:** Elephant activity with outdoor access 24/7.

**Key Elephant Features:** Exhibit 1. 1000 sqm (11,000 sf) with waterfall and shallow pool; exhibit 2. 2,800 sqm (30,000 sf) with large pool; exhibit 3. 3000sqm (32,000 sf) with small pool; exhibit 4. 300 sqm (3000 sf)

**Barn:** 1200 sqm (13,000 sf)

## 6. San Diego Zoo



San Diego Zoo elephant exhibit. Photo: *Google Earth*

YouTube:

<https://www.youtube.com/watch?v=JmcNNZnRJYg>

(Note waterfall)

**Major Renovation:** (Date unknown at time of printing)

**Overall Size:** 19,300sqm (4.75 acres)

**Elephants:** 2 Asian cows, two African cows

**Type:** Functional

**Driving Concepts:** Linear arrangement of five areas with two barns. Arranged to maximize public viewing capacity all along one side

**Key Elephant Features:** Exhibit 1. 4200 sqm (45,000 sf) including 700 sqm (7500 sf) pool; exhibit 2. 372 sqm (4000 sf), exhibit 3. 1370 sqm (1500 sf); exhibit 4. 1750 sqm (18,800 sf); exhibit 5. With smaller barn and three smaller yards totalling 200 sqm (2000 sf). All areas ploughed to provide soft substrate; large architectural shade structures.

**Barns:**

## 7. Dublin Zoo<sup>15</sup>



Dublin Zoo elephant exhibit. Photo Google Earth

Webcam:

<https://www.dublinozoo.ie/18/Elephants.aspx>

YouTube:

<https://www.youtube.com/watch?v=yfxOGIED3ic>

(Swimming, note brief view of hanging hay feeder);

<https://www.youtube.com/watch?v=VNJyst1rKJc>

(Note PC foot treatment)

**Opened:** Date unknown at print date.

**Overall Size:** 12,000 sqm (3 acres)

**Elephants:** 12 with 7 calves 4 years or younger in age. eight natural births in nine years.

**Driving Concept:** Landscape immersion setting with active' naturalistic habitat/enrichment programs

**Key Elephant Features:** 1. Management emphasis on frequent regrading of substrate, rearranging earth mounds, wallows, deadfall, etc. to create novelty and challenge for elephants. 2. Encourage frequent, nearly constant movement by the herd throughout the day and throughout the areas available. Randomized feed pod system to encourage long distance travel crisscrossing areas. 3. Elevated hay and feed nets. 24-hour outdoor access. 4. Water cannon for staff use. 5. Indoor overhead sprinklers create a gentle rain. 6. Training crèche for calves, adults not excluded during training.

**Barn:** 1. 760 sqm (8,000 sf), 2. 400 sqm (4,300 sf).

<sup>15</sup> See Gerry Creighton interview.



## 8. Copenhagen Zoo



Copenhagen Zoo elephant exhibit. Photo: *Google Earth*  
Photo right: *Wikipedia*



YouTube:

<https://www.youtube.com/watch?v=6eFx3a4FdDM>

<https://www.youtube.com/watch?v=ks02sNgij04>

<https://www.youtube.com/watch?v=Pf5t1ayEKGU>

**Opened:** 2008

**Overall Size:** 8,000 sqm (2 acres)

**Elephants:** 4 total: 1 bull, 2 cows and a calf

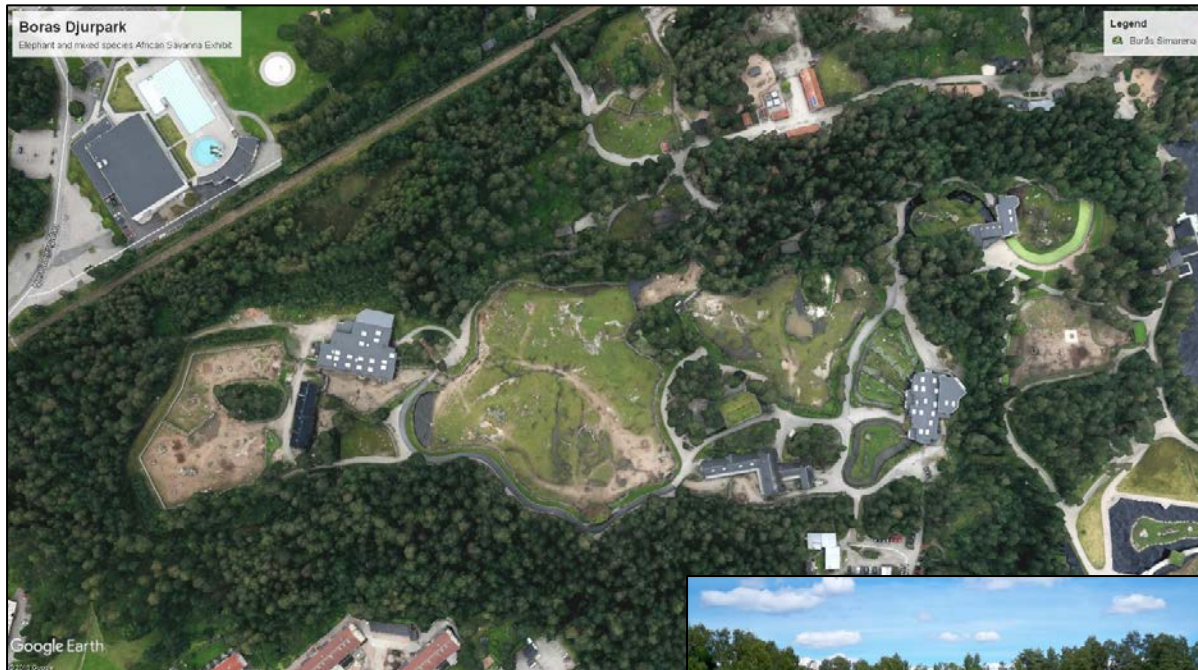
**Type:** Functional, all weather northern zoo

**Driving Concepts:** Activity-based management for inner city northern zoo

**Key Elephant Features:** 1. West outdoor yard with small pool 885 sqm (9500 sf); 2. East exhibit yard 1500 sqm (16000sf) with large 68m (220 ') long, 3m deep, 500sqm (5300 sf) pool. Enrichment features include automated hanging feeders, daily renewal of mulch/sand/branches terrain. Can rotate between outdoor yards via motorized drawbridge across public walkway.

**Barns:** 1. Indoor north transparent dome elephant hall 400 sqm (4,300 sf); 2. Indoor south transparent dome elephant hall 800 sqm (8600 sf);

## 9. Boras Djurpark



Boras Djurpark elephant, giraffe, zebra, etc. exhibit.  
Photo: *Google Earth* and Photo Right: *Wikipedia*



YouTube:

<https://www.youtube.com/watch?v=bFlnhG8Tpsw>

<https://www.youtube.com/watch?v=CbXGcmtE5ds>

**Opened:** 1962

**Overall Size:** 6.1 ha (15.25 acres)

**Elephants:** 5, 1 bull, 4 cows

**Type:** Naturalistic/functional

**Driving Concepts:** Very early example of mixed hoofstock species with elephants. A linear arrangement of large open areas of turf with natural boulder outcrops and walls.

**Key Elephant Features:** Exhibit 1. 3300 sqm (35,500 sf); exhibit 2. 2000 sqm (21,500 sf); exhibit 3. Two small shift areas 1600 sqm (17,200 sf) combined; exhibit 4. 16,000 sqm (4 acres) can be used as mixed species; exhibit 5. A smaller holding area 900 sqm (9680 sf); exhibit 6. 6000 sqm (1.5 acres) can be used for mixed species.

**Barn:** 1800 sqm (20,000 sf)

## Thoughtful Quote

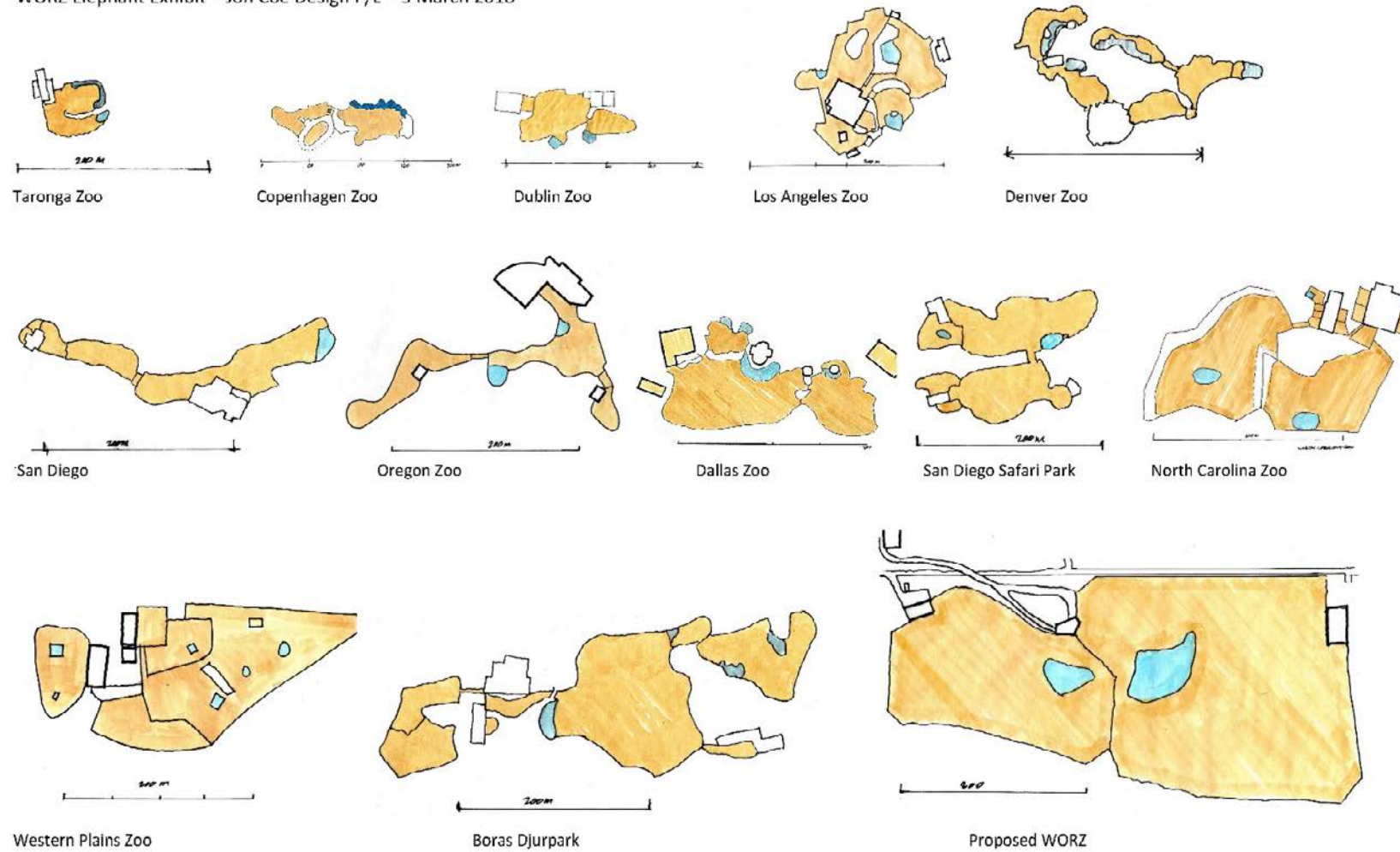
*“Marching from food source to food source isn’t ‘thriving’. What about the journey, the discoveries, the interactions with an interesting and responsive environment on the way?”*

David Hancocks (paraphrased)

APPENDIX A.

# Elephant Facility Size Comparison Chart

WORZ Elephant Exhibit – Jon Coe Design P/L – 5 March 2018



## Appendix B. Cost Comparisons

*The following are very rough cost comparisons based upon information received.*

### **Dallas Zoo – 2010**

4.6ha      Total AU\$38.64m      AU\$840sqm

### **Denver Zoo – 2012**

4ha      Total AU\$64.4m      AU\$1610sqm

### **Los Angeles Zoo – 2008**

2.6ha      Total AU\$54m      AU\$2076sqm

**APPENDIX C. Zoo Elephant Exhibit Profile Study by Nevin Lash, Ursa International (Used with permission)**  
 See PDF Attachment of original report (View > Show/Hide > Navigation Panes > Attachments)

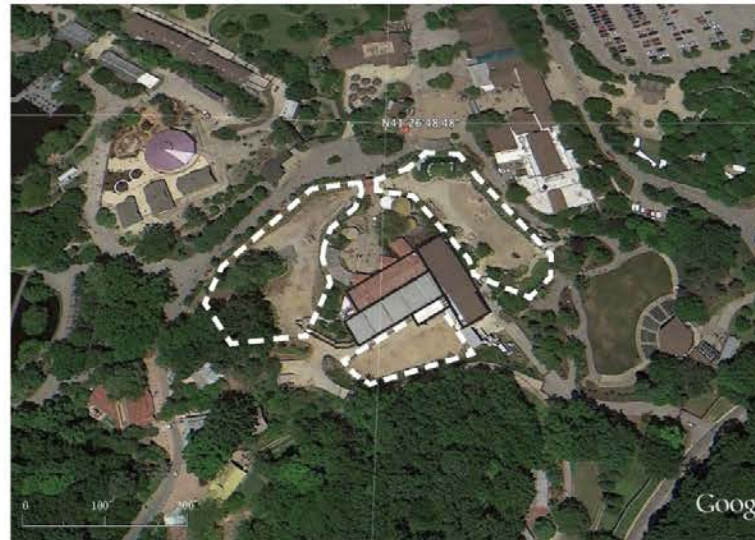
Questions	Answers
Cost of Facility/year	3030, \$/SQM, 2011 AZA Significant achievement award
Overall site area	11.4 acre (5.1 ac: Total animal area)
Size of Barn	10,000 sf
Construction type	Metal building - one wall exposed to elephants, poly clerestory at top of walls
Types of Stalls	Large community sand room (2225 sf), and four stalls (259700, 500, 366 sf) with rubber matting- would rather all at but one sand stall
Size of habitats	16,000 sf, 107,000 sf plus connected hotstock habitats (40,000 sf)
Outdoor Holding	(2) large holding areas with large shade structure (11,000 sf)
Population	0 (6)
Number of habitats	2 plus outdoor holding
Indoor Viewing	None
Hay Storage	Daily delivery from centralized hay barn
Manure handling	2 small dumpsters and 12' wide loading ramp
Browse handling	Large roll-off dumpster, daily browse work, and chipping
Enrichment built-in	Two major Activity Stations with hoists and elevated enrichment areas on perimeter service road. Lots of deadfall, subvert feeders and hanging hayracks. Water cannon, Fig tree feeder area
Administrative Space	Office, breakroom (entry), locker room/bathroom, storage room- no food prep room - use keeper hallway for large refrigerators, and hanging tool storage
Bull caging	none
Cow Caging	Heavy bollard (1' spacing) with bar diagonals and working walls
Training Walls	Multiple mesh covered training stations with foot and ear ports
Size of water moat (depth)	varies - 8' barrier
Maintaining Grass	Heavy granular mix did not work - too much stone. Mostly dirt yard
Water use	(2) waterfalls, shallow pools with tall walls, and deep (10' pool - 20x30x12' deep)
Filtration system	Fund quality pools - looked ok. Large T&P filtration system (11.5M) without Ozons - filtration yard originally outside, after major freeze, they built a building
Drinker inside and out	Nelson drinkers did not work (too small) now rubbermaid tubs. Need to build custom drum waterers
Special features	Master species management systems, fig tree feeder, hanging fruit umbrellas, food bags with up away ropes hung from davit cranes - pivot back to keeper area to refill
Size of wall	8' in most places - 4' between areas
Spacing of cables	2' (4 cables) on 8' i-beams with galv. chainlink on front
Holders	Tree protection cages, and exclosure areas at perimeter fence and to Hotstock yard
Tree protection type	Hot grasses and dangly bits from trees
Photo of Gate	Gates not wide enough at 8' - need 12' min.
Special precautions	Crane Access to all areas
Type of Sand	Sugar sand (found particles) - need designated bobcat
Rubber coating	Used on 4 stalls (but not recommended) rather use sand stalls everywhere except one bath stall
Wall treatment	Heavy steel bollards at one perimeter wall - otherwise all walls exposed for utilities and tool storage, food prep - with 15' keeper walkway with 7' painted line for elephant reach through bollards
Size of Transfer door	7'6" wide x 10' high hydraulic or manual slider. Pins with holes in upper rail to catch in 3 positions. Need to latch pin open prior to movement. Provides steel stops at open and closed position
Hydraulic system/location	Some doors, underground piping to drive doors (vault 30' with water), pump system located outside barn open to elements (including bollard 8' dia) 12' spacing, Angled 1.1/4" o-c
Cage front	Roll-Up galval single door into breakroom
Exterior keeper door	Working walls with 6'6" x 18" woven steel mesh (painted)
Mesh panels - sizes	Bridge Rail with hem beams and 6' ton hoist
Hoist	Bull into ERD
Scale	(1) Fauna Research ERD
ERD	WP Fluorescent fixtures up at ceiling level with red nightlights
Lighting types	Limited Electrical outlets at outside wall
Outlets (where)	12' wide concrete trench drains with fiberglass grating - would rather have area drains - only catching keeper aisle
Drain size	?
Hospital types	?
HVAC	Gas Radiant heaters used (on floor heating installed but used)
Ventilation	Huge ceiling fans/large roll up doors on all sides of barn
Video	Multiple cameras inside barn, none outside (but would be good)
Shade areas	several (4 20' x 30' x 25' high steel frame structures with concrete posts, and thatch roof (no misters or enrichment)
Other	Big rollup doors on three sides of barn



**Dallas Zoo: Giants of the Savanna**

## Cleveland Zoo - Elephant Crossing

Questions	Answers
Cost of Facility/Year	2011, \$25M AZA Significant achievement award
Overall site area	5 acres
Size of Barn	8,000 sf elephant area plus keeper halls, admin areas plus full basement
Construction type	Concrete building, some reuse of old. Low sawtooth roof with glass monitors with caging
Types of Stalls	Two bull stalls (30x30, 30x40), one medical/training (30x17), four cow (30x30 ea), total 6210 plus 1900 chutes animal only
Size of Habitats	Savanna yard= 27,000 sf, Mopani yard 33,000 sf.
Outdoor Holding	Off exhibit 11,000 sf with heated slab, elevated feeder
Population	1.5 (large bull) all worked together outside
Number of habitats	2 plus outdoor yard
Indoor Viewing	Long hall looking into 4 stalls plus interpr. Stalls have 6 electric cables as barrier
Hay Storage	Huge 2nd floor room can hold 800 bales
Manure handling	1 dumpster and skid steer loader
Browse handling	none seen?
Enrichment built in	12 elevated feeders (7 inside, 5 outside)
Administrative Space	Many rooms including prep kitchen, break area, office, tool storage plus basement with filtration, hydraulic and hotwire
Bull caging	Heavy bollard (1" spacing) with bar diagonals
Cow Caging	Heavy bollard (1" spacing) with bar diagonals
Training Walls	Heavy bollard (1" spacing) with bar diagonals and low foot door and ear door (ringed)
Size of water moat (depth)	Standard - 10' wall with waer 1' above
Maintaining Grass	Nothing extraordinary done - dirt
Water use	Modest pool on two sides of one exhibit with waterfall, one exhibit no water
Filtration system	High quality water system with Ozone equipment in basement
Drinker inside and out	Custom built waterers - one works better than others
Special features	Elephant crossing at visitor access walk
Size of wall	10' HOT cable barriers throughout.
Spacing of cables	Two low, the 18' or so to 8'-9'
Hotwire	Perimeter, at indoor viewing cables and tree protection zones
Trees protection type	didn't notice?
Photo of Gate	no complaints - look like 10'. Two in one yard (one from visitor trail), and one in other from service road
Special precautions	Crane access diagram (85 and 250 ton)
Type of Sand	Multiple standard sand stalls, has designated bobcat
Rubber coating	none seen
Wall treatment	Heavy concrete walls between with barred shift doors side to side, solid to chute behind
Size of Transfer door	8' wide x 12' high hydraulic sliders everywhere.
Hydraulic system/location	All doors, basement equipment room
Cage front	Standard steel door to exterior - no special keeper doots
Exterior keeper door	Standard steel doors
Mesh panels - sizes	No mesh, just diagonal bars (1 1/2" dia.)
Hoist	No Hoists
Scale	Built into chute area under floor
ERD	Major ERD (A-Z7) room
Lighting types	WP Fluorescent fixtures up at ceiling level above clerestories
Outlets (where)	didn't notice?
Drain size	18"x 18" area drains in keeper area against curb - one per stall - underdrain below sand
Hosebib types	didn't notice?
HVAC	Heated floors under sand, and forced hot air ducted system
Ventilation	didn't notice?
Video	Multiple cameras inside barn and outside
Shade areas	One large shade structure Savanna Yard
Other	Compressed air system



## Cleveland Zoo: Elephant Crossing

## Birmingham Zoo - Trails of the Elephant

Questions	Answers
Cost of Facility/Year	2010, \$10M (?)
Overall site area	7-8 acres total
Size of Barn	130x65 = 8450 sf
Construction type	Stained concrete building, metal roof, and CMU keeper wall
Types of Stalls	One conc. bull stall (40x50) one sand community room (60x50) and one concrete quarantine stall (40x50)
Size of Habitats	Single, four acre habitat. One "boma" yard/demonstration (130x40)
Outdoor Holding	3, off-exhibit sand yards off back 50'x130' total
Population	4, 0 all worked together outside
Number of habitats	One large, one demo, plus outdoor yards
Indoor Viewing	None.
Hay Storage	Loading dock with standing trailer
Manure handling	1 dumpster?
Browse handling	none seen?
Enrichment built in	none seen?
Administrative Space	Separate building including prep kitchen, break area, office, tool storage plus outdoor covered filtration, hydraulic and hotwire
Bull caging	Open bollards with single chain, working chute
Cow Caging	None
Training Walls	15" bollards with 4"x4ports
Size of water moat (depth)	9' claybank walls, small pools
Maintaining Grass	Nothing extraordinary done - dirt
Water use	two(70x40) modest pools on two sides of one exhibit - one with waterfall
Filtration system	2 vertical sand filters, sump in covered area, small enclosed electrical room
Drinker inside and out	Hand watered elephants daily, lots in stalls
Special features	All bachelor group in large habitat, secondary containment for future hoofstock 15' back from cables (new zealand fence), 9' claybank walls and 5 cable barriers
Size of wall	18" plus middle cable low
Spacing of cables	Away from cable barrier, tops of walls - recent addition around tree groups
Hotwire	Hot wire islands at 3' 6"x6" tubes with 6"x6" diagonal tubes at 12" oc. None seen
Tree protection type	None seen
Photo of Gate	Sealed concrete walls on ends, with steel bollards between stalls with top steel tube at 10' and chain at 3'
Special precautions	
Type of Sand	
Rubber coating	
Wall treatment	
Size of Transfer door	Roll-up gates/ single keeper access door
Hydraulic system/location	4x4" heavy mesh between sq. bollards
Cage front	Single beam hoist
Exterior keeper door	Surface mounted in chute at exit door
Mesh panels - sizes	None (working wall in front chute)
Hoist	WP Fluorescent fixtures up at ceiling level
Scale	On keeper wall
ERD	Stal drain with one basket at 4" drainline and grinder pump
Lighting types	Wall mounted hot and cold retractable reels with on-demand hot water
Outlets (where)	Gas Radiant heaters used (in floor heating installed on two concrete stalls)
Drain size	Hydraulically operated vents - exhaust fan?
Hosebib types	Multiple cameras inside barn and outside
HVAC	One structure in Boma yard, many trees in habitat - nothing permanent there.
Ventilation	
Video	
Shade areas	
Other	Big rollup doors on keeper side of barn



## Birmingham Zoo: Trails of the Elephant

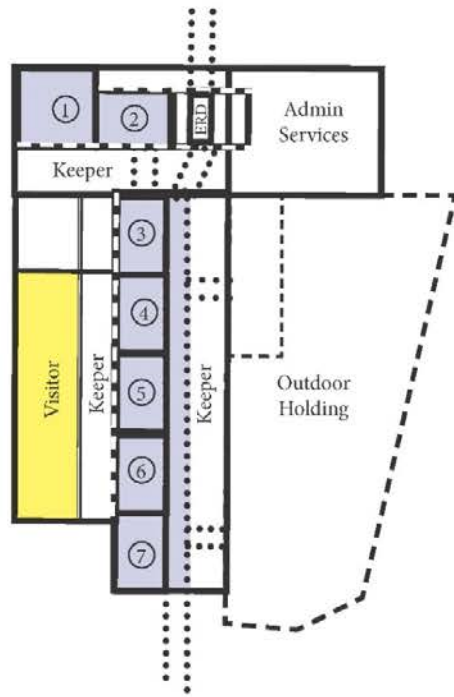


## North Carolina Zoo - Elephant on the Plains Exhibit

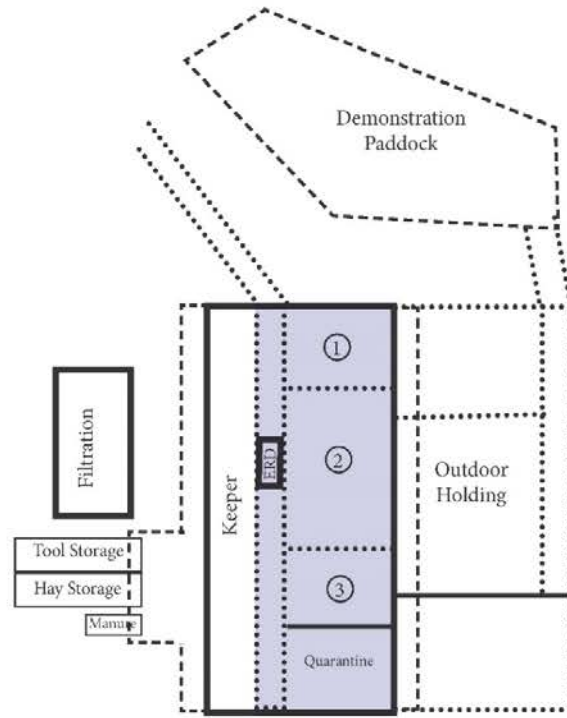
Questions	Answers
Cost of Facility/Year	2006, \$8M, renovation of exhibit, new elephant barn/owner caging
Overall site area	± 10 acre (7 ac. Total animal area)
Size of Barn	10,000 ± sf.
Construction type	Concrete walls, wood roof with large clerestory windows in cupola
Types of Stalls	Large community concrete room (1800 sf), and 3 bull stalls (2@400, 1@600 sf) and 3 cow stalls (2@400, 1@600 sf)
Size of Habitats	2 large habitats (3.5 acres each)
Outdoor Holding	(2) large holding areas each side 50x50 each area (10,000 sf. Total)
Population	2.4
Number of habitats	2 plus outdoor holding
Indoor Viewing	None
Hay Storage	Hay trailer at loading ramp
Manure handling	Small dumpster at loading ramp
Browse handling	Nothing specific
Enrichment built in	Hanging basket feeders from hoist, and several davits in outdoor holding areas, and scratching tree on habitat
Administrative Space	Office, breakroom (entry), locker room/restroom, food prep room
Bull caging	Same as Cows
Cow Caging	Heavy bollard (18" spacing) working walls
Training Walls	Multiple mesh covered training stations with foot and ear ports
Size of water moat (depth)	varies - 8' barrier
Maintaining Grass	Renovation of an established turf yard - GREEN - seed mix
Water use	(1) waterfall, deep pool with steep slope, and shallow (5') pool - 40'x40'x 5' deep
Filtration system	None- recirculated lake water only, dig out on occasion
Drinker inside and out	Neilson drinkers outside animal area - small bowl, but works
Special features	Extensive habitats and overlooks, interactive graphic game, interpretive hanger with footage of wild elephant work/helicopter. Training area at interp. Wide open dry moat viewing
Size of wall	8'-12' concrete walls at sloped dry moats
Spacing of cables	12" (8 cables) on 6" dia. bollards (8')
Hotwire	Large tree protection circles, and exclosure areas at dry moat (use of home made hot grass)
Tree protection type	Hot grasses working well.
Photo of Gate	Gates 12' min.
Special precautions	Nothing to note
Type of Sand	Sugar sand (round particles) at outdoor holding only- designated gators
Rubber coating	None used in Elephant - used in Rhino (with bad results)
Wall treatment	All four walls concrete with elephants on both sides (on two sides of barn) Raw sealed concrete only.
Size of Transfer door	7'-8' wide x 12' high hydraulic only - - some narrower. Use of manual hinged gates for chutes across keeper hall w/special latching pins.
Hydraulic system/location	All doors hydraulic grouped in several operator stations - hydraulic pump station in mechanical room on second floor, outside barn.
Cage front	Bollard (6" dia.) 24" spacing - some mesh working walls
Exterior keeper door	Steel door access into keeper hall with mesh door outside.
Mesh panels - sizes	Working walls with 2"x2" x 1/4" woven steel mesh (painted)
Hoist	Multiple beams for twin hoists - only one purchased at this point. 6' spreader beams to form cradle
Scale	In hallway in front of ERD
ERD	Home made articulating ERD
Lighting types	WP halogen fixtures up at ceiling level with perimeter fluorescents nightlights
Outlets (where)	Limited Electrical outlets at outside wall
Drain size	18" wide shallow concrete trench drains with iron grating at door crossing. Ankle breaker.
Hosebib types	Portable hose reels and fixed reels with in wall outlets
HVAC	Radiant floor heat
Ventilation	Huge ceiling fan/twin exhaust fans up in clerestory, large roll up doors on all sides of barn
Video	Multiple cameras inside barn. none outside but would be good.
Shade areas	Roof over-hang at building, large shade trees on habitat
Other	In-house caging systems, graphics and landscape



## North Carolina Zoo: Watani Grasslands Exhibit



Cleveland Zoo

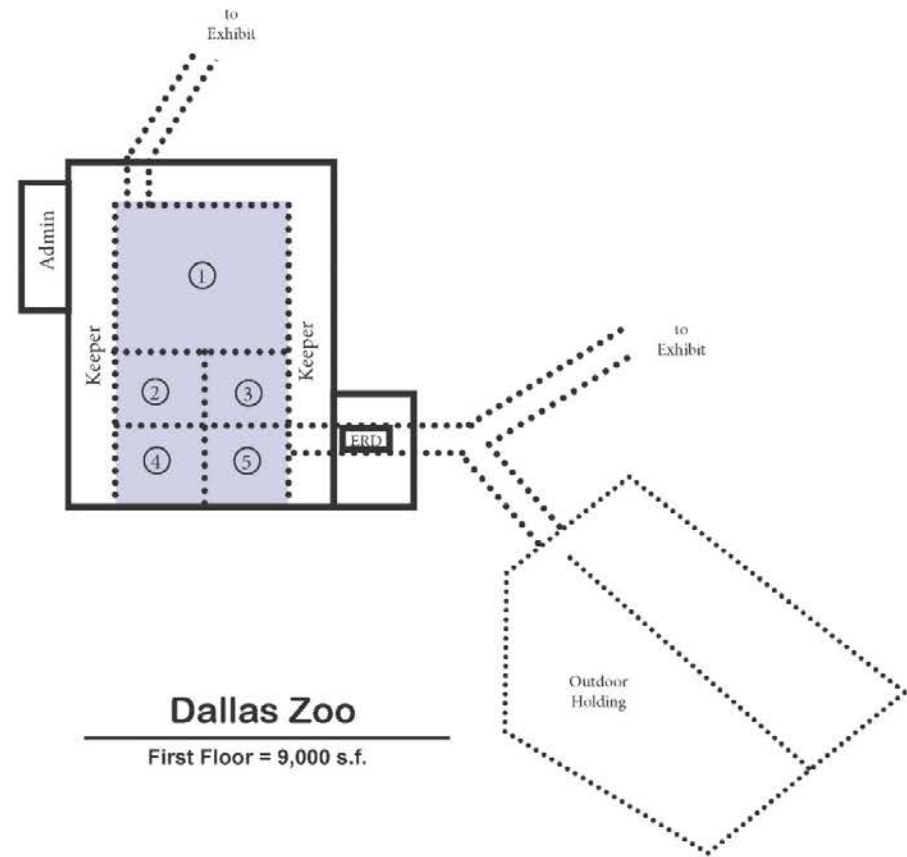
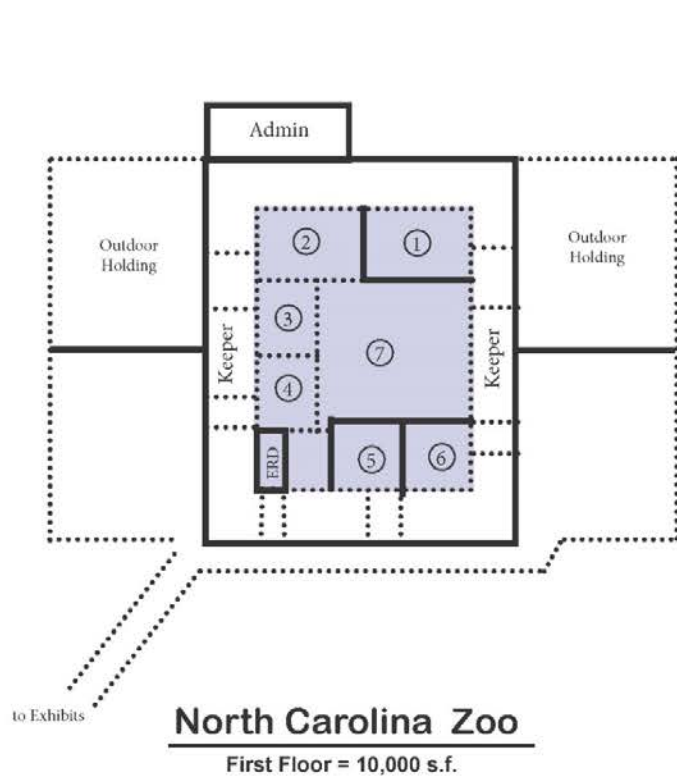


Birmingham Zoo

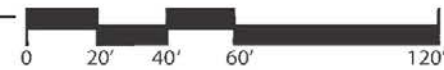


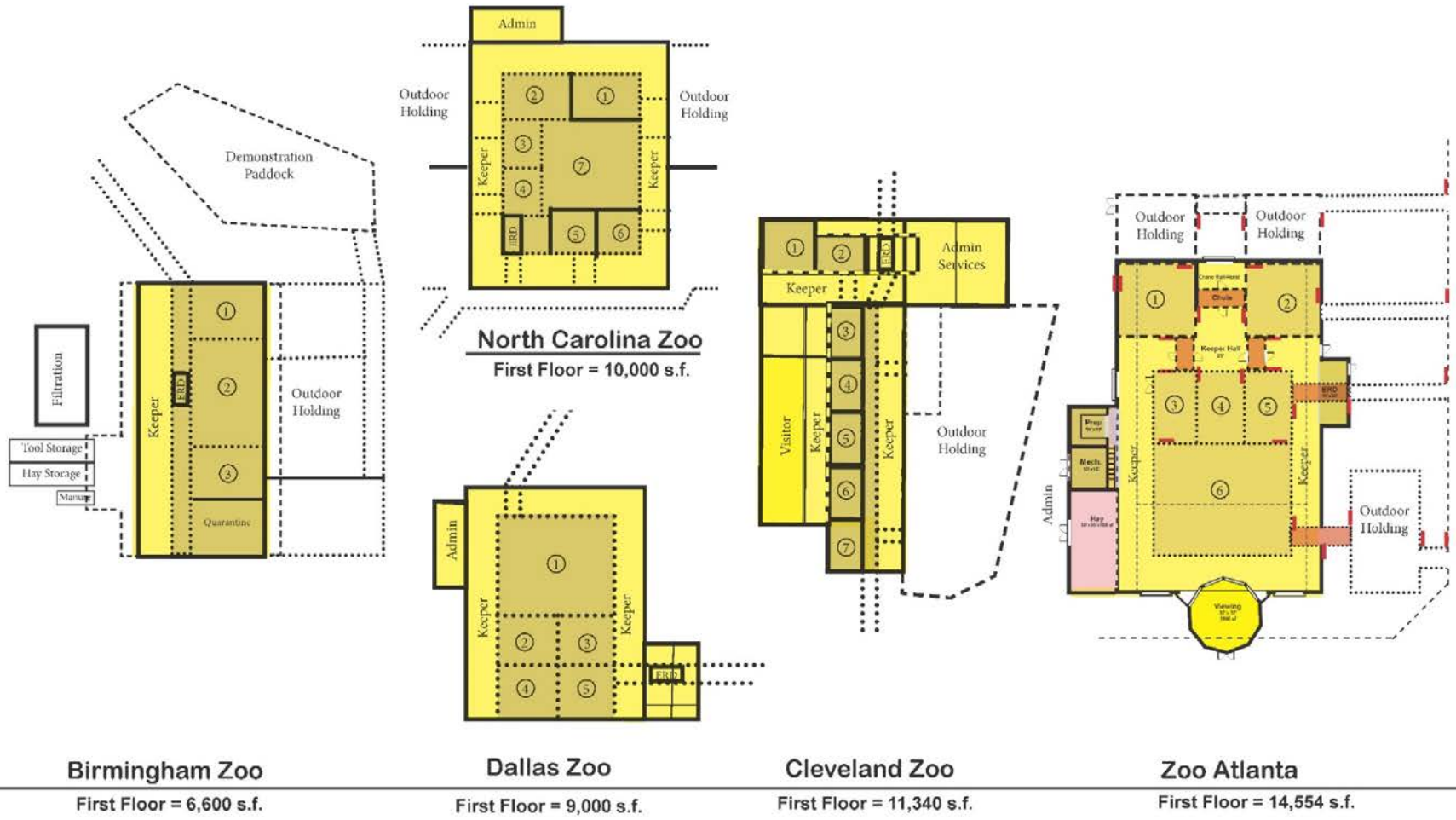
**1 COMPARATIVE ANALYSIS**  
**Elephant Barns**





**1** **COMPARATIVE ANALYSIS**  
**Elephant Barns**





**1** **COMPARATIVE ANALYSIS**  
Elephant Barns



**APPENDIX D. Presentation by Mr. Jeff Sayer**, CLRdesign, *Designing for Wellness*, Philadelphia to National Elephant Conference, Jacksonville, Fl. October 2017

**APPENDIX E. Dallas Zoo: Post Occupancy Interview by Mr. Jeff Sawyer, CLRdesign, with Ms. Karen Gibson, Elephant Curator for Giants of the Savanna.**

**Question:** Are you tracking the elephants' movements?

**Answer:** Yes, we are tracking the elephants at Giants, but we are using RFID (Radio Frequency ID) not GPS. Things that are being looked at and are important to us are:

- Nearest Neighbor-Who is each elephant in close proximity to most of the time? (Social information)
- Exhibit Utilization-What locations are each elephant favoring? How can we affect that with changing up browse placement, wallows, exhibit furniture (tree trunks covered in bark), hanging hay nets, varying feeding times throughout the day so they aren't predictable, and sand mounds for dusting/resting?
- Weight Maintenance-Average speed walked, and distance traveled for each elephant.

**Question:** What were/are the key things for doing animal introductions for a multi-species exhibit containing elephants?

**Answer:** Giants of Savanna consists of a North and South side. The North side is Giraffe, Zebra, Impala, Ostrich and Guinea Fowl. The South side is the elephant side. It was important to let the animals in the North side explore the South side before they were introduced to elephants. Likewise, the elephants were allowed access to the North side without other animals initially. This provided all animals with the knowledge of escape routes and topography, before we began introductions. Introductions were done slowly, with 1 species being added at a time with the elephants. Over time, the personal space has decreased between the species. For example, you may see an elephant and zebra eating out of the same pile of hay. Elephant to elephant introductions are done using a setup they call an "Electric curtain". PVC pipes hung on a cable with strands of hotwire hung from pipe to pipe. Food is thrown under the curtain and behavior is monitored while eating. They can touch trunks.

**Question:** What has been the longest introduction period for any new animal being introduced into the multi-species habitats with elephants?

**Answer:** The longest introduction period was done for giraffe to elephant-This was the most complicated because we had to construct a tall hot-wire "howdie" fence across part of the South Habitat.

**Question:** Have any of the elephants ever gotten aggressive with the other animals? Chasing? Fighting? Been able to corner the other animals? Serious injury?

**Answer:** Elephants have chased other species, especially in the beginning of introductions due to curiosity, not aggression. It is important to have strategically placed tree trunks and piles of substrate that animals can take cover in or get behind if they need to. We have not seen fighting nor have we had any serious injuries. A couple of times, we had an ostrich sit on the ground right in front of an elephant at shift time (when animals go back to the North Habitat for the night). The elephant nudged the ostrich gently with the base of her trunk to get her to stand back up and shift over to the North. This was amazing!

**Question:** Vice versa – Have any animals gotten aggressive towards the elephants?

**Answer:** No. However, we have had other animals approach elephants out of curiosity.

**Question:** Does the Zoo actively encourage animal/elephant movement in any way? Is food spread out in the outdoor habitats for elephants? What % of daily food do they have to seek out/forage for?

**Answer:** Hay, browse and “scatter” items (low calorie-greens) are spread throughout the exhibit to create movement. Hay is also put in overhead hay nets at Activity Stations, which are utilized in the afternoon. Staff also does several “scatter” feeds during the day

**Question:** Are the keeper towers at the back of the habitat being used? If so, how?

**Answer:** Yes, these towers currently have swinging arms that hold hay nets and staff does “scatter” feeds throughout the day from them. They do research and elephant staff make behavioural observations and give VIP tours. Even before Giants of the Savanna opened, Dallas Zoo was building a separate quarantine facility to receive new elephants. This facility has recently been enlarged and enhanced to receive the recently imported elephants from Swaziland.

**Appendix F. Dallas Zoo Giants of the Savanna Details** (2010) <http://www.zoolex.org/zoolexcgi/view.py?id=1595>

1. Species

Bovidae	<i>Aepyceros melampus</i>	Impala	8
Elephantidae	<i>Loxodonta africana</i>	African elephant	6
Equidae	<i>Equus burchelli</i>	Plains zebra	1.0.0
Equidae	<i>Equus burchelli boehmi</i>	Grant's zebra	3
Giraffidae	<i>Giraffa camelopardalis reticulata</i>	Reticulated giraffe	13
Numididae	<i>Acryllium vulturinum</i>	Vulturine guinea fowl	8
Numididae	<i>Numida meleagris</i>	Helmeted guinea fowl	10
Struthionidae	<i>Struthio camelus</i>	Common ostrich	

2. 45680 m<sup>2</sup>, thereof 26% landscaped / non-exhibit area, 11% service area, 9% guest area.
3. USD 32,000,000
4. Swimming pools allow elephants to fully submerge in 567811 liters (150000 gallons) of water
5. A water cannon allows keepers to provide additional cooling during hot Texas summers. Mud wallows and sand piles
6. The South Habitat is approximately 1 hectare (2.5 acres) in size, with undulating hills and mud banks, large pools for swimming, waterfalls, and termite mounds. The exhibit provides access to the off-exhibit elephant holding yards and the elephant barn.
7. Combined, both habitats are 259 meters (850 feet) in length.
8. The North Habitat mixed species
9. Elephant barn: 929 square meters (10000 square foot) elephant barn can hold a large elephant herd and features a communal stall with a 1.2-meter (4-foot) deep sand floor, a training wall for protected-contact training, and a track-mounted hoist with a 15000-pound capacity for enrichment items or assistance in an emergency situation. Stall floors are rubberized and heated; eight hay nets are located overhead; and large overhead fans were installed.



**APPENDIX G. Mr. Gerry Creighton. Dublin Zoo**, telephone Interview, Elephant Program Manager, Operations Manager for Animals and Grounds –12 January 2018

**Key Points**



*Mr. Gerry Creighton*

1. The entire elephant management team must be deeply committed to the principles of ‘protected contact’ (PC) management, allowing the elephants to manage themselves as much as possible. Example: staff spends more time renewing the animals’ areas than in interacting with the elephants.
2. Essential to promote multigenerational interaction within the herd, teaching and learning by the elephants themselves.
3. Encourage frequent, nearly constant movement by the herd throughout the day and throughout the areas available. Large areas are only good if elephants use them entirely and frequently.
4. Daily and lengthy exercise (several kilometers each day) model’s natural behavior, improves physical fitness and reduces stress.
5. Dublin Zoo uses widely spaced automatic, random feeding devices, feed pods and automatic feed hoists widely spaced around the elephant area and timed to encourage maximum exercise through multiple cross crossing movement patterns.
6. Elevated hay nets on hoists encourage elephants to raise heads and develop physical strength.

7. Hay nets also contain fruit and nuts along with hay so tall animals also dislodge treats for smaller animals.
  - a. This reduces food competition aggression.
  - b. Simulated natural feeding behaviors.
  - c. Must have more than one random feeder in operation to give elephants choices and minimize food competition.
8. Browse is widely scattered and always available. They place browse on hills to encourage climbing.
9. Team uses earthmoving equipment to relocate sand/mulch hills and mud wallows frequently.
10. Elephants have 24-hour access to outside areas.
11. Water cannons were installed for staff use (not used by public) but should only be used when elephants have free choice to participate.
12. Indoor area includes a 'training crèche' for training youngsters, but mothers have free access to this area during training if they wish. Example: young elephant had a shattered tusk and came into training crèche for treatment, accepting painful treatment willingly and mother didn't interfere.
13. Elephants in confined Indoor paved areas don't like noisy power washers. Dublin Zoo has a system of overhead sprinklers to wet the floors with "a gentle rain", one half of the area at a time so elephants can enjoy or avoid the shower. Later power washers are used when needed, but which elephants can avoid.
14. They have had eight natural births in nine years as confirmation of an effective management system.
15. Their elephants have tested positive for herpes (he believes most managed elephants carry this), but their highly active and low stress lifestyles allow these elephants to maintain good health.
16. Garry offered to send many training videos and other management material.
17. Garry generously and enthusiastically offered to assist in the design of the WORZ elephant facility through remote brainstorming, design review or visits to WORZ to actively participate and help train WORZ staff.

**Appendix H. Mr Otto Fad**, telephone interview, Animal Learning & Welfare Specialist at Precision Behavior, Elephant training specialist in Florida – 12 February 2018

## Key Points



*Mr Otto Fad*

for over ten years without problems. So, using these species should be fine, especial as an optional alternative (example: one elephant-only area, another for mixed species or flexible rotation concept.

7. Should have at least two large areas and on small one (elephant interaction area) plus indoor/outdoor quarantine zone out of trunk-to-trunk reach.

1. “Choice-based, trust-based, relationship-based, behavioral management” is key to Otto Fad’s approach to management of all species. His professional background includes marine mammal, elephant and orangutan behavioral management and training.
2. Otto strongly supports giving elephants much more choice and control.
3. Thinks caregivers and their work should still be visible as part of the ‘Message’ to guests.
4. Use ‘immersion’ visitor experience principles such as multiple small unexpected views, entire animal area not entirely visible from any one area.
5. Mixed species exhibits with elephants can create many problems by giving elephants opportunities to ‘misbehave’, especially with smaller animals.
6. But Busch Gardens, where he was director of their elephant program, did have elephants with zebra and oryx

8. Elephant interaction area (EIA) is a small training area.
  - a. Should be set up, so it can be open to the general public or isolated for VIP viewing as needed.
  - b. Animals are attracted to training/working/vet sessions, free choice to come or leave or just watch. Animals are not usually isolated in this area.
9. Gates and short raceways interconnect these areas with barn without having to go through one area to reach another.
10. Large enclosures need two points of access.
11. Frequent access for service vehicles such as dump trucks and large front-end loaders is essential.
12. Barn (night area).
  - a. Elephants should have 24/7 access to outdoor areas. In this case only one indoor stall needs to be deep sand
  - b. If elephants must be confined overnight, then large group room with deep sand/mulch floor is needed.
  - c. Protected contact working areas such as working walls, keeper aisle barriers and such should be mesh covered to prevent animals reaching through with their trucks.
  - d. Strongly suggests care staff areas such as office, break/training room, hay storage, etc. are closely related to elephant areas, and not located remotely.
13. No need for separate bull barn but do need to be able to separate bull(s). Most often bull can mix with herd. Natural group interaction is very important.
14. All gates should be hydraulic and lockable in both open and closed positions.
15. Is Elephant Restraint Device (ERD) required? It is not needed with protected contact reward-based training. Very expensive waste of money.
16. Otto supports use of safe dry moats with hidden barriers and open vistas; animals have free access.
17. Should create rolling, diverse topography (built with fill from moat excavation?)

18. Water features are very important.
  - a. Linear water bodies, especially with moving water, are better than static pools.
  - b. Think of ways for elephants to control water characteristics (Elephant jacuzzi?).
  - c. He likes to create new small 'rivers' (linear water/mud wallows) every few days. Elephants really enjoy this surprise.
19. Idea: have a large highly naturalistic area with browse and feed available (perhaps mixed species) as well as a smaller highly manipulated landscape area. Elephants can choose where to go.
20. Locate some feeding areas (automated or manual) and overhanging shade areas near guest viewing areas.
21. Otto suggests having a restaurant overlooking elephant area.
22. Baseline research in existing facilities followed by long-term research in new facilities is very important.

**Appendix I. Mr Alan Roocroft**, telephone interview, Elephant Business Inc. – 2 March

**Key Points**



1. Where do we go from here? Bits and pieces of the next generation elephant program are in place around the world but need to be combined and consolidated within a long-term plan.
2. Every new facility should be built with a longevity plan written into the master plan. This would be a 10-year evaluation plan written into the constitution of the zoo at a board level. The hiring of executive staff would hinge on this topic, so the elephant program doesn't start to wane based on personal interest and over time. Identify space to grow in the master plan, number of staff, elephant subdivision, partners so the national program has credible space to grow, embracing future successes, ideas and societal concerns, we shouldn't identify ourselves as the expert. Let's use the elephant's own biology as our guide from the onset.
3. Elephants have very long lives and very long generations. We need a 50 and 100-year succession management plan! The plan will identify our potential successes and action needed based on that success.
4. Think of the mother elephant raising her calf. She needs certainty that her life will succeed, and her daughters' or sons' lives will succeed, taking their place in the herd (or country-wide population) into future herd generations.
5. This long-term succession plan includes elephants and staff and curators and directors and the community.
6. Continuous long-term support, collaboration and leadership is needed from all stakeholders for long-term success!
7. Start-stop, cyclic support isn't sufficient to reach our goals.
8. Long-term succession plans need 5-year updates to insure opportunistic evolution.
9. Elephant facilities/habitats need flexibility for renovation and expansion.
10. Ongoing pertinent scientific evaluations are needed to identify areas of improvement.
11. This long-term succession plan must be integrated with other regional zoos into a regional succession plan.
12. Elephant success means total buy-in within the zoo's work force. The sales clerk in the gift shop and the security guard can talk with knowledge and enthusiasm about the zoo's elephant program.
13. Use elephant biology/ecology to guide planning.

14. Three essential pillars of elephant program support if they are going to survive in a zoo environment: Keeper safety, animal welfare and Institutional & community credibility, if the institution doesn't succeed neither will elephant programs.
15. Training of elephants is easy, elephants having babies is easy, we just need to set ourselves up for success by planning for success. The difficulties thus far have been correct staff training in correctly built Protected Contact designed facilities. Sustainably planning, having multiple babies on a planned time frame based on elephant natural history needs to be national & international zoo community goals.