Guidelines on minimum dimension of enclosures for housing animals of different species in Zoos

Introduction

The Central Government has, through amendment of the Wild Life (Protection) Act, 1972 and notification of Recognition of Zoo Rules, 2009, prescribed minimum standards and norms for housing, upkeep and healthcare of Indian animals housed in the different zoos of the country. However guidelines on the minimum dimension on housing of various exotic species of animals and birds are not yet prescribed 137 species of exotic animals and birds are currently housed in various Indian zoos.

Dimensions and size of animal enclosures

In order to meet the above requirement, a sub-committee was constituted to develop the minimum prescribed standards for housing the exotic animals and birds. Following recommendations of the committee are prescribed:-

(1) As per the Recognition of Zoo Rules, 2009, the land area to be given to any animal exhibit enclosure should be decided giving due regard to the maximum number of animals that can be displayed in the animal enclosure. Many times multiple species can be housed together for display. However, the maximum number of animals that can be displayed in a single enclosure shall vary from species to species.

(2) The area of the enclosure should have adequate land space for facilitating the animals to have free movement and exercise, adequate area to rest in shade and bask in the sun and have safe refuge from dominant animals and express their natural, social and reproductive behaviour.

(3) The animal exhibit enclosures should not be given geometrical shapes, as the presence of corners is not congenial to smooth and unrestricted movement of animals. Enclosures with greater depth facilitate the animals to keep a safe distance from the visitors and are always preferable.

(4) The dimensions and the area of any enclosure should be decided giving due regard to various factors mentioned above and the topography and naturalistic features of site identified for construction of the enclosure. The indicative sizes for the outdoor

enclosures and feeding cubicles/night shelter of exotic animals are given in Annexure I. Since, the indicative sizes for outdoor enclosures at Annexure I are minimum, zoo operator should always try to provide for larger and bigger outdoor to the extent possible.

It is desired that display of animals in a zoo should be done on the concept of nature immersing enclosures with following objectives:

(i) Landscape around every animal exhibit/ enclosure should comprise of plantations of appropriate tree and shrub species of adequate extent and of such shape that the enclosure should not be visible to the visitors from any place other than the animal viewing areas.

(ii) All the hard exteriors of the enclosure i.e. the enclosure barrier and the frontage of the feeding cells, feeding kraals should be effectively camouflaged through planting of bamboo, dwarf tree species and shrubs.

(iii) Planting of appropriate trees and shrubs should be done around the animal viewing areas to break up the visitors into small viewing groups.

(iv) Visitors should be made to move through the green landscape around the enclosure for reasonable distances.

(v) Planting of appropriate trees species should be done in the enclosure to ensure that entire animal enclosure is not visible to the visitors from any of the viewing points. The animal should be seen to the visitors in its near natural settings.

(vi) Enclosure Barrier-Barrier of every enclosure should be of a design, dimension and material that can effectively contain the animals housed within the enclosure and safeguard against any animal escaping from the enclosure. Due care should also be taken to ensure that the shutters and doors fitted in the enclosure, kraal and feeding cell are of such material and design that these can not be broken/ opened by the animals housed in the enclosure. The barriers of all the enclosures, except the animal viewing area could comprise of natural cliffs (if any), wall, glass, power fence or chain-link fence, etc. of prescribed dimensions. However, in animal exhibit enclosures, provision of a moat could be made in the animal viewing area, to facilitate the visitors in having an

unobstructed view of the animals without getting close to them. Wet moats shall normally not be used as enclosure barrier for the viewing area except in case of water loving animals. The total land area under moat should not exceed 20% of the land area of the enclosure.

(vii) Other safeguards :

(a) Due care should be taken to ensure that no power line/ power cable passes over any animal enclosure.

(b) Enclosure barrier should be erected/ constructed at a safe distance from such trees that can aid the animals to escape from the enclosure or damage the enclosure barrier.

(c) Where walls are used as enclosure barriers, due care should be taken to plaster the same with such proportion of cement mix that the plaster does not wither away leaving gaps that could be used by the animal as holds for escaping out of the enclosure.

(d) Live wire overhangs or chainlink should be used to prevent the animals from escaping out of the enclosure.

(e) Water pipelines and sanitary fittings should be fixed within the enclosure in such a manner that the same can not be used by the animal as aid to escape from the enclosures.

(f) Adequately a deep foundation should be provided for enclosure barrier housing the burrowing species.

(g) Attention should be given to different barrier materials, fixtures, shutters etc. to see that they are safe and can not be broken or cause injuries to animals.

Minimum prescribed size for feeding/retiring cubicle for important mammalian species of exotic animal and birds.

S. No.	Name of the species	Minimum size of the outdoor enclosure (sq. mtrs.)	Number of animals /birds to be housed	Size of the feeding cubicles/ night shelter (mtrs.) (Length x Breadth x Height) for each animal/ bird.	Minimum size of the water body (if any) (in sq. mtrs.)
1.	Flightless birds, Emu, Cassowary,	500 (upto 10 nos.)	1:1	3 x 2 x 2.5	-
2.	Exotic Pheasants	80 (with minimum size of the aviary – 3 x 3 x 6 m)	1:3		-
3.	Flying birds	80 (with minimum size of the aviary – 3 x 3 x 6 m)	2:2	Height of the aviary should be 6 mts	-
4.	Parrots, Macaws, Cockatoos, Conures, Rosella	80 (with minimum size of the aviary – 3 x 3 x 6 m)	2:2	Height of the aviary should be 5 mts	-
5	Baboon, Capuchin, Lemur, exotic monkeys	500	1:1	2 x 1.5 x 2.5	-

6.	Marmosets, Squirrel monkey	50	1:1	1 x 1.5 x 2	-
7.	European bear	1000	1:1	2.5 x 1.8 x 2.5	-
8.	Cape buffalo	1500	1:1	3 x 2 x 2.5	-
9.	Chimpanzee, Orangutan, Gorilla	1000	1:1	2.75 x 1.8 x 3	-
10.	Fallow deer, Sikka deer & Lechwe deer	1000	2:3	3 x 2 x 2.5	-
11	African elephant	5000	1:1	8 x 6 x 5.5	-
12	Giraffe	1500	1:1	8 x 5.5 x 6	-
13	Hippopotamus	1000	1:1	5 x 3 x 2.5	-
14	Jaguar	500	1:1	2 x 1.8 x 2.5	-
15	African Lion	1000	1:1	2.75 x 1.8 x 3	-
16	African Rhino/ White Rhino	2000	1:1	5 x 3 x 2.5	-
17	Tapir	500	1:1	2.5 x 1.5 x 2.5	100 m2
18	Tigers (other than Bengal tiger)	1000	1:1	2.75 x 1.8 x 3	-
19	Zebra	1500	1:1	3 x 2 x 2.5	-
20	Wallaby	300	1:1	2.5 x 1.5 x 2.5 The floor should have a provision of ramp.	-

21	Crocodiles/ Alligator African Dwarf, American, Australian Freshwater, False gharial Crocodile Morelets, Nile, Siamensis, Snouted, African Slender, West African Dwarf Gavial False, Caiman Spectacled, Yacare & Dwarf.	500	1:1		200 (with a depth of 2 mtrs.)
22	Iguana	100 (covered partly by chain link	1:2	No house required	May also keep reptile house/ glass terrarium type enclosure
23	Giant Aldabra tortoise	200	1:1	With 20 sq. mtrs. (small shade from rain & heat)	-
24	Small aviary birds (Love birds, finches, Lorikeet, Java sparrows, Munia, Budgerigar	15	2:3	Earthen pots of appropriate size for nesting and shelter should be provided.	-

Minimum prescribed size for Feeding/Retiring Cubicle for important mammalian Species of Captive Animals

Name of the Species	Size of the feeding cubicle/night shelter for each animal (meters)			Name of the species	Size of the feeding cubicle/ night shelter for each animal (meters)		
	Length	Breadth	Height		Length	Breadth	Height
Tiger, Asiatic lion	2.75	1.80	3.00				
Common leopard, Clouded leopard & Snow leopard	2.00	1.80	2.5	Musk deer, Nilgiri Tahr, Chinkara, Four horned antelope, Bharal, Goral, Wild sheep and Markhor	2.5	1.5	2.5
Small Cats	1.8	1.50	2.0	Mouse deer	1.5	1.0	1.5
Sloth bear, Himalayan black bear, Brown bear and Malayan sun bear	2.5	1.8	2.5				
Monkeys and Langurs	2.0	1.5	2.5				
Civets, Binturong, Otters, Ratel, Hogbadger, Martens, Red panda, Wolf, Jackal and Wild dog	2.0	1.5	2.5				
Elephant	8.0	6.0	5.5	Slow loris and Slender loris	1.0	1.0	1.5
One-horned Indian Rhinoceros	5.0	3.0	2.5				
Wild buffalo, Yak, Indian gaur and Wild ass	3.0	2.0	2.5				
Brow antlered deer, Hangul & Swamp deer	3.0	2.0	2.5				

Minimum prescribed sizes for outdoor open enclosures for important Mammalian Species in Captivity

Animals/ Species	Minimum size of outdoor enclosure (per pair) (Square meters)	Minimum extra area per additional animal (Square meters)
Tiger and Lion	1000	200
Panther, Clouded leopard and Snow leopard	500	100
One-horned Indian Rhinoceros	2000	400
Brow antlered deer, Hangul, Swamp deer	1500	100
Wild buffalo, Indian bison and Wild ass Bharal, Goral, Wild	1500	200
sheep and Serow	500	100
Sloth bear, Himalayan black bear, Brown bear and Malayan sun bear	1000	100
Red panda, Jackal, Wolf and Wild dog	400	100
Monkeys and Langurs	500	100

MINIMUM PRESCRIBED SIZES FOR OUTDOOR ENCLOSURES FOR IMPORTANT BIRDS IN CAPTIVITY

Animals/ Species	Minimum size of Aviary (Square meters)	Minimum height of the aviary (meters)	Minimum size of the water body within the aviary (Square meters)
Birds of prey	300	8	10
Pheasant *	80	3	3
Water birds (mixed species enclosure)	300	8	60 (with a depth of 1.5m)
Flying birds (mixed species enclosure)	300	8	20
Flying birds (single species)	80	6	2

* In case of Peafowl the aviary size should be kept 160 sq. m.

MINIMUM PRESCRIBED SIZES FOR OUTDOOR OPEN ENCLOSURES FOR IMPORTANT REPTILES AND AMPHIBIANS IN CAPTIVITY

Animals/ Species	Minimum size of the enclosure (Square meters)	Minimum size of the water body within the enclosure (Square meters)
Crocodile/ Gharial	400	150 (with a depth of 2 meters)
Python	80	6
Cobra, Rat snake, Vipers	40	4
Sand boas	40	4
Monitor lizards *	80	6
Chameleons and Small lizards	40	4
Tortoises	40	4
Turtles	80	40 (with a depth of 2 meters)
Amphibians	10	4 (with a depth of 0.5 meter)

* In case of Water monitor lizard the size of water body should be kept at 40 sq. meters with a depth of 1.5 meters.

NOTE

1. The dimensions have been given only in respect of the species, which are commonly displayed in zoos.
2. No dimensions for outdoor enclosure have been prescribed for Chinkara and Chowsingha because of the problem of infighting injuries. The enclosure for these species could be a group of small sized enclosures with fewer animals in each. Care should be taken to ensure that there should be no competing mating males in each small enclosure.
3. The designs of enclosures for endangered species, not covered by this Appendix, should be finalized only after approval of the Central Zoo Authority.

7 (j). Guidelines on use of innovative exhibit design and barriers' design for holding and display of animals and birds in Indian Zoos

1. Animal Types, Enclosure & Barrier Recommendations

Animal	Front barrier	Rear barrier	Remarks
Tiger, Asiatic Lion	V-shaped dry or wet moats, glass viewing structures at special viewing areas. Depth of moat: 5m Horizontal width at he top: 8 m	U-shaped dry moats OR chain-link fences of 5 m high with 1.5 m overhang at 600 angle or high rock walls.	1. The hot wire barrier may be provided to prevent animals coming into the moat. 2. In case of want of space for a moat, all sides can be provided with chain-link mesh fence with glass fixed at 2/3 places for unhindered viewing.
Leopard/Jaguar	1. Chain link mesh fence of 4 m high with inclined inward steel plate of one meter width on the top. The steel plate should be placed at an angle of 600. 2. Wherever space is available 5 meter deep moat with overhang of hot wire.		For a unhindered vision, use of toughened glass of proper specifications at one or two points could be used.
Jackal, Wolf, Hyena, Wild dog	V-shaped (flat bottomed) dry moats on the visitor side. Depth of moat: 2.6 m Width of moat: 5 m	V-shaped (flat bottomed) dry moats or chain-link fences of 2.5 m in height.	

Bear/Civets/ Lesser cats	U-shaped / V-shaped dry moats on the visitor side.	U-shaped / V-shaped dry moats or high smooth walls, or chain-link fence of 4m high with inclined inward steel plate of one meter width on the top.	The steel plate should be placed at an angle of 600.
Primates	U-shaped / V-shaped dry moats, shallow wet moats, netted aviaries with glass viewing. Moat width for langur: 7 m Moat depth for langur: 5 m Moat width for macaque: 6 m Moat depth for macaque: 4 m or chain-link mesh of 5 m high with inclined steel plate of 1m width.		a. In case of moated enclosures, the inner side of the enclosure should be provided with overhang with 2 strands of hot wire attached below the slanting portion. b. The moated enclosure should have clearance of tree of at least 9 m from the inner side of fence/moat.
Deer and antelopes	Chain-link fences all around the paddock, V-shaped (flat bottomed) dry moats of 2.5 m depth having slope width of 6m.	V-shaped (flat bottomed) dry moats or chain-link fences	a. The visitors view should be restricted. b. Slope should be grass sodded (turfed) or stone pitched depending on the site condition.

Gaur, Wild Boar, Rhinoceros, Asian Elephant	V-shaped dry moats, or low walls (clay banks), cattle grids (for gaur) or 5 meters away a sunken B.G. Rail Barrier with 1 to 1.5m high or hot wire fence made in depression, created by excavating earth for camouflaging it from viewer.	
Pheasant	Covered type enclosure of wire mesh of 3 meter high, 8 m depth, 4 m width	a. The double galvanized mesh of 12mm x 12mm x 4g should be placed 0.5m below the earthen surface to prevent rodents. b. The plinth should have 7 cm (over hang) to prevent rodents/snakes approaching the chain link mesh from the viewer side or either side.
Walk through aviary	i. The area for the walk through aviary should not be less than 2 hectares with at least 100 m wide withdrawal area for the birds. ii. The height of the aviary should be 18 m.	a. Adequate vegetation should be provided b. Provision of board walk shall be ideal for visitors.

Terrestrial birds	The height of the mesh covered enclosure should be at least 5 meters.	Sufficient vegetation and perches should be made available to the birds.
Water bird aviary	i. The chain link mesh covered aviary could be ideal. ii. The height of the aviary should be kept 12 m.	a. The chain link used for the aviary should be off 45 m x 12-15 m in dimension. b. The 50% of the enclosure area should be covered by water body with flaring angle or aeration.
Birds of Prey/ flying birds	The dimension of the chain link mesh covered should be 45mx12-15mx12m high	
Crocodile / Gharial enclosure	Open 'V' shape moated enclosure with dry moat should be provided.	a. It must be ensured that enclosure should have at least 20% space covered by water (pool). b. Sufficient area shall be provided for basking. Sand must be available for gharials for basking and egg-laying.

2 (a). Other decisions taken in the meeting are as follows:-

(i) It was agreed there should be increasing use of other barriers like hot wire (power fence), concealed ones, glass fronted viewing, rails etc.

(ii) Use of stainless steel instead of mild steel, particularly on posts and chain-link mesh should be encouraged due to its longevity, avoidance of rust and lighter weight.

(iii) Environmental enrichment like perches, dens, ledges, nesting boxes, feeding logs, wooden logs, wooden platform, wallow, pools, logs, vegetation, bunchy earth should be provided in the exhibits. For this a letter can be addressed to all the zoos for sending their plan with requirement of funds for the purpose. This can be supported by CZA as it is a small component.

In case of new enclosures, it should be in built with the design and should be limited to 2% of cost.

(iv) Nocturnal animal houses should provide adequate space, with open air kraal and sufficient number of animals to be rotated and arrangement for proper regulation of lighting.

(v) Reptile houses particularly in the cooler regions, should be covered and glass fronted with assured heating arrangement in winter i.e. back up power supply.

(vi) Large, medium and small zoos located in urban areas or within 500 meters from human habitations should be bounded with perimeter wall on all sides of 2 m height from the ground level.

(vii) In case of zoos with less than 10 hectares area, creation of moated enclosures should be avoided.

2(b) Use of different materials in barriers

Use of different materials in designing barriers at animal enclosures was discussed and it was decided to use many alternative materials like stainless steel mesh and posts, anodized aluminum frame, piano wire, hot wire (power fence), glass, vegetation, rail, invisible cattle grid type barrier.

2(c) Use of alternatives

No particular barrier can be specified for all situations. Different materials can be used either completely or in combination depending on the species, space, availability, topography, climate and existing display type of the zoo. There should be scope for innovation by the zoo management.

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