

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 the top: 8 m	U-shaped dry moats OR chain-link fences of 5 m high with 1.5 m overhang at 60° 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 60°. 2. Wherever space is available 5 meter deep moat with overhang of hot wire.		For an 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.	

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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	<p>U-shaped / V-shaped dry moats, shallow wet moats, netted aviaries with glass viewing.</p> <p>Moat width for langur: 7 m</p> <p>Moat depth for langur: 5 m</p> <p>Moat width for macaque: 6 m</p> <p>Moat depth for macaque: 4 m</p> <p>or chain-link mesh of 5 m high with inclined steel plate of 1m width.</p>	<p>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.</p> <p>b. The moated enclosure should have clearance of tree of at least 9 m from the inner side of fence/moat.</p>	
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	<p>a. The visitors view should be restricted.</p> <p>b. Slope should be grass sodded (turfed) or stone pitched depending on the site condition.</p>

Legislation, Policy, Guidelines and Strategy

<p>Gaur, Wild Boar, Rhinoceros, Asian Elephant</p>	<p>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.</p>	
<p>Pheasant</p>	<p>Covered type enclosure of wire mesh of 3 meter high, 8 m depth, 4 m width</p>	<p>a. The double galvanized mesh of 12mm x 12mm x 4g should be placed 0.5m below the earthen surface to prevent rodents.</p> <p>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.</p>
<p>Walk through aviary</p>	<p>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.</p> <p>ii. The height of the aviary should be 18 m.</p>	<p>a. Adequate vegetation should be provided</p> <p>b. Provision of board walk shall be ideal for visitors.</p>

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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	<p>i. The chain link mesh covered aviary could be ideal.</p> <p>ii. The height of the aviary should be kept 12 m.</p>	<p>a. The chain link used for the aviary should be off 45 m x 12-15 m in dimension.</p> <p>b. The 50% of the enclosure area should be covered by water body with flaring angle or aeration.</p>
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.	<p>a. It must be ensured that enclosure should have at least 20% space covered by water (pool).</p> <p>b. Sufficient area shall be provided for basking. Sand must be available for gharials for basking and egg-laying.</p>

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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