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**SANS 1884-1:2004**

Edition 1

## **SOUTH AFRICAN NATIONAL STANDARD**

### **Holding pens for temporary housing of animals**

#### **Part 1: Holding pens for wild herbivores at auctions and in quarantine facilities**

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# SANS 1884-1:2004

Edition 1

## Table of changes

Change No.	Date	Scope

## Abstract

Specifies the minimum requirements for holding pens for wild herbivores at game auctions and in quarantine facilities.

Concentrates on constructional and containment aspects, and does not cover animal management methods.

Also does not cover temporary field pens, holding pens for animals in zoos or abattoirs, or holding pens used for housing of trained elephants.

## Keywords

auctions, herbivores, quarantine, specifications, structural design, wildlife.

## Acknowledgement

Standards South Africa wishes to acknowledge the valuable assistance derived from the publications listed in the bibliography.

## Foreword

This South African standard was approved by National Committee StanSA SC 5140.38A, *Steering committee for nature conservation – Translocation of wildlife*, in accordance with procedures of Standards South Africa, in compliance with annex 3 of the WTO/TBT agreement.

SANS 1884 consists of the following parts, under the general title *Holding pens for temporary housing of animals*:

*Part 1: Holding pens for wild herbivores at auctions and in quarantine facilities.*

*Part 2: Vehicles for transportation of wild herbivores by road* (in course of preparation).

This list is not exhaustive, and other parts are under consideration.

Annex A is for information only.

A reference is made in the note to clause 5 to “relevant authority”. In South Africa this means the Directorate of Animal Health at the National Department of Agriculture.

A reference is made in 5.1 to “national regulations and statutory requirements”. In South Africa this means the Animal Diseases Act, 1984 (Act No. 35 of 1984).

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## **Holding pens for temporary housing of animals**

### **Part 1:**

#### **Holding pens for wild herbivores at auctions and in quarantine facilities**

### **1 Scope**

**1.1** This part of SANS 1884 specifies the minimum requirements for holding pens for wild herbivores at game auctions and in quarantine facilities.

**1.2** This part of SANS 1884 does not cover temporary field pens or holding pens for animals in zoos or abattoirs.

**1.3** This part of SANS 1884 does not cover holding pens for housing trained elephants.

### **2 Normative references**

The following standards contain provisions which, through reference in this text, constitute provisions of this part of SANS 1884. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this part of SANS 1884 are encouraged to take steps to ensure the use of the most recent editions of the standards indicated below. Information on currently valid national and international standards can be obtained from Standards South Africa.

SANS 457-2 (SABS 457-2), *Wooden poles, droppers, guardrail posts and spacer blocks – Part 2: Softwood species.*

SANS 457-3 (SABS 457-3), *Wooden poles, droppers, guardrail posts and spacer blocks – Part 3: Hardwood species.*

SANS 1288 (SABS 1288), *Preservative-treated timber.*

SANS 1475-1, *The production of reconditioned fire-fighting equipment – Part 1: Portable rechargeable fire extinguishers.*

SANS 1475-2, *The production of reconditioned fire-fighting equipment – Part 2: Fire hose reels, hydrants and booster connections.*

SANS 1910, *Portable refillable fire extinguishers.*

SANS 10005 (SABS 05), *The preservative treatment of timber.*

SANS 10104 (SABS 0104), *Handrailing and balustrading (safety aspects).*

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SANS 10105-1 (SABS 0105-1), *The classification, use and control of fire-fighting equipment – Part 1: Portable fire extinguishers.*

SANS 10105-2 (SABS 0105-2), *The classification, use and control of fire-fighting equipment – Part 2: Fire hose reels.*

SANS 10162-1 (SABS 0162-1), *The structural use of steel – Part 1: Limit-states design of hot-rolled steelwork.*

SANS 10162-2 (SABS 0162-2), *The structural use of steel – Part 2: Limit-states design of cold-formed steelwork.*

SANS 10331 (SABS 0331), *Translocation of certain species of wild herbivore.*

SANS 10400 (SABS 0400), *The application of the National Building Regulations.*

SANS 60335-2-76/IEC 60335-2-76 (SABS IEC 60335-2-76), *Safety of household and similar electrical appliances – Part 2-76: Particular requirements for electric fence energizers.*

### **3 Definitions**

For the purposes of this part of SANS 1884, the applicable definitions given in SANS 10331 and the following definitions apply:

#### **3.1**

##### **acceptable**

acceptable to the authority administering this part of SANS 1884, or to the parties concluding the purchase contract, as relevant

#### **3.2**

##### **crush**

purpose-made area in a passageway, in which an animal can be humanely constrained for animal management purposes, for example, for examinations or the administration of injections

#### **3.3**

##### **quarantine facility**

officially approved holding area where sick animals or captive wild animals intended for import or export are isolated and accommodated in such a manner that any contact (physical or aerosol) with other animals outside the quarantine area is prevented

#### **3.4**

##### **WCCA-treated**

timber preservation method involving the use of a water-borne mixture of copper-chromium-arsenic compound

### **4 General requirements for holding pens**

#### **4.1 General layout**

**4.1.1** The general layout of a holding pen facility, suitable for antelopes, zebras and similar-sized wild animals, is shown schematically in figure 1.

NOTE The features shown in figure 1 are illustrative only, and there are many other possible designs for holding pens that would be equally suitable.

4.1.2 The basic functional aspects of a good holding pen design are such that

- a) each pen has a roofed area and an open area,
- b) each pen has a minimum of two doors, and one or two separate passageways. This allows for an easy flow of animals into and out of the pens, as well as easy maintenance of the pens,
- c) the doors to the pens, when in the open position, form an angle with the wall of the passageways. This eliminates sharp corners or rapid changes in direction when the animals are moved in and out of the pens,
- d) the off-loading ramp has a funnel effect as it approaches the passageways,
- e) the curved passageways to the loading ramps prevent the animals from seeing too far ahead,
- f) the crush is also approached from curved passageways, and has sliding gates which allow individual animals to be blocked off for management, treatment or tranquillization, and
- g) the layout of the passageways and pens allows a "flow-through" effect in the facility, which is a desirable feature of the design.

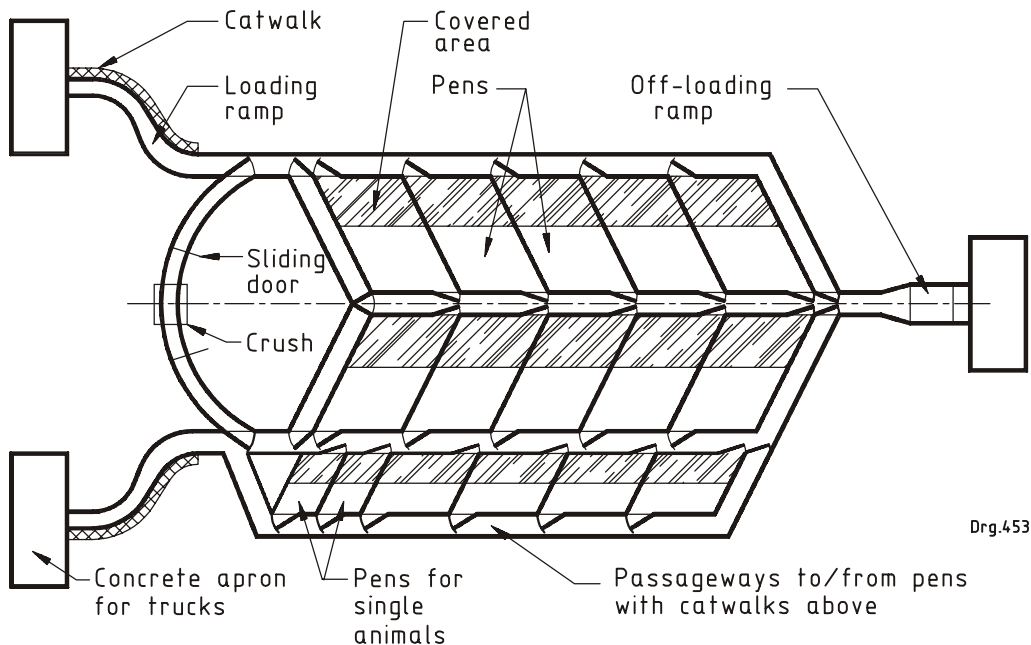
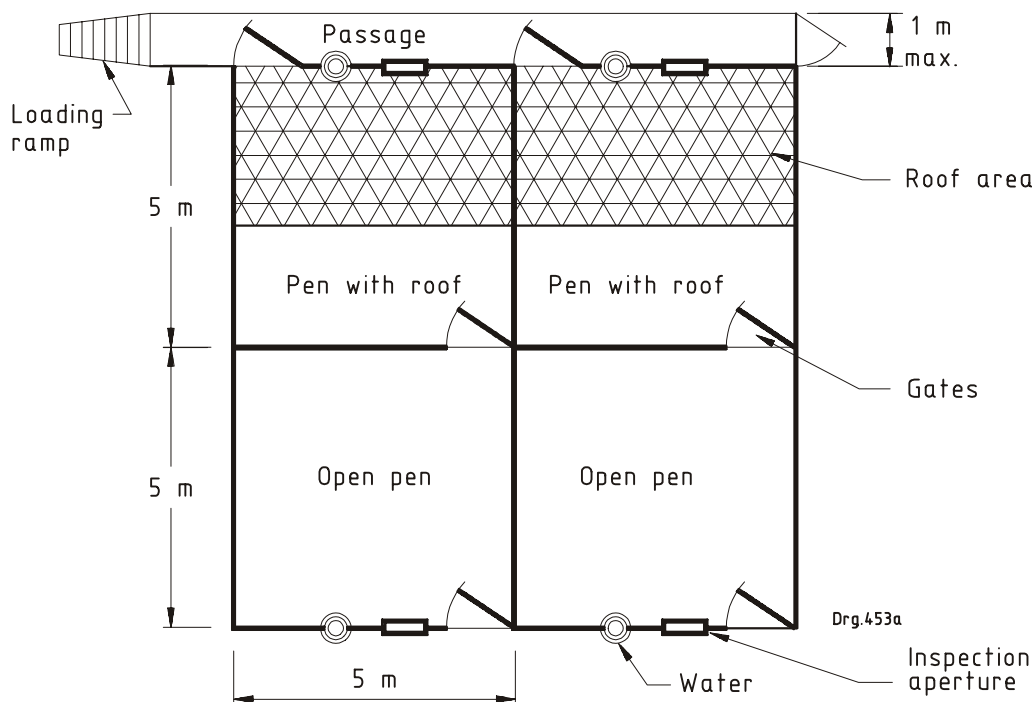


Figure 1 — General features of a holding pen facility

**4.1.3** A basic accommodation unit which is suitable for antelopes is shown in figure 2.



**Figure 2 — Basic accommodation unit**

**4.1.4** Specific requirements for housing of larger animals are given in 6.1 to 6.3 (inclusive).

**4.1.5** Aspects of holding pens which affect animal welfare shall comply with the applicable requirements of SANS 10331.

## **4.2 Location and environment**

**4.2.1** Holding pens shall be constructed in quiet areas, away from noisy human activity, industrial activities, buildings, domestic animals, main roads, railways or overhead power lines.

**4.2.2** Holding pens shall be so situated and orientated that animals are protected from strong prevailing winds, and are provided with sunlight and shade, as required.

**4.2.3** Wherever possible, suitable trees and shrubs shall be incorporated into the open areas of the pens, to provide daytime shade and a more natural environment for the animals.

**4.2.4** Holding pens shall be situated on well-graded, well-drained soils.

**4.2.5** Holding pens shall be so situated and designed as to allow for adequate drainage and run-off of rainwater (see also 4.3). Animals shall never have to stand in stagnant water, or in persistent muddy conditions, such as might lead to footrot.

## **4.3 Drainage**

**4.3.1** Provisions for the efficient drainage of run-off water shall be made at the design stage of the holding pens, and before the holding pens are erected.



**4.3.2** Holding pens shall, where possible, be located on the highest possible elevation of a slope, so that water drains out and away from the pens and not into the adjacent pens or the passageways.

**4.3.3** Where natural drainage is not provided by the terrain, suitable drainage shall be achieved by the use of drainage sewers, pipes, gutters or subsoil drains, or a combination of these.

**4.3.4** Drainage systems for holding pens shall comply with the regulations in Part R of SANS 10400.

**4.3.5** Drainage layout plans of holding pens shall be checked and approved by a Civil Engineer (professional or technical level) before construction is commenced.

#### **4.4 Construction materials and methods**

**4.4.1** Enclosures and holding pens shall be constructed of materials of adequate strength to suitably contain the captive animals, taking into account their species, age, needs and habits, as well as the particular needs and requirements of family units.

**4.4.2** Specially reinforced holding pens shall be provided for housing giraffes, elephants, rhinoceroses, hippopotamuses and buffaloes (see annex A).

**4.4.3** Locally available construction materials may be used where these are suited to the purpose.

**4.4.4** Construction methods used shall be such that the insides of the holding pens are free from sharp-edged or protruding objects such as screw threads, nail heads or loose or sharp-ended wires which could snag, entrap, or otherwise injure the animals.

**4.4.5** Structural steelwork shall comply with the requirements of SANS 10162-1 or SANS 10162-2, as relevant.

**4.4.6** Construction materials shall be suitably protected or surface-treated against corrosion or deterioration. The treatment method shall not be toxic or otherwise detrimental to the welfare of the animals.

**4.4.7** Timber products, including poles, shall be treated in accordance with SANS 10005, and shall comply with the requirements of SANS 457-2, SANS 457-3 or SANS 1288, as applicable.

NOTE Creosoted poles should not be used within one year of treatment for the construction of animal holding pens.

**4.4.8** Surfaces likely to come into rough contact with the animals shall be made smooth and free from any sharp edges or projections which could cause injury to the animals. Where necessary, potentially abrasive or injurious areas shall be covered with smooth resilient materials such as fabric-reinforced rubber conveyor belting. Steel-reinforced belting shall not be used.

**4.4.9** Some examples of possible construction methods are given in annex A.

#### **4.5 Roofing**

**4.5.1** Holding pens shall be provided with a roofed area which covers at least one third of the total pen area.

NOTE The roofed area might also serve as night quarters, if suitable (see 4.6.1).

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**4.5.2** The roof shall be weatherproof and slanted towards the outside of the holding pen area.

**4.5.3** The roof shall be provided with permanent gutters and downpipes for drainage of rainwater away from the pen and passageways.

**4.5.4** The height to the underside of the roof shall be not less than 3 m, except in the case of a holding pen which will house giraffes, where the minimum height shall be 5 m.

### 4.6 Area

**4.6.1** The total area of a pen shall consist of a day area (open), and night quarters (walled, and under a roof). In general, the night quarters shall comprise approximately 25 % of the total holding pen area.

**4.6.2** Typical day area sizes for certain animals are given in table 1.

**Table 1 — Typical day area sizes for holding pens**

1	2
Animal species	Area per adult animal m <sup>2</sup>
Blesbok or impala	6
Wildebeest	8,5
Zebra or kudu	10
Giraffe	18
Buffalo	30

**4.6.3** Alternatively, the day area required for antelopes, zebras and buffaloes may be calculated on the basis of 1 m<sup>2</sup> per 25 kg of live body mass.

**4.6.4** The day area requirements for elephants, rhinoceroses, hippopotamuses and warthogs are given in 6.1 to 6.4 (inclusive).

**4.6.5** The total area of any holding pen shall never be less than 9 m<sup>2</sup>.

**4.6.6** The day area of a holding pen shall be constructed in such a manner that it can easily be divided into two separate compartments, so that the animals can be contained in one compartment while the other is being cleaned (see 4.11.6 for gate positions).

NOTE The dividing wall (or fence) can also serve as a hiding screen for an initially nervous animal.

**4.6.7** It is recommended that a few spare holding pens be available to accommodate sick, disabled or injured animals.

### 4.7 Height

**4.7.1** The minimum height of walls or fences enclosing a holding pen to house small, non-jumping antelopes or zebras shall be 2,4 m.

**4.7.2** Where the holding pen is intended to house adult kudu, waterbuck, eland or impala, the minimum height of walls or fences shall be 3 m.

NOTE Where animals that are notorious jumpers, such as kudu or waterbuck, are to be accommodated, it is recommended that a 500 mm wide section of suitable fencing be fitted horizontally (and internally) at the top of the wall or fence. Alternatively, a covering of chicken wire (or similar type wire) or shade cloth may be placed over the pen to contain these animals.

**4.7.3** The walls of holding pens for giraffes shall be at least 4 m high.

## **4.8 Observation apertures**

**4.8.1** Apertures, of suitable size and position, shall be incorporated in the walls of holding pens to facilitate convenient viewing and inspection of animals.

**4.8.2** The apertures shall be so designed and placed as to minimize stress of, or disturbance to, the animals. For most animals, a height of 1,5 m to the bottom of the aperture, and an aperture opening height of 150 mm will suffice.

## **4.9 Floors**

**4.9.1** The material of the holding pen floor shall be such as to allow good drainage and be easily cleaned, but still be comfortable for the animals.

NOTE Such a condition can be achieved by a substrate layer of compacted gravel, topped by a layer of river sand.

**4.9.2** The floor area shall be free from any unnecessary projecting obstacles or undue hollows which could be hazardous to the animals.

**4.9.3** Run-off slopes shall be sufficient for their purpose but shall not exceed a gradient of 1:50.

## **4.10 Passageways and corridors**

**4.10.1** All holding pens shall be connected by passageways or corridors, to expedite the movement of animals within the facility and for loading and off-loading purposes.

**4.10.2** Passageways shall be at least 1 m wide.

**4.10.3** Passageways, together with gates, shall be so designed as to act as channels in a "flow-through" system which forces the animals to move in the desired direction (see figure 1).

**4.10.4** It is recommended that passageways leading to, or from, loading bays or crushes should be curved where possible. This prevents the animals from seeing too far ahead, and reduces the tendency to stampede.

**4.10.5** The floors of passageways shall be covered with a layer of compacted gravel to a depth of 150 mm.

**4.10.6** Sharp-edged or abrasive areas in passageways where animals might rub against the walls (such as on corners) shall be covered by a suitably resilient material to prevent harm to the animals in these areas, for example, by the use of fabric-reinforced rubber conveyor belting. Steel-reinforced belting shall not be used.

## **4.11 Gates**

**4.11.1** Gates shall be at least as strong as the walls of the holding pens, and shall be the same height as the walls of the holding pens.

**4.11.2** Gates leading from individual holding pens into passageways or corridors shall be wider than the passageways. The wider gate shall ensure that when the gate is in the open position, it will form an angle of at least 45°, but less than 90°, with the opposite corridor wall, which will effectively guide the animal whenever it has to change direction, for example, when rounding a corner, or entering or exiting a holding pen.

NOTE The wider gate also ensures that any pressure exerted on the gate is reacted by the opposite corridor wall and will force the gate more tightly against the opposite corridor wall.

**4.11.3** Gate hinges shall be of a loose-pin type, such that the gate may hinge from either side, as required. (Removal of the pins from one side allows the gate to swing about the other side.)

**4.11.4** Where possible, sliding bolts, used to secure holding pen doors and gates, should be constructed so that they angle slightly downwards at the leading end. This produces a fail-safe action, in that the bolt will tend to close itself under gravity, and will not tend to slide open under the effect of vibration or continual pushing of animals against the door or gate.

**4.11.5** Sliding gates may be utilized in areas where the gate is required to be operated from outside the animal enclosure, for example, in corridors leading to and from crushes, or for gates used internally within loading and off-loading ramps, etc.

**4.11.6** The connecting gate between the two compartments in a day area (see 4.6.6) shall be at one end of the dividing wall, and not in the middle of the wall. This allows the gate to be operated without personnel having to enter the pen, and provides better support for the gate.

**4.11.7** A suitable construction method, which is recommended for sliding gates, is given in annex A.

## **4.12 Crush**

**4.12.1** A crush, with sliding doors or gates to control the movement of animals, shall be provided for the purpose of safe handling, inspection, bleeding, management and treatment of animals, as required.

**4.12.2** The walls of the crush shall be of minimum height 2,4 m, and there shall be no gaps between the bottom of the wall and the floor of the crush.

NOTE Animals in stress might lie down, and their legs, head or horns might become hooked or trapped in a gap.

**4.12.3** The dimensions of the crush should be approximately 1 m (width) and 2,5 m (length) between gates. Where the crush is a multi-compartment design, the length of each potential compartment should be 2,5 m.

NOTE The purpose of the crush is to restrict the animals' capability for movement, as too much space might allow a frightened animal to jump, twist or otherwise injure itself.

**4.12.4** The crush should be located as near as possible to the loading or off-loading ramp.

## **4.13 Loading ramps**

**4.13.1** Loading ramps shall be of adequate strength and fully height-adjustable for loading animals into, or from, transport vehicles of suitable type and height.

**4.13.2** Variations in vehicle height may also be accommodated by having permanent loading ramps of the following heights:

- 1 800 mm or 1 200 mm (for large vehicles), as applicable
- 650 mm (for lower vehicles)
- 500 mm (for giraffe trailers)

**4.13.3** The floor of the ramp shall be strong enough to support the mass of the animals being loaded or off-loaded.

**4.13.4** The surface of the ramp shall be of a non-slip material.

**4.13.5** A thick strip of rubber or a strong wooden plank shall be provided for attachment to the edge of the ramp to close the gap between the ramp floor and the edge of the vehicle, in order to prevent the animals' feet from slipping into the gap.

**4.13.6** The sides of the ramp shall be clad in a resilient, non-abrasive material (for example, fabric-reinforced rubber conveyor belting) and shall be sufficiently strong and high enough to prevent animals from falling off or escaping.

**4.13.7** The slope of the ramp shall not exceed an angle of 30° from the horizontal.

## **4.14 Overhead catwalks**

**4.14.1** Suitable catwalks may be provided above, or adjacent to, the passageways, loading ramps, crush area and, where necessary, above the holding pens themselves. The purpose of catwalks, when provided, is to facilitate easier handling, moving and sorting of animals.

NOTE Catwalks are not provided or recommended for viewing of the animals by the public, or for the throwing of food into the holding pens.

**4.14.2** Catwalks, where provided, shall be designed and constructed according to good engineering practice, shall be sufficiently sturdy for their intended purpose, and shall be fitted with handrails in accordance with SANS 10104.

**4.14.3** Although not a recommended practice, where it is intended that catwalk-type structures be used as viewing platforms by large groups of people or by the general public, their load capacity and structural soundness shall at least comply with the requirements of Parts B and D of SANS 10400.

**4.14.4** Access to catwalks shall be via a suitable ladder equipped, where necessary, with safety rings.

**4.14.5** Access to ladders, stairways and catwalks shall be closed by chains or gates fitted with locks, to prevent access by unauthorized persons or the general public.

## **4.15 Ventilation**

**4.15.1** Holding pens shall be adequately ventilated. In holding pens constructed from wooden poles or planks this can be achieved by having openings of between 10 mm and 20 mm between the poles or planks.

**4.15.2** The roofed area shall be sufficiently high to allow good air circulation (see also 4.5).

## **4.16 Water supply and troughs**

**4.16.1** Each holding pen shall be supplied with a water trough, of capacity approximately 50 L, and manufactured from a material which cannot injure the animals.

**4.16.2** Troughs shall have rounded edges to prevent injury to the animals, and a radiused bottom to facilitate cleaning. Cut metal drums that have sharp edges shall never be used.

**4.16.3** Where permanent water troughs are built, they shall be elevated approximately 100 mm above the ground. It is recommended that one third of the trough should protrude outside the holding pen to facilitate cleaning and filling from the outside.

NOTE Rubber water troughs of capacity 20 L to 50 L may be used instead of fixed troughs for most species, except elephants, rhinoceroses, buffaloes or hippopotamuses.

**4.16.4** Water troughs should preferably be positioned in the middle of a boundary wall of the holding pen, and not in a corner. This allows access from three sides of the trough and reduces the tendency for animals to fight for space at the trough.

**4.16.5** Water troughs shall be situated away from feeding areas to prevent contamination of the water with food.

**4.16.6** For giraffes, water may be supplied in a sunken trough or, alternatively, water troughs (with smooth edges) may be mounted on the walls of the holding pen at the same height as the feeding racks.

**4.16.7** It is recommended that water be supplied to the holding pen facility via pipes (not trucked), and from there to the troughs in the holding pens via a reliable ball-valve control device, which is capable of being regulated from outside the holding pen.

## **4.17 Feeding facilities**

**4.17.1** Feeding areas shall be separate from the water troughs, and shall preferably be located under a weatherproof roof to provide protection from rain.

**4.17.2** Feeding areas should preferably be positioned in the middle of a boundary wall of the holding pen, and not in a corner (see 4.16.4).

**4.17.3** Where necessary, feeding areas shall be raised slightly above the level of the surrounding soil in order to prevent the ingress of run-off water, etc.

**4.17.4** In large holding pens, the feeding area (or areas) shall be sufficiently large to allow food to be placed in different parts of the feeding area, to allow a number of animals to eat at the same time and to prevent competition for food. The space provided for feeding shall be such as to allow all the animals to feed simultaneously with minimum difficulty.

**4.17.5** Access hatches, which allow the placement of food from outside the pen, shall be provided where possible, to minimize disturbance to the animals.

**4.17.6** Permanently constructed feeding racks, located inside the holding pens, shall not be used (except in the case of giraffes, see 4.17.7) because of the risk of injury to the animals.

NOTE Truck tyres, of approximately 1,2 m internal diameter, have been found to make good feeding troughs for antelopes or zebras.

**4.17.7** Feeding racks provided for use in giraffe holding pens shall be securely attached to the wall of the holding pen, at a suitable height. The height of feeding racks shall be adjustable to accommodate all sizes and ages of giraffes.

## **4.18 Fire precautions**

**4.18.1** The ground area immediately surrounding the holding pens shall be cleared of grass, brush and other flammable materials, in order to form a fire break (see also 4.18.2).

NOTE Large, isolated trees do not constitute a hazard.

**4.18.2** The fire break shall be a minimum of 10 m wide, but the width shall be increased if necessitated by local environmental conditions, for example, in heavily-wooded areas or areas of prevailing high winds and long grass.

**4.18.3** Suitable and acceptable fire-fighting equipment shall be available and accessible at all times.

**4.18.4** Fire-fighting equipment shall comply with the requirements of part T of SANS 10400.

**4.18.5** Where fire extinguishers are provided, they shall be of the correct type for use with the class of fire anticipated, and they shall comply with the requirements of SANS 1910.

**4.18.6** Fire-fighting equipment shall be controlled, inspected and maintained in accordance with the requirements of SANS 10105-1, SANS 10105-2, SANS 1475-1 and SANS 1475-2, as appropriate, and with the supplier's instructions.

**4.18.7** Signs that prohibit smoking or the use of naked flames shall be prominently displayed at the entrance to, and within, the holding pen complex.

## **4.19 Information boards at auction pens**

Where animals are to be housed for auction purposes, a chalkboard (or similar) shall be provided on the passage wall of each holding pen to supply the following information regarding the animals in the holding pen:

- a) the number, species, family (if applicable), age group and gender of the animals;
- b) the date of capture and date of arrival at the auction facility;
- c) the name(s) of the seller or of the capture team (or both);
- d) the origin of the animals (nearest town and province);

e) details of tranquillization (date and type administered); and

f) details of treatment administered to any injured animals.

## **5 Special requirements for quarantine facilities**

**NOTE** The requirements in this clause are based on current knowledge and practice. It is strongly recommended that persons planning the construction of quarantine facilities consult the relevant authority (see foreword) regarding the regulations prevailing at that time.

### **5.1 General**

The design and usage of all quarantine facilities shall comply with national regulations and statutory requirements (see foreword).

### **5.2 Additional fencing**

**5.2.1** An essential feature of a quarantine facility is a fence within a fence. Therefore, the whole quarantine area shall be surrounded by a 2,5 m high security perimeter fence, which shall be located at least 10 m away from the nearest holding pens within the quarantine facility. The open area between the holding pens and the perimeter fence shall act as an exclusion zone between the fences to prevent nose-to-nose contact between animals on either side of the fence.

**5.2.2** It is recommended that the external security perimeter fence (see 5.2.1) be of solid construction, or be covered in game-capture plastic (or other suitable opaque material), in order to prevent animals from seeing outside.

**5.2.3** If burrowing or gnawing animals (such as warthogs or porcupines) are likely to be present in the area, a barrier trench shall be incorporated under the external security fence, and a protective covering of steel diamond mesh fencing shall be attached to the bottom of the external fence.

Detail of this construction method is given in annex A.

**5.2.4** The surface of the exclusion zone shall be such that it can be kept free from vegetation or long grass.

### **5.3 Access to quarantine area**

**5.3.1** Although it might be desirable to have a number of gates giving entrance to the quarantine area for the purposes of animal management, maintenance and transportation, it is recommended that, when the official quarantine period has commenced, pedestrian access to the quarantine area should be limited to a single, lockable entrance.

**5.3.2** The entrance shall be so constructed that persons entering or leaving the quarantine area are required to walk through a footbath containing an approved disinfectant.

**5.3.3** A suitable locker room shall be provided adjacent to the entrance gate to hold overalls and gumboots for use by all persons when entering the quarantine facility, and for persons to leave them on departure.

**5.3.4** A signboard shall be prominently displayed at the entrance to the quarantine area, saying **QUARANTINE AREA: NO UNAUTHORIZED ENTRANCE**.



## **5.4 Floors in quarantine areas**

Floors in open and undercover quarantine areas shall be constructed of materials which are non-slip and which can be disinfected.

## **5.5 Veterinary facilities**

Adequate veterinary facilities shall be provided for the isolation and treatment of sick or injured animals, for the collection and storage of blood samples, and for supplies of veterinary materials.

## **5.6 Heating**

In areas where the daytime or night-time ambient temperature is likely to fall below 5 °C, or where young animals might be held in quarantine for long periods (such as buffaloes in disease-control areas), supplementary heating of the night quarters shall be provided.

The heating method used shall be of a safe non-flammable type, such as can be supplied by infra-red heating lamps made for space-heating purposes.

## **5.7 Insect-control measures**

Where insect control is necessary for the prevention of diseases transmitted by insects, appropriate measures to prevent contact between animals and these insects shall be taken.

Information regarding appropriate measures and permit requirements should be obtained from the National Department of Agriculture.

# **6 Requirements for specific species**

## **6.1 Elephants**

**NOTE** Many of the requirements in this clause are based on information obtained from official publications of the Elephant Management and Owners Association (EMOA) (see bibliography). It is strongly recommended that these documents be read in their entirety by anyone considering housing elephants.

**6.1.1** The following basic characteristics of the species shall be taken into account when designing or constructing accommodation to house elephants:

- Elephants are highly sociable animals and shall not, wherever possible, be kept in solitary confinement.
- They are also inquisitive animals and will investigate new surroundings thoroughly, both through smell and touch. If they discover a weak point they will persist in their attempts to escape, and if they can get their heads through a gap, their bodies will follow.

**6.1.2** The holding pen for elephants shall provide a day area of at least 1 m<sup>2</sup> per 25 kg of live body mass. However, the minimum day area size shall never be less than 30 m × 20 m.

**6.1.3** Where night quarters are provided, the area shall be equal to 25 % of the minimum required day area (as calculated in 6.1.2).

**NOTE** In areas where the ambient temperature is unlikely to fall below 5 °C, night quarters might not be required.

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**6.1.4** The day area should have large shady trees, otherwise shade shall be provided by artificial means, for example, by the use of 80 % shade cloth.

**6.1.5** If elephants are to be housed for more than 3 days, then double enclosures are required so that the animals can be moved from one enclosure to the other, as required, to allow cleaning of the holding pen.

**6.1.6** Each holding pen shall be equipped with a water trough of size approximately 2 000 mm long, 750 mm wide and 400 mm deep, elevated 300 mm above ground level.

NOTE An adult elephant will drink, on average, 100 L of water per day.

The open day area shall also contain either a small dam with a mud wallow, or an additional water supply for bathing and spraying purposes.

**6.1.7** Rubbing posts, in the form of tree stumps or large rocks of suitable shape, etc. shall be provided.

**6.1.8** Where night quarters are not provided, a suitable portion of the holding pen area shall be roofed, and the floor concreted with a rough finish, to provide a dry place for the animals to lie down, for example, in the rainy season.

**6.1.9** Where provided, the night quarters shall be of sturdy construction and draught-proof.

NOTE Elephants, especially young animals, react badly to draughts and cold winds.

Tar poles shall not be used as construction materials within a year after treatment, as these might cause skin problems. Apertures, such as windows, shall be out of reach of the elephants' trunks.

**6.1.10** Where the area of the holding pen exceeds 1 ha, the perimeter fence surrounding the elephant enclosure should preferably be electrified (see 6.1.12). Where electrification is not used, the construction of the perimeter fence shall be sufficiently robust to withstand the considerable strength of the animals. If steel pole construction is used, the poles shall be set vertically, never horizontally (to reduce the risk of elephants breaking their tusks in them), and the tubes shall be filled with concrete.

An arrangement of steel tubes of 150 mm diameter and of 6 mm wall thickness, set at 450 mm centres, has been found to be suitable.

Some examples of alternative construction methods are given in annex A.

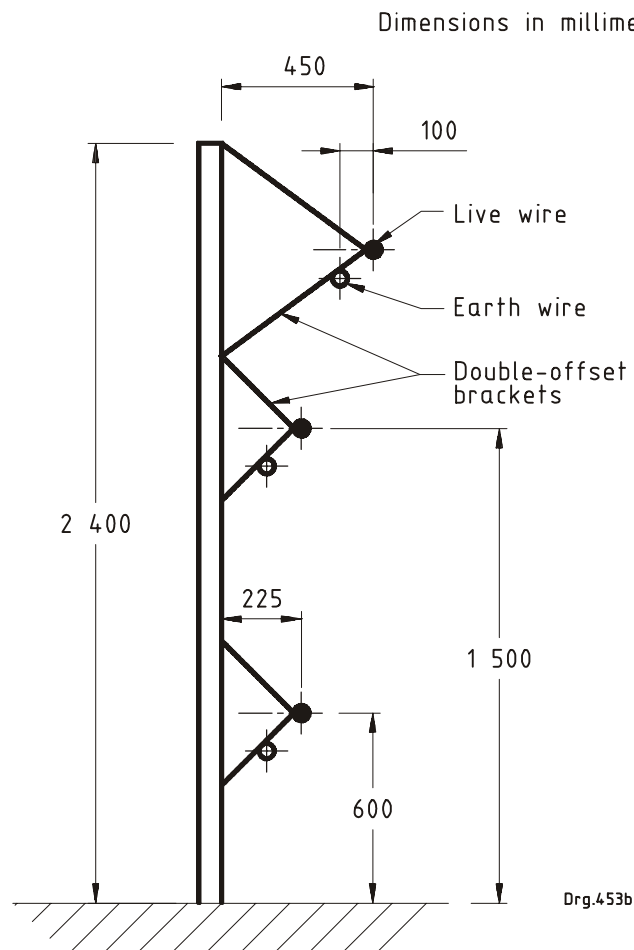
**6.1.11** Holding pens of less than 1 ha in area shall not be electrified on the inside of the pen. If, for some reason, it is desired to electrify a holding pen of less than 1 ha in area, an inside enclosure of sturdy construction shall be erected between the elephants and the electric fence.

**6.1.12** Where electrification is used, the following minimum fencing specifications shall apply:

- a) The electrified peripheral game-proof fence shall be 2,4 m in height, with a minimum of 20 strands of fencing wire.
- b) The inside of the game fence shall be electrified with at least three strands of electrical wire of minimum diameter 2,24 mm, supported on double-offset brackets spaced 5 m apart (see figure 3).

NOTE Double-offset brackets are devices designed to ensure a fixed spacing between the live wire and the earth wire.

- c) The bottom strand of electrical wire shall be 600 mm above ground level and supported on 225 mm wide double-offset brackets.
- d) The middle strand shall be at 1,5 m height and supported on 225 mm or 450 mm double-offset brackets.
- e) The top strand shall be located at the top of the fence, on 450 mm double-offset brackets.
- f) An earth wire shall be mounted on the double-offset brackets at a distance of 100 mm on the inside of each live wire strand.
- g) The double-offset brackets shall be spaced 5 m apart, along the length of the wires.
- h) A minimum voltage of 6 000 V shall be maintained on the entire peripheral electrified fence.
- i) Energizers shall comply with the requirements of SANS 60335-2-76, and shall be large enough to maintain at least 6 000 V over a distance of 8 km.
- j) On physical contact, the maximum energy discharged per impulse shall be not less than 6 J or more than 8 J.



**Figure 3 — Electrified fencing with double-offset brackets**

## **6.2 Rhinoceroses**

**6.2.1** The following basic characteristics of the species shall be taken into account when designing or constructing accommodation to house rhinoceroses:

- The rhinoceros is big, strong, dangerous and unpredictable.
- Construction methods used shall be of a very sturdy nature, as rhinoceroses will search for a weak point and work away at it till they can escape.

**6.2.2** The construction of the perimeter fence shall be sufficiently robust to withstand the considerable strength of the animals. A steel or wood pole construction, of minimum height 2,4 m above ground level, is recommended. An arrangement of wood poles, of 130 mm to 200 mm diameter, with gaps of 50 mm to 75 mm between the poles, has been found to be suitable.

Some examples of alternative construction methods are given in annex A.

**6.2.3** Where wood poles are used for the construction of rhinoceros holding pens, they shall be WCCA-treated and not creosoted. Creosote causes skin irritations and might cause gastric ulcers as rhinoceroses tend to lick the poles.

**6.2.4** Cable-type fencing shall not be used for rhinoceros holding pens.

**6.2.5** The holding pen for white rhinoceroses shall provide a day area of at least 1 m<sup>2</sup> per 25 kg of live body mass. However, the minimum day area size shall never be less than 30 m × 20 m.

**6.2.6** A suitable holding pen arrangement (including sizes) for housing of black rhinoceroses is shown in figure 4.

**6.2.7** Provision shall be made in the holding pen for shade from the sun and shelter from the rain.

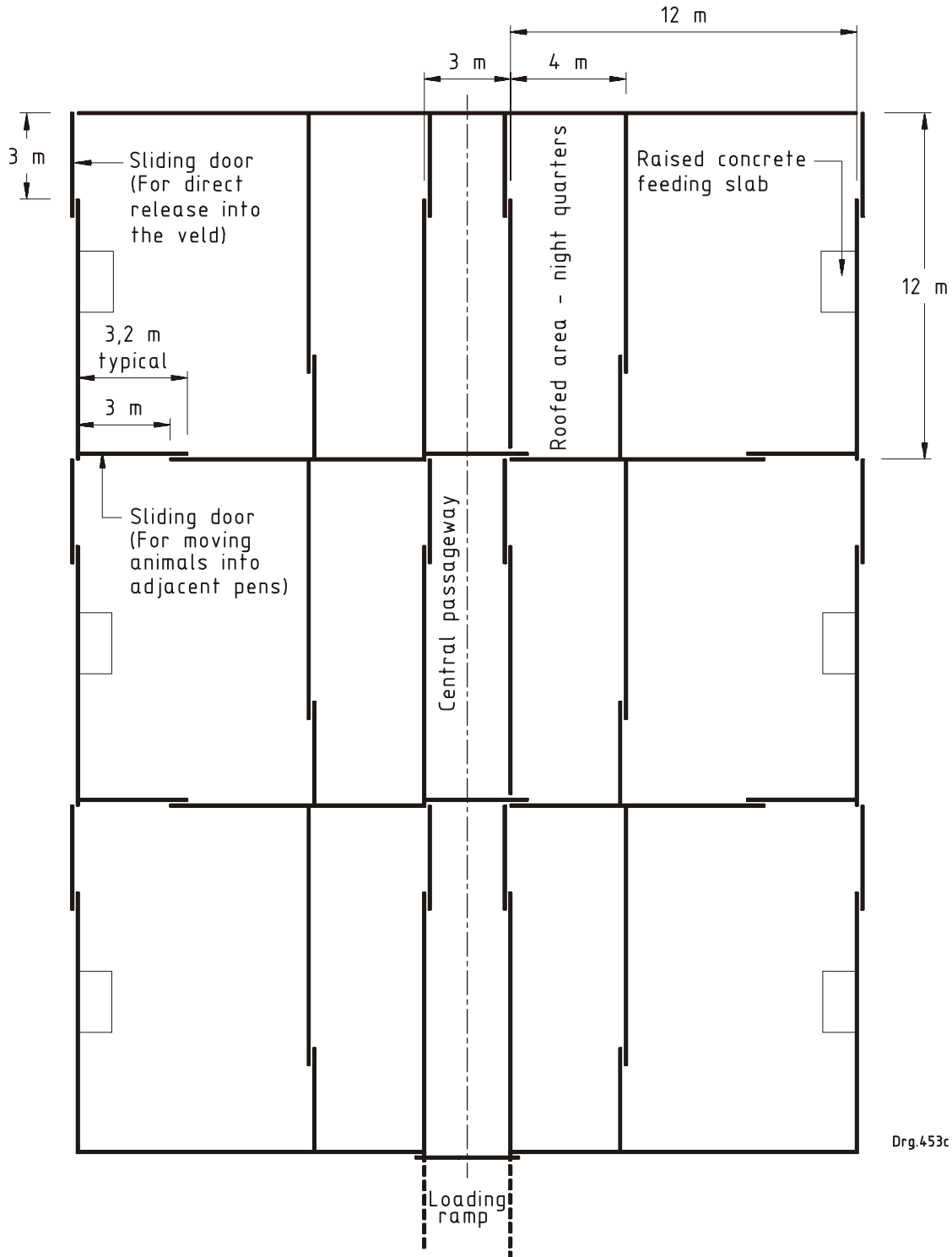
**6.2.8** Where night quarters are provided, the area shall be equal to 25 % of the minimum required day area (as calculated in 6.2.5).

**6.2.9** If rhinoceroses are to be housed for more than 10 days, then double enclosures are required so that the animals can be moved from one enclosure to the other, as required, to allow cleaning of the holding pen.

**6.2.10** Sunken water troughs, of size approximately 1 000 mm × 500 mm × 400 mm deep shall be provided. The top edge of the trough shall be rounded, and protrude 100 mm above ground level to prevent the animals from kicking soil into the trough.

For rhinoceroses, the whole trough shall be fully inside the fence. Otherwise, if part of the trough is outside the fence, the rhinoceros might get its horn jammed under the horizontal bar while drinking or attempting to escape.

**6.2.11** The feeding area shall be a concrete slab, approximately 3 m × 1,5 m, with its top surface raised slightly (± 30 mm) above ground level. The feeding area shall be protected by a roof.



**Figure 4 — Holding and releasing pens for black rhinoceroses**

## **6.3 Hippopotamuses**

**6.3.1** The following basic characteristics of the species shall be taken into account when designing or constructing accommodation to house hippopotamuses:

- The hippopotamus is extremely powerful and aggressive.
- It can climb high walls if there are suitable footholds.
- If it can get its chin on top of a wall, it will be able to pull itself over.
- The hippopotamus is susceptible to sunburn.
- It will charge at people if it can see them.

**6.3.2** A strong structure, similar to those designed for elephants or rhinoceroses shall be used. The walls of the enclosure shall, however, be solid or covered in game-capture plastic to prevent the animals from seeing people on the outside.

**6.3.3** Walls shall be at least 2,4 m high, and shall contain no horizontal poles or other features which will allow the hippopotamus to climb the walls.

**6.3.4** The holding pen for hippopotamuses shall provide a day area of at least 1 m<sup>2</sup> per 50 kg of live body mass, but the minimum pen size shall never be less than 40 m<sup>2</sup>.

The main features and proportions of a hippopotamus holding pen, suitable for housing up to two animals, are shown in figure 5.

**6.3.5** Adequate shade shall be provided in the enclosure, either by permanent roofing, natural trees or 80 % shade netting.

**6.3.6** Night quarters are recommended. Where these are provided, the floors shall be made of cement, with a non-slip finish, to facilitate cleaning.

NOTE Hippopotamuses are very dirty animals, and frequent cleaning of the holding pens is required.

**6.3.7** Access to and from the night quarters should be controlled by horizontally sliding doors, which can be operated from outside the enclosure. This will facilitate easier control of the animals for pen-cleaning purposes and for loading into a crate or truck.

**6.3.8** If hippopotamuses are to be housed in holding pens without night quarters for more than a few days, double enclosures are required so that the animals can be moved from one enclosure to the other, as required, to allow cleaning of the holding pen.

**6.3.9** The floor of the open day area of the holding pen shall be made of soil, and shall not be rocky or stony.

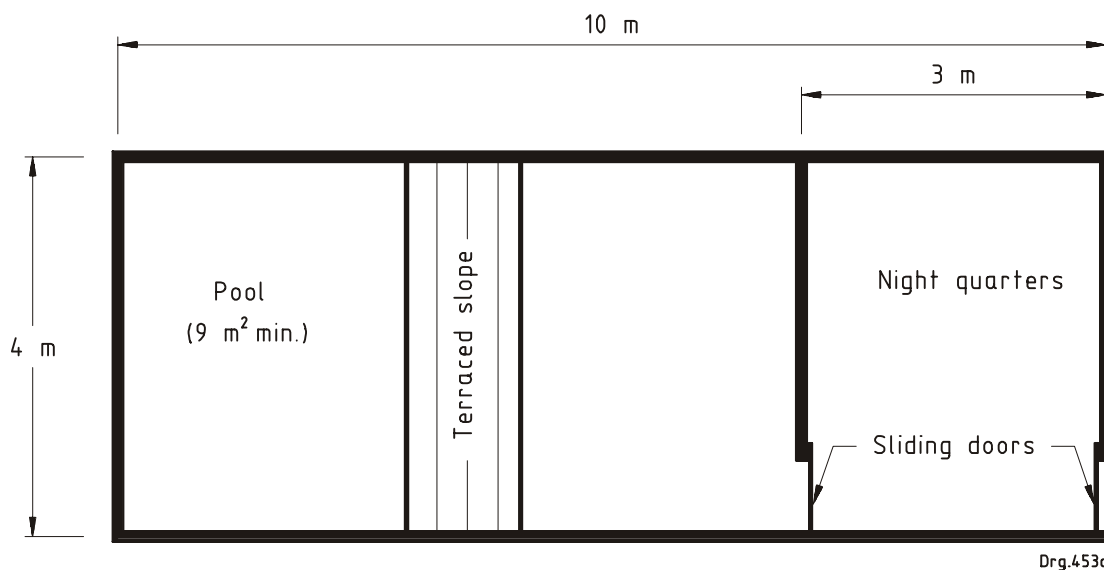


Figure 5 — Typical holding pen for hippopotamuses

**6.3.10** A concrete pool or dam shall be provided in the enclosure, at the end furthest from the night quarters or entrance.

**6.3.11** The pool shall have a minimum surface area of 9 m<sup>2</sup>, and a depth of 1,5 m.

NOTE An adult hippopotamus should be able to lie in the pool with its back submerged.

**6.3.12** The pool shall be accessed from one side by means of a terraced (stepped) slope, at an effective angle not greater than 40°.

**6.3.13** The pool shall be fitted with a large-bore drainage pipe (min. 100 mm in diameter), or a suitable pump shall be provided to allow for regular draining and cleaning of the pool.

NOTE Hippopotamus dung is very coarse and fibrous, and would block a standard size drainage pipe.

**6.3.14** Water troughs shall not be more than 500 mm deep, otherwise the hippopotamus might try to climb into them.

**6.3.15** The loading ramp shall be a solid structure, with the floor preferably consisting of compacted earth.

## **6.4 Warthogs**

**6.4.1** The following basic characteristics of the species shall be taken into account when designing or constructing accommodation to house warthogs:

- Warthogs are notorious diggers, and are known to dig up to a metre deep into the ground under a fence. For this reason warthogs cannot be accommodated in normal holding pens such as are used for antelopes, etc.
- They are highly susceptible to stress, and should always have a place to hide.
- They are susceptible to overheating and stress-induced mortality.

**6.4.2** A holding pen with a day area of 7,5 m<sup>2</sup> per animal shall be provided. The holding pen shall be provided with a level, non-slip, concrete floor and a strong wire-netting fence all round, up to a height of 2 m.

**6.4.3** Night quarters, constructed from brick or concrete, shall be provided as a sleeping and hiding area.

**6.4.4** A sliding door, which can be operated from outside the pen, shall be fitted between the night quarters and the day area.

**6.4.5** The night quarters shall have an outside door which can be used to remove bedding and for cleaning purposes.

**6.4.6** The night quarters shall be dark and cool.

**NOTE** The floor of the night quarters should contain lots of bedding material, as the warthog will seek shelter under this if stressed.



**Annex A**  
(informative)

**Guidelines for design and construction methods**

**A.1 General**

This annex lists various design criteria and methods of construction which may be used for the design and construction of holding pens, and which have proved successful in the past.

**A.2 Design loads for walls of holding pens used to house various animals**

**A.2.1** The recommended minimum design loads for walls of holding pens intended to house certain types of animals are given in table A.1.

**Table A.1 — Recommended minimum design loads for walls of holding pens**

1	2	3
Animal to be housed	Load to be applied kN	Position of load application
Antelope	5	1,5 m above floor level
Buffalo	8	1,5 m above floor level
Elephant	30	2,5 m above floor level
Giraffe	7,5	3,0 m above floor level
Rhinoceros	25	1,6 m above floor level

**A.2.2** The load values given in table A.1 should be increased by 50 % in potentially highly stressed areas such as loading ramps, etc.

**A.3 Typical construction methods for holding pens to house elephants or rhinoceroses**

**A.3.1 Enclosure fences — Steel and gum pole construction**

Example A:

Steel pipes, 150 mm diameter and 3 m long, are concreted in the ground to a depth of 1 m, in 1 m<sup>3</sup> capacity holes, at 3 m intervals, to serve as main support poles.

NOTE Specific foundation details should be to the Engineers' recommendations, based on the soil type and terrain.

Horizontal cross-pieces of treated gum poles, each 125 mm to 200 mm in diameter and 3 100 mm long, are connected to the top and bottom of the uprights by means of 12 mm diameter carriage bolts (see also 4.4.4), or M12 threaded rod, with the nut area recessed below the timber surface.

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The clearance under the bottom cross-piece shall not be more than 50 mm above ground level. (This is to prevent animals from breaking their tusks or horns by hooking them under the cross-piece).

Upright poles, at least 125 mm in diameter and 2 m long, are bolted to the horizontal poles, with spaces of 100 mm to 150 mm between the poles. There should be a small clearance ( $\pm 50$  mm) between the bottom of the upright pole and ground level.

The vertical poles shall be bolted on the inside of the horizontal cross-member, so that if an animal collides with, or pushes against the vertical poles, the force will be transmitted to the horizontal members, and not onto the bolts.

Both ends of the gum poles shall be bound with wire or metal binding straps (as used in the transport and packaging industries) in order to prevent the poles from splitting when the holes are drilled.

### Example B:

Alternatively, the main support posts may be made from standard 48 kg/m Railway Line, and the horizontal cross-members from 152 mm  $\times$  76 mm mild steel channel. Fixing brackets, of 155 mm  $\times$  6 mm mild steel, 450 mm long, are welded to the Railway Line support, and the horizontal members are attached to the fixing bracket by bolts.

Vertical gum poles are then bolted to the horizontal members, as in example A.

### **A.3.2 Enclosure fences — All steel construction**

An all-steel construction method may be used, as follows:

The main support poles may be steel pipe or Railway Line (as described in examples A and B of A.3.1). The horizontal cross-members are 100 mm  $\times$  100 mm  $\times$  12 mm mild steel angle, and the vertical gum poles are replaced by lengths of 100 mm  $\times$  100 mm square steel hollow sections of 5 mm wall thickness or 102 mm diameter round steel tubing of 4 mm wall thickness, set vertically between the horizontal members, and welded to the horizontal members at each end, with 150 mm gaps between uprights.

## **A.4 Holding pens for zebras and antelopes**

**A.4.1** A typical holding pen to house small wild animals could be constructed as follows:

- Main uprights – 100 mm diameter metal poles (for example), 3 m high above ground level, cemented into ground on  $\pm 40$  m centres.
- Intermediate posts – T-shaped steel reinforcement bar (or similar), cemented into the ground on  $\pm 1,5$  m centres.
- Fencing material – 100 mm  $\times$  50 mm galvanized steel wire mesh, wire diameter  $\pm 2,5$  mm.

**A.4.2** Where animals are known jumpers, a re-entrant portion should be included at the top of the fence (see 4.7.2).

## **A.5 Protection against burrowing and gnawing animals**

If burrowing or gnawing animals (such as warthogs or porcupines) are likely to be present in the area it is recommended that a barrier trench be incorporated under the external security fence. The trench should typically be 500 mm wide and 1 m deep, filled with large rocks, and topped off with a layer of concrete over the rocks. Additionally, a protective covering of steel diamond mesh fencing (with 25 mm holes) should be attached to the bottom of the external fence to a height of 600 mm above the concrete.

## **A.6 Gates**

**A.6.1** The frame of a steel sliding gate, of size 2 m high × 3 m wide, could typically be made of channel iron. Pipes of 75 mm diameter are welded vertically into the frame, with 75 mm gaps between the pipes. Suitable wheels and axles are attached to the top of the frame, to allow it to run on a suitable rail and guidance system mounted above the gate opening.

NOTE Experience has shown that top-sliding gates present less problems than bottom-mounted gates which run in a sunken channel under the gate.

**A.6.2** Gates shall be secured with a lockable device which elephants or rhinoceroses are unable to open.

## **A.7 Planting of wooden poles**

**A.7.1** Wooden poles should be planted in the ground to a depth equal to 25 % of their length, with a maximum depth of 1 m.

**A.7.2** When a treated pole is planted in the ground, water entering the timber shall be able to drain out again, and not be retained in the timber. Where poles are to be planted in concrete, it is recommended that the collar method be used (see figure A.1), with a layer of gravel underneath the pole. The gravel layer may also be extended up the sides of the pole for a short distance, if so desired.

**A.7.3** Where wooden poles are planted in concrete, the top of the concrete collar should be capped to a height of ± 150 mm above ground level, and with sloping sides (see figure A.1). This is to protect the pole against the corrosive action of chemicals contained in urine and manure.

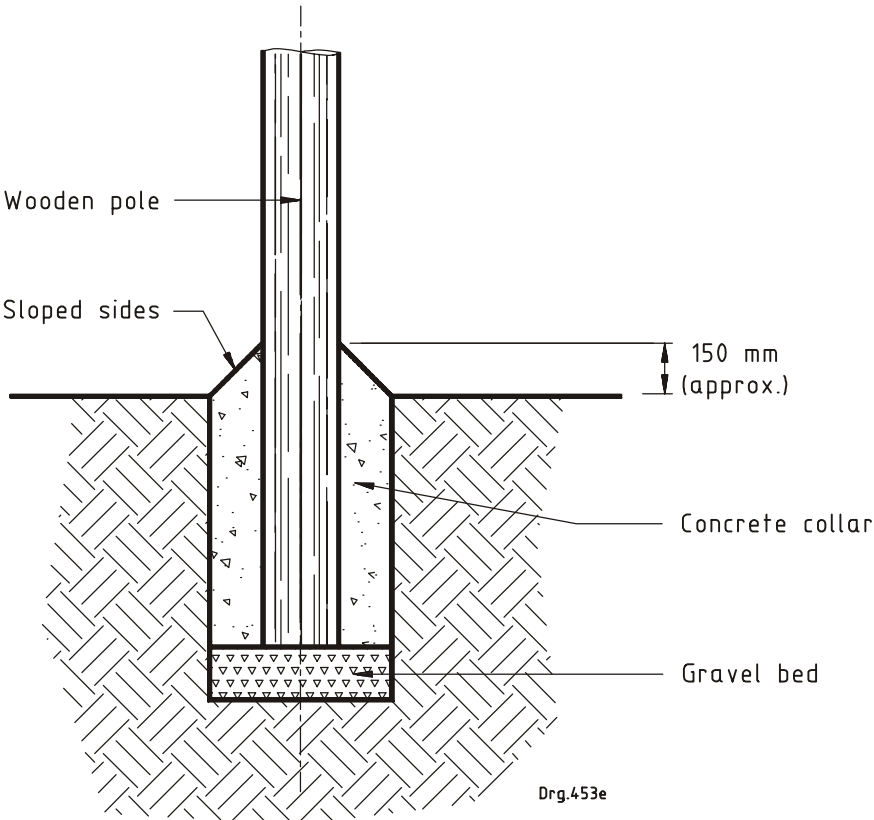


Figure A.1 — Concrete collar method

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