usual custom at Chester Zoo, confining barriers for the mammals are restricted to water ditches, low walls and wrought iron railings. In the reptile section, too, our first aim has been to provide the exhibits with accommodation resembling their natural habitat as closely as possible.

ELEPHANT AND RHINOCEROS PAVILION AT LONDON ZOO

by Hugh Casson and Neville Conder
Casson Conder & Partners, London, England

THE new Elephant and Rhinoceros Pavilion at London Zoo is the first major building in the main area of the Gardens to be completed in accordance with the Redevelopment Plan prepared in 1956 by Sir Hugh Casson and the Society's architect, Mr F. A. Stengelhofen. It occupies a central position, deliberately emphasising in plan and silhouette its focal importance an area now being gradually opened up southwards towards Regent's Park. The building stands among existing trees on a gentle mound formed from the excavated soil and the animals are seen by the public against its massive curved and ribbed walls.

The building houses two Indian elephants, *Elephas maximus*, two African elephants, *Loxodonta africana*, and two White rhinoceroses, *Diceros simus*. Dens are also available for two additional rhinoceroses. There are four pairs of dens and each has access to sick-bay dens and to moated outdoor paddocks. There is an indoor heated bathing pool for the elephants, slightly below the public area, and visitors can watch the elephants being bathed from shallow steps. The keepers' staff room is situated near one of the entrances and the keepers can keep an eye on visitors and animals through a window looking on the indoor part of the house. Heating apparatus and facilities for the storage, preparation and distribution of food are in the basement.

Outside there are two large enclosures, one for the elephants and one for rhinoceroses. Each is planted with trees and each contains a pond. The moats separating the animals from the public follow roughly the same curve as the rounded walls of the building itself. The distance separating the public from the elephants is 12 ft and the moat, 5 ft deep, is planted with grass. On the public side there is a wall, 2 ft 6 in. high surmounted by a 1 ft rail, and on the elephants' side there is no barrier except for the moat. The same system is followed with the other enclosure, except that the bottom of the moat is cement and on the rhinos' side the wall of the moat has been constructed at an angle of 30°. It was decided not to use vertical walls for the rhino moats owing to the risk of the rhinos pushing each other over the edge.

The building has two purposes: first to provide a healthy, comfortable and easily manageable environment for the animals, and secondly to display them to the public to their best advantage, both inside and outside the building. Certain decisions, for instance the size and relationship of the dens, conditions of light and temperature, are closely specified and determined by function. Others, for example the system of public circulation and the method of lighting, arise from the need to display these massive animals in the most dramatic way.

There is an entrance/exit on either side of the house. Inside the house the visitors circulate on an 'S' shaped route through the building (on busy days this can become one-way), or they can step aside from the main route and stand in viewing bays which are stepped down opposite each den. To increase the dramatic effect the central public space is kept low and dark. To increase the apparent height of the animals, they stand on floors at slightly higher level than the public and are seen against cyclorama walls. The tall lantern lights that dominate the exterior and provide the only internal lighting are placed over the animals and out of the visitors' sight. The elephants are therefore seen dramatically highlighted.

SOURCE OF THE DESIGN

The main source of the design was the arrangement of the dens. This arrangement depends first upon the basic den unit—i.e. accommodation for two pairs of animals and a den for sick animals, out of sight of the public, grouped round a holding area that allows controlled movement from den to paddock or den to

hospital den; and secondly upon the low level service system. Food is stored and prepared in the basement and passed up to the holding area. Service from below has made possible a building that is truly 'in the round' and this is important because the back (or outside) of the building is just as much a public viewing area as the main concourse within. The third formulative factor in the arrangement was the disposal of the two main groups and the ancillary accommodation in a way that appears informal, though it is in fact very tightly controlled in its geometry. To avoid a straight-lined, numbered parade of these impressive animals, the dens are so arranged that the visitor instead of seeing the whole interior and its occupants in one glance upon entry, discovers each pair of animals separately and in turn.

The elephants are separated from the public

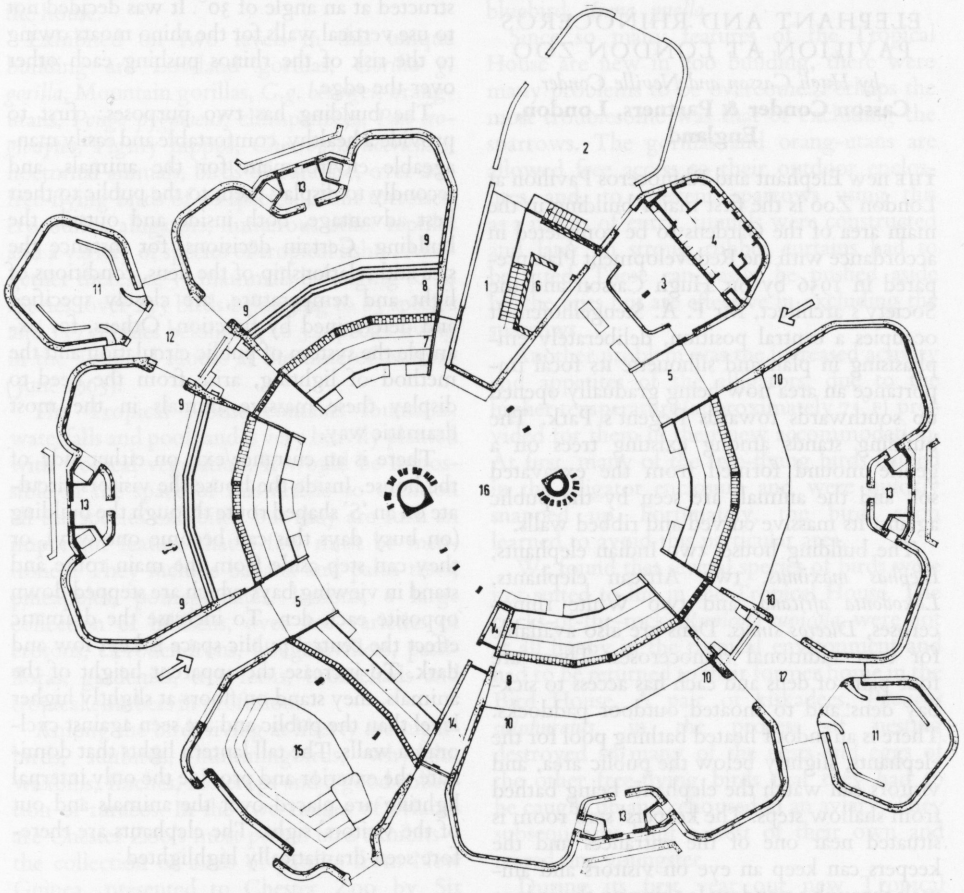

Figure 1. Groundplan of the Elephant and Rhinoceros Pavilion at London Zoo.

KEY
1 Ramp from service yard
2 Service ward
3 Mess room
4 Staff lavatories
5 Public entrance
6 Store
8 Animal ditches
9 Rhino dens
10 Elephant dens
11 Sick bays
12 Den lobbies
13 Drinking trough areas
14 Main rising ducts
15 Elephant pool
16 Public space

by a moat, 4 ft deep on the animals' side and 10 ft wide. The public can walk down shallow steps to the bottom of the moat where a fence, 3 ft 6 in. high, prevents them from approaching nearer than 10 ft to the elephants. The same system is used for the rhinos except that along the animal's side there is a row of aluminium posts to prevent the rhinos from falling into the moat. These are removable.

All the elements of design (with one exception noted below) have a functional origin: the curved plinths and ribbed walls of the outside of the house discourage the animals from marking the walls: the plan curves for easy cleaning of the inside walls and also to minimise the chance of animal damage to the mosaic: the roof hoods combine lighting and air extractor fans. The exception is the accommodation for the keepers which has been made to conform to an architecture derived from the needs of animal display.

There are two visual analogies incorporated in the building: externally the scale is elephantine and the form is a close visual parallel to a group of animals around a watering place; internally, the low dark central area, with a radial arrangement of joists and brightly lit cyclorama walls gives the effect of the animals standing in bright top-lit clearings in a forest.

STRUCTURE, SERVICES AND FINISHES

The external walls are of reinforced concrete cast with vertical ribs hacked to expose the aggregate. Internally, the dens are finished in light grey-blue ceramic mosaic on a brick inner skin wall that protects 1-in. polystyrene insulation.

The glazed venting hoods over each of the dens are formed in laminated and solid wood members finished internally with white painted tongued and grooved boarding and externally in copper-covered felt. They are supported on concrete ring beams that form the top edge of the den walls.

The spiders-web roof structure over the public area is formed on laminated wood beams set in metal shoes, which span from the perimeter concrete columns and walls to a set of laminated wood columns clustered round the free-standing flue and the air intake. The separation formed between the roof and each of these two shafts is glazed to allow a glimmer of daylight in the centre.

A dark blue brick is used consistently for the outside moat walls, the yard walls and the curved plinths on which the building sits. It is also continuously used for the paving of the public area, both outside and through the interior.

The main heating is by warmed air that rises from the basement and feeds through curved horizontal ducts to outlets over the dens. To reduce the smell, a small amount of warm air is also fed into the central public space to create positive air pressure towards the animals.

Hidden spotlights in the den hoods are the main source of artificial light. The public area is in contrast kept deliberately dark; the only lighting being from a group of spotlights lighting the central columns and from safety lights under the seats picking out the beginning of the steps.

The building was built to our design by John Mowlem and Co Ltd. Jenkins and Potter were the Structural Engineers and G. H. Buckle and Partners designed the heating installation. A. S. Wilson and Partners were the Quantity Surveyors.

NEW BIG CAT ENCLOSURES AT MANCHESTER ZOO

by R. E. Legge
Superintendent, Belle Vue Zoological Park, Manchester, England

ONE of the most important steps in the progressive development programme at Belle Vue Zoo Park has been the establishment of spacious, open-air enclosures for the Big Cats. There is nothing new, of course, in the general concept of such enclosures and indeed the materials we have used are conventional ones; constructional methods and one or two features of the exhibit, however, may be worthy of note.

The enclosures are five irregular-shaped areas, varying in size from 120 to 750 sq. yd, surrounding a low, unobtrusive house, to which the public is not admitted, but which is divided into a number of snug retirement cages.

58. The new Elephant and Rhinoceros Pavilion at London Zoo provides a visual parallel to a group of elephants at a water-hole (see pp. 123-25). The building is roughly circular in shape and on each side there is a large, semi-circular animal enclosure containing trees and ponds. The moats separating the animals from the public follow roughly the same curve as the rounded walls of the building itself. The tall roof hoods that dominate the exterior are placed over the animal dens and light them from above. *Henk Snoek/Casson Condor & Partners*

59. A view of the inside of the Elephant and Rhinoceros Pavilion at London Zoo. The four large exhibit dens and the elephants' indoor bathing pool are arranged round the central public area in such a way that the visitor does not see the whole area at a glance but discovers each pair of animals separately and in turn. The public area is darkened while the animals are spotlighted by the overhead lighting. The animals stand on floors at a slightly higher level than the public and are seen against cyclorama walls. *Henk Snoek/Casson Condor & Partners*