

## The Colosseum

The Colosseum is roughly elliptical in shape, with its long axis, oriented WSW-ESE, which measures 188 meters and the short one 156 meters. The building stands on a base of two steps; above it there are three floors of arcades built in travertine stone and a fourth storey with windows. There were eighty arches on every floor, divided by pillars with a half column.

The four arches on the axis of the building were the main entrances, and were probably decorated with a little porch and a statue. The other 76 arches were numbered for an easier access to the seats. Only 31 arches of the outer ring, from number XXIII to LIV, have remained intact.

The ground floor half columns are Doric in style; those of the second floor are Ionic and those of the upper floor Corinthian. The attic is divided into panels by Corinthian columns, with a rectangular window every second panel. Ancient authors mention that a series of bronze shields were affixed all around the attic on the panels without the windows.

The arches are 4.20 meters wide and 7.05 meters high on the ground floor, while on the upper floors they are only 6.45 meters high. Including the cornices between the floors and the attic, the overall height of the building is 48.5 meters.

The arena, in which the shows to place, gladiatorial games and fights against wild beasts measures 76 meters by 44 meters and it was made of wood, covered with yellow sand taken from the hill of Monte Mario. Over 100,000 cubic meters of travertine stone (45,000 only for the external wall), quarried near Tibur, and were employed for the building. A road was built from the quarries to Rome for this purpose. Tufa blocks, bricks and opus cementicium (concrete made of small lumps of tufa in mortar) were also employed, thus adapting the resistance of the materials to the loads and thrust that had to be supported. The combination of different materials improves the elasticity of the whole: the main pillars are made of travertine, radial walls are of travertine and tufa, the vaults are cast in cement work, and the walls were plastered and painted white and red. The passages corresponding to the main entrances were decorated with paintings and stuccoes, which have hardly survived the centuries.

All around the top there were the sockets for 240 wooden beams which supported the awning that covered the spectators from the sun and was maneuvered by a unit of sailors of the imperial fleet, stationed nearby.

The Colosseum was surrounded by an area paved with large travertine slabs and delimited by boundary stones set in the ground with a slight inclination inwards, which are supposed to have been supports of some sort for the ropes of the awning. Beyond these stones began the street paving of big gray blocks of basaltic lava.

The square around the Colosseum is probably one of the few places in Rome that is at the same level as the ancient times. Remember that Rome is about 2600 years old, and that during all this time layers and layers of buildings and roads have accumulated. The level of the ancient city is about 8-15 meters below the current one. But when you walk on the cobblestones around the Colosseum you are walking on the same stones as the ancient Romans.

The north side of the outer wall is still standing including 31 of the original 80 entrances, together with the part of the building that is between it and the inner wall supporting the top floor colonnade and practically the whole skeleton of the structure between this inner wall and the arena, that is, the encircling and radiating walls on which rested the cavea with its marble seats, that instead have disappeared.

The seating was all in travertine, now almost completely lost, and was raised 3.60 meters above the arena. Part of the floor of the arena was made of masonry and part of wood, with removable sections for the entrance/exit of scenarios, beasts and materials. There were marble decorations around the podium, at the vomitoria that gave on to the cavea for the passage of people, and perhaps also on the niches beside the main entrances on the arena.

Under the arena there were all the services necessary for the shows: cages for the animals, stores, tools, and lifts that raised the beasts to trapdoors placed on the floor of the arena. When wild beasts were in the amphitheatre a fence was erected all around the podium. The fence had wooden rollers on top, in order to prevent the beasts from climbing over. Inside, the seating has a gradient of 37°, and the overall height of 48.5 meters was calculated to give a good view of the arena even to the spectators in the upper seats.

The corridors and stairs were planned in order to allow the public, calculated between 50,000 and 75,000, swift access and exit and to keep the different classes of spectators separated. The two main entrances on the short axis led directly to the central boxes, while a series of obligatory pathways, symmetrically repeated in each quadrant of the stand, led the other spectators to their assigned places.

Between the arena and the wall surrounding it, called podium, there was a service tunnel, with niches. Their function is uncertain; some say they housed archers who protected the spectators from the risk of wild animals reaching the public, some say they were latrines, and some say that there was a water channel meant to give supplementary protection from the beasts. In any case, it seems that these niches could be reached only through some entrances located in the fourth ring of the cavea, accessible only to service personnel.

The site in itself had advantages, but also drawbacks. One of the main problems was the drainage of the site, but at the bottom of Nero's lake the engineers managed to reach the clay bed that would have supported the foundations. Drainage was guaranteed: it was calculated that, even though it reaches such a low level, the bottom of the arena remains

10 meters above that of the drain.

To build the amphitheatre the original site was deeply transformed. First of all, some enormous drains were built in order to ensure an adequate drainage towards the Circus Maximus.

After the area was completely drained, the excavation started, and it lasted until it reached the clay bed of the lake. In the firm clay bed an elliptical ring was excavated, 31 meters wide, 6 meters deep, with a perimeter of 530 meters. This enormous excavation was filled up with Roman cement, for example mortar made with pozzuolana and lime, mixed with coarse crushed stones. Layers and layers of mortar and stones were laid, and the concrete was compacted by hammering. It seems that on the southwest side the clay bed was not as firm as on other sides, and this could be the reason why that side collapsed first.

Then the foundation was raised for a further 6 meters, so that the thickness of this enormous doughnut is over 12 meters. All around the foundations a reinforcement brick wall was built, 3 meters wide and 6 meters deep, and a similar wall was built inside. On the internal side of the brick wall were arranged 32 cells that are visible all around the underground of the arena. The only foundation is this formidable ring of cement, and the only underground arches at the bottom of the arena are the ones on the main axis. All the surrounding buildings were demolished and with these materials and earth, the valley was filled up to the level we see today. It is believed that the only thing surviving from the former arrangement was the Meta Sudans (the sweating post), an ancient fountain that was placed at a crossroad where the borders of four traditional boroughs of the city met.

The drillings have demonstrated that the top of the foundation reaches up just beneath the ground floor. The foundation can be also seen from the so-called Passage of Commodus, a fifth tunnel decorated with stuccoes which was excavated after the Colosseum was completed. This passage has never been explored completely, and is believed to connect the amphitheatre and some imperial palace on the side of the Celian Hill.

In the foundations and in the external wall along the axis there are the four underground tunnels and below them four big drains that are 1.3 meters by 3.8 meters. These passages were made during the building of the foundations, by casting the concrete around a wooden boxing. Some remains of the boxing, which were made of non-seasoned oak timber, have been dated back - quite obviously - to about the year 70 AD. More large underground rooms, necessary for the services and the preparation of the shows, were made along the main axis.

Underground tunnels connected the amphitheatre to the surrounding buildings: the Northeast Passage, under the Porta Libitina, reached the Ludus Magnus, and it was interrupted by a modern drain in the 19th century; the one on the opposite side led to the Temple of Venus and it was probably sliced by the works for the underground railway in

the 19th century. Quite surprisingly, it seems that the other passages haven't been explored yet.

The cubicles built all around the bottom of the arena were, according to many, used to keep the wild beasts during the shows. Moreover, with the animals confined along the sides, the central corridors could be free for transit.

Small differences in some details of the construction have convinced the archaeologists that the building of each quadrant of the Colosseum was entrusted to four different contractors, who worked side by side sharing the four main entrances. The name of the architect, like that of many others of the antiquity, is not known. The money necessary to finance the building came most probably from the booty of the Palestinian war and the plundering of the Temple of Jerusalem. This was widely accepted before as commonsense, but now the theory is corroborated by a recent study on a marble inscription. On the stone, "underneath" the inscription, there are still the holes used to lodge the metal letters of a precedent inscription that was later erased.

Scholars have debated at length if forced labor had been employed to build the amphitheatre. In fact, slave labor was widely used then; however the concept that only slaves were employed has been rejected, since the quality of the construction is evidence of a skilled work force.

Once completed, the foundation base was covered by a travertine floor, 90 cm thick in average. On this stone floor were marked the reference points for the main pillars, and the base blocks of the pillars were anchored to the floor by a pivot and melted metal. This skeleton of pillars was raised up to the second floor, and the pillars were connected, at the top, by big arches made with 2 feet long bricks, placed so as to allow the construction of many rampant vaults, which all together make up the big cavea, destined to support the marble seats. Some remaining vaults can be seen in the picture of the arena as it is today. The system of having a first basic structure built up to the second floor allowed the builders to carry out the rest of the works above and below the cavea at the same time, leaving only some vaults open for the lifting up of the materials. The space between the pillars was filled by tufa opus quadratum on the ground floor, and by cement aggregate with a brick facing for the second floor. The tufa structures and the bricks ones which constitute together with the pillars the radial walls of the amphitheatre are indeed independent from the pillars themselves and from the big vaults, and it is thought that they were built after the pillars.

In general, the different materials used were utilized by exploiting their respective qualities of lightness, resistance and ease of installation. The combination of different materials has also improved the resilience of the whole structure. There are many outstanding structural elements in the Roman Colosseum: the formal elegance, the solidity of the construction and the organization of the spaces. In our opinion one of the most astonishing feats is the building technique, for example the system of making first the main arches in travertine, so that the rest of the construction could be carried out at the same time above and below this first structure.

Amazingly, it took less than 10 years to build it!

- Its long axis, oriented WNW-ESE, measures 188 meters and the short one 156.
- Its coordinates are: latitude  $41^{\circ} 53' 33''$  North, longitude  $12^{\circ} 29' 31''$  East
- The overall height of the building is 48.5 meters
- The arena measures 76 meters by 44 meters
- The building stands on a base of 2 steps; there are 3 floors of arcades and a 4th storey with windows (see image on the right).
- There were 80 arches on every floor, divided by pillars with a half column.
- The arches are 4.20 meters and 7.05 meters high on the ground floor; on the upper floors they are only 6.45 meters high
- The seating was raised 3.60 meters above the arena, and it has a gradient of  $37^{\circ}$
- The ancient capacity is calculated between 50,000 and 75,000 spectators
- 300 tons of metal were used for the iron clamps that connected the limestone blocks together
- The ground floor, in limestone, is 90 cm thick on average
- Over 100,000 cubic meters of travertine stone were used (45,000 for the external wall only)
- A road about 20 km long was built to transport the travertine stones from the quarries near Tivoli
- All around the top there were sockets for 240 wooden beams which supported the awning