

## The Longest Constructions in the History of Mankind

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**Anotation** Construction is a complex and laborious process, as it requires the full implementation of a number of technological operations. In addition, it often takes no less time to draw up an architectural and structural project, which often changes during the construction process. Without a properly executed project, not a single significant object in the world has been built and will never be built. Therefore, the construction itself can last a very long time, but the main thing is the final result. It is only worth mentioning that the huge pyramids built in Egypt 45-46 centuries ago have survived to this day without serious damage and subsidence of the foundations. In addition, one can cite examples of many stone structures dating back to the Paleolithic era, which were earlier than them, whose structure has withstood millennia and retained its original condition. All this indicates that construction traditions have existed since time immemorial. There are great architects and builders whose names are remembered alongside saints, emperors, pharaohs, kings, and other great historical figures.

**Key words:** Duration, Beginning, End, Construction, History, Building, Century

### 1. Introduction

Many famous buildings in the world sometimes lasted several centuries, and maybe even a millennium. There were many reasons for such delays, but such long-term construction projects are finally completed, and most of them are masterpieces of world architecture and construction. In addition, there are many such buildings that lasted at least one or two centuries. We must definitely mention the Sagrada Familia, a Catholic cathedral in Barcelona, the construction of which began in 1882 and is still unfinished. This magnificent creation of the architect Antonio Gaudi attracts tourists from all over

the world even during the construction process, but no one knows exactly when it will be completed. In the history of mankind, for the consideration of the longest construction projects, we have selected such objects that took four or more centuries to build. There were 8 of them in total. It is interesting that their names alone are enough to imagine the greatness that has been created by human hands. They prove that achieving the desired result is impossible without hard work, overcoming unprecedented obstacles, and striving for perfection.

### 2. Main part

Based on all available documentary materials, the longest period of construction was the Great Wall of China, which was rightfully included in the list of the New 7 Wonders of the World according to a general survey conducted in 2007. This defensive structure is the largest architectural monument, its length is 8851.9 km (according to some sources it was 21,196 km). Its construction began in the 3rd century BC and was completed in 1644 AD, that is, it lasted for 20 centuries. It is interesting that China was not a unified state at the time of construction. The kingdoms located in the north began to build separate sections of the wall to protect themselves from nomadic tribes, who were attracted by the wealth of Chinese cities and tried to plunder them. In the 20th century BC. In 246, Qin Shi Huang ended the centuries-old era of wars, unified the lands

of China, formed the first centralized Chinese state, founded the Qin Dynasty, of which he himself became the ruler, and began the construction of a single wall. The grandeur of the construction is also evidenced by the fact that during the Qin Dynasty, up to 2 million people worked on it. The construction environment itself was extremely difficult, since the wall followed mountain ranges. In addition, it had to overcome both heights and very significant and deep valleys. However, this is precisely what caused the peculiar uniqueness of the structure. It is unusually naturally integrated into the landscape and forms a single whole with it. A large part of the wall was built mainly of rammed earth. Clay, pebbles and other materials that could be obtained on site were mixed in layers. Sun-dried bricks were also used. It is because of the construction materials that the wall is called in Chinese folk name - "Earth Dragon". Already during the Qin period, in some areas, stone slabs began to be used, which were laid in layers of compacted earth. The sections of the Great Wall of China that have survived to our time were built mainly by the Ming Dynasty, during which its construction was completed (1368-1644). By this period, the main building materials were already bricks and stone blocks, which made the structure more reliable. Interestingly, the Chinese used a mixture of glutinous rice porridge and calcium hydroxide to glue the stone blocks. The dimensions of the wall vary in different places. The height is on average 7.5 meters, with towers - 9 meters,

width 5.5-6.5 meters, in general places more. Towers are an integral part of the wall. They were mainly built together with the wall, but there are also cases of later construction and they are narrower. Some, all towers are 200 meters apart, within reach of the arrows used to send messages. At a distance of 10 km, there are taller, signal towers. A bonfire was lit on their roofs to warn of an enemy invasion. During this longest and most difficult construction, due to harsh working conditions and epidemics, more than 1 million people died on the construction site, who, of course were buried there, and therefore the wall is also the longest cemetery in the world (Fig. 1).



Fig. 1. Great Wall of China

Many famous constructions in the world sometimes lasted several centuries, and maybe even a millennium. There were many reasons for such delays, but such long-term construction projects are finally completed, and most of them lasted more than a millennium, about 11 centuries. The construction of the Great Pyramid of Cholula in Mexico (3rd century BC - 8th century AD), which in the Aztec language means "mountain built by hand" and is located in the city of Cholula. The pyramid was dedicated to the "winged serpent", whose cult existed in these

places until our era. The height of the ancient complex is 66 meters (the actual height compared to the existing ground surface is 55 m), but due to the large length of the sides of the base (450 X 450 m), it is considered the Guinness World Record holder as the largest pyramid in the world by volume. The volume of stones used for its construction is 4.45 million m<sup>3</sup>, according to some sources this figure does not exceed 3.3 million, but in any case it is much larger than the volume of the world's tallest pyramid, the Pyramid of Cheops.



Fig. 2. Choluli Hill



Fig. 3. Great Pyramid of Cholula

The pyramid has been almost completely covered with earth for centuries and is a large, well-greened hill. On top of the hill is a temple, which was built in later years and reconstructed many times. It is noteworthy that the existing road and stairs leading to it from the west side are preserved in many later paintings, which indicates that its surface was covered with earth very soon after the construction of the pyramid itself was completed. It is noteworthy that in the post-

colonial period the pyramid was seriously damaged in connection with the construction of roads from the north and west sides (Fig. 2). As a result of research, it has been established that the pyramid consists of six rectangular structures of different sizes (decreasing in plan as the height of the pyramid increases) stacked on top of each other. It is noteworthy that only three of them have been studied so far. These structures were connected in height from all sides by stairs in the middle, which ultimately took the form of a pyramid (Fig. 3).

The city of Petra is one of the oldest cities on earth and is located in Jordan, 900 meters above sea level. This city is unique because the buildings are built of sandstone and many temples, houses and utility buildings are carved directly into the rock. The inhabitants of Petra were masters of working with stone. The name "Petra" itself means rock in Greek. Petra occupies a huge area (larger than Manhattan). It stretches for kilometers from the center. The main street, which was laid from west to east during Roman rule. On both sides of it there is a magnificent colonnade. The end of the street in the west led to the great temple, and in the east it ended with a triumphal arch. The monastery carved into the rock is a huge building about 50 meters wide and 45 meters high.



Fig. 4. Petra

The famous Al-Khazneh temple-mausoleum was built in the riverbed. For this, the riverbed was changed, a tunnel was made in the rock to transport water, and several dams were built, which was truly amazing for that time. Moreover, in a place where rainfall does not exceed 15 cm per year, channels were cut directly into the rock, and more than 200 reservoirs in the city were filled from all



sources within a radius of 25 km. This solved the problem of water scarcity. It is precisely because of such engineering achievements that the city of Petra is named one of the New 7 Wonders of the World. Studies have confirmed that its construction began in 600 BC and was completed in 250 AD. Although its construction lasted 8.5 centuries, there is no other such magnificent creation in the history of mankind (Fig.4)..

The first stone of the foundation of the Gothic cathedral of Cologne in Germany was laid on May 15, 1248, and construction was completed in 1880, 632 years after it began. Upon completion, the cathedral, with its height (157 meters), became the tallest building in the world for four years. It still ranks third among the cathedrals in the world in height and is the most important architectural landmark in Germany in terms of the number of visitors. It lost the first place in height to the 169-meter monument to George Washington. The construction of the cathedral was carried out continuously, and during this time many masters of construction changed, each of whom perceived the final form of the building in his own way. In Germany, there is a legend about this, according to which the first architect of the Cologne Cathedral, Konrad von Gochstaden, sold his soul to the devil in order to develop an ingenious and unique project. The devil agreed, but on the condition that if the construction process was stopped, the building would immediately collapse. This is how tourists are still explained the ongoing restoration work in the temple. Interestingly, even in conditions of complete calm, there is always wind near the temple; the stream of Hari, as soon as it encounters resistance from the high spires of the temple, goes down. The temple is very impressive. Its length is 144 meters and its width is 86 meters. To allow more light into the temple, pilasters were erected, and a system of external buttresses and arches was used to support the weight of the arches by the walls. In addition, the arches had not a semicircular shape, but an arrow-like outline, which allowed the entire building to be evenly covered and the entire structure to be

emphasized as if it were reaching heaven (Fig. 5).



Fig.5. Cologne Cathedral

St. Vitus Cathedral in Prague is a masterpiece of European Gothic and is an artistic and national-historical monument of the Czech Republic. Its architecture is a combination of Gothic, Renaissance and Baroque styles. The resulting beautiful cathedral was built in four stages for almost 600 years, from November 21, 1344 to the beginning of the 20<sup>th</sup> century. Its construction, despite the 6<sup>th</sup> century construction, was incredibly expensive. The first architect, the Frenchman Matthias of Arras, died 8 years after the start of construction. Since 1352, his work was continued by the 23-year-old architect from Germany, Peter Parlerz, who introduced many useful innovations into the construction. He died in 1399, and his three sons took up the work, but the war of 1419 seriously damaged the cathedral under construction and the construction process was stopped for a long time. Despite several attempts, the work did not progress due to lack of funds. In 1541, it was in even worse condition due to a severe fire. In 1619, it came under artillery fire during the new war, and three years later the dome of the main tower was split in two by lightning. In 1844, the architect Josef Kraner presented a program for the completion of the temple, which mainly envisaged the reconstruction of the already built building, but only in 1861 was the Church Restoration Society created and in

1929, after 585 years, the construction was completed (Fig. 6). The length of the main part of the temple is 124 meters, the highest, the southern tower, is 96.5 meters high. On the west side, two 82-meter Neo-Gothic stone towers are erected. The three portals of the cathedral are richly decorated with sculptures, stone and bronze reliefs. During the construction process, 10 architects were replaced, and many sculptors and artists of several generations participated and contributed to this work.



Fig. 6. St.Vitus Cathedral in Prague

Milan Cathedral (Italy) is the largest building in the world made of white marble. Its construction lasted from the end of the 14th century to the middle of the 20th century. To be exact, 579 years. It is very impressive in its size and the deliberate use of various architectural styles. It is the fourth largest Christian cathedral in the world. According to legend, in 1386, in a dream, the devil demanded that the architect Gianluca Galeazzo Visconti build a building decorated with numerous demonic images. Otherwise, he would be doomed to eternal torment. In accordance with the agreement with the church, he began to fulfill this task, but soon (1402) he died. The cathedral was built not in the name of the devil, but of the 3,400 sculptural compositions in its interior and exterior, 96 are demonic in nature. Construction, which began in 1388, was often stopped in order to make significant changes to the project. Therefore, the architecture of the cathedral does not belong to any one style, but is a kind of mixture of them with unadorned

spires. The length of the cathedral is 158 meters, the height of the main spire is 106.5 meters. At the same time, the cathedral can accommodate 40,000 people. The main landmark of the cathedral is the golden statue of the patron saint of Milan located on the spire of the cathedral (Fig. 7).



Fig. 7. Milan Cathedral

Angkor Wat, a Hindu temple built in Cambodia in honor of the god Vishnu, is one of the largest cult buildings in the history of mankind. It occupies a huge area. It was built as a city-temple and is a three-tiered truncated pyramid with towers on top. Its total height reaches 65 meters and it is surrounded by a rectangular wall and an artificial reservoir measuring 1.5 X 1.3 km. It has only one entrance from the west. The path from the entrance tower to the temple is bordered by a parapet decorated with sculptures. Angkor Wat is an outstanding example of the fusion of architecture and sculpture. Of particular note are the bas-reliefs located on the galleries surrounding all three tiers of the temple (Fig. 8). The construction of the first buildings of the complex began in 802 AD and was completed in 1220, and the construction lasted 418 years. After its completion, the population soon abandoned the site for unknown reasons. The city, which had become a ruin, was almost merged with the jungle. Only at the end of the 16 th century was this forgotten city briefly



mentioned by Portuguese missionaries, but efforts to restore it began 1981.



Fig. 8. Angkor Wat



Fig. 9. Chichen Itza

Chichen Itza, the cultural and political center of the Maya civilization, is a city with a large number of buildings of various purposes and sophisticated architectural styles on the Yucatan Peninsula in Mexico. One of the New 7 Wonders of the World, Chichen Itza is a vivid example of the realization of the capabilities of the Maya Indians as a people of a distinctive and highly developed ancient civilization. Scientists agree that construction began in 600 AD and was completed 400 years later. The total area of this massif is several square kilometers. The most famous building of the complex is the "Temple of Kukulcan", a 24-meter-high 9-step pyramid with wide stairs on all sides (Fig. 9). It was built to better see and hear the orator standing on it, and a

number of acoustic features were carefully considered. It is noteworthy that during the construction, the Mayan Indians did not use either the wheel or the live power of domestic animals. All buildings were built by human hands. In the 13th century, the city was plundered and raided by enemies. After that, the influence of the Mayan people gradually weakened, and soon, for a long time, this unique settlement was completely abandoned.

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### Conclusion

1. Most of the world's most famous ancient constructions took from several tens of centuries to several millennia to complete. Despite the unlimited number of workers, the work was mainly hampered by an extremely high proportion of manual labor. A lot of time was spent refining the project, which often underwent significant changes during the construction process, and, most importantly, problems with financing almost always arise during grandiose constructions;

2. As a result of analyzing the longest constructions in the world, it can be said with certainty that the longest time, 20 centuries, was spent on the construction of the Great Wall of China. The Great Pyramid of Cholula in Mexico was built for 11 centuries. The construction of the city of Petra took 8.5 centuries. The cathedrals of Cologne, St. Vitus, and Milan were built around the 6th century, while the construction of the Angkor Wat (Cambodia) and Chichen Itza (Mexico) complexes continued for the 4th century.

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