

THE REPRESENTATION OF THE ART OF BUILDING THROUGH HISTORY¹

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Abstract: *Images are an excellent way to learn more about history. Just like writing, they make it possible to collect information and describe the reality of different periods of history. Although images representing construction work are not as numerous as those representing other subjects, such as architecture and its styles, it is possible to find interesting and quite didactic examples. These images, found in different supports, such as drawings, frescoes, paintings, sculptures, mosaics, engravings, and photographs, represent the workers, the techniques, the instruments, and the materials used, showing the context of the time portrayed. This work presents and analyses images that represent constructions in different periods of history, such as Ancient Egypt, the Middle Ages, the Renaissance, and nowadays. We tried to be as broad as possible, expanding the analysis beyond Western and European art, seeking images that present constructions in various regions and cultures. Aiming to show how images are a valuable source of information and how the analysis of these enables knowledge, contextualization and understanding of the evolution of construction, images that represent construction works, either as the main theme of the work or as details, were collected. The search for works in different artistic media, such as paintings, frescoes, illuminations, mosaics, sculptures, engravings, drawings, and photographs and different contexts, such as the construction of churches, temples, houses, skyscrapers, among others, was undertaken. With this work, we conclude that a great evolution happened in some aspects of construction, but these changes were only expressive after the industrialization of the 18th century, which brought the use of new materials, such as iron and cement. But despite all the evolution of the last centuries, some techniques and instruments are still similar to those used for many millennia, such as the trowel and the plumb bob.*

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1 INTRODUCTION

The history of construction can give us a big scope in different aspects of human life. By looking at the techniques, builders and building materials, it is possible to understand the cultural, social, and economic reality of a society. The history of construction begins in prehistoric times when humans began to erect shelters and modify the landscape to suit their interests. The evolution of these constructions over the centuries is done with the development of techniques and the use of new materials and tools.

Pictures are always a great way to learn about history. They can be used as primary sources, telling a lot about the time of its creation. With them, researchers can discover information that is not present in written and other types of sources. As many other aspects of human life, construction works have been represented in art throughout history. These images, found in different media, such as drawings, paintings, engravings, and photographs, represent workers, their tools, the techniques, and materials, while also providing a context for the period.

This work will thus attempt to show how images can help to understand and identify construction elements throughout history. The images will be presented in a chronological way, starting from ancient Egypt. The works presented here were produced in different countries, like France, Italy, Brazil, Japan, and others. In this paper we analyse the elements found in the images, for example, the evolution of the tools or the different materials used, and try to trace a conclusion, showing the importance of the images for the study of the history of construction.

2 IN ANCIENT TIMES

The history of construction begins in prehistoric times, when the first humans began to use elements of nature to build shelters. "It was not until the Lower Palaeolithic and the European Homo heidelbergensis (ancient Homo erectus) that the first traces of land development that could be considered as habitat remains were observed" [1]. There is no representation of the building processes used in prehistory, so that it is only possible to know elements such as techniques, tools, and materials through archaeological observations.

The first representations related to construction were found in Ancient Egypt, and even then, they were very rare. In the New Kingdom tomb of *Rekhmire* at Thebes in Upper Egypt, which dates from about 1450 BC, it is possible to find a scene that shows all the stages of making unfired bricks (Figure 1). They were made of mud, shaped like wood, and dried in the sun and normally used for the houses of the common people, while stone was used for palaces and tombs. We also see the different tools, for transporting, to mould, and measure [2].



Figure 1 Brick making in Egypt. Painted on the walls of the Theban tomb of *Rakhmire* (mid-15th century BCE). Source: Dospěl, M. (2023) Pharaoh's brick makers, Biblical Archaeology Society. Available at: <https://www.biblicalarchaeology.org/daily/ancient-cultures/ancient-egypt/pharaohs-brick-makers/> (Accessed: 26 July 2023).

It is also quite difficult to find representations of ancient Greek constructions. In the scene found on a Greek vase (Figure 2), which dates from 475 to 425 BC, we see a carpenter using a very primitive instrument to drill into the wood.



Figura 2 Acrisios has Danae & Perseus locked in a chest (Boston hydria). Date: Between 475 and 425 BC. Location: Boston, Museum of fine arts. Source: <https://utpictura18.univ-amu.fr/notice/14875-acrisios-fait-enfermer-danae-persee-dans-coffre-hydrie-boston>.

In the famous Trajan's Column in Rome, dating from the early second century AD, there are numerous carved scenes of the construction of military fortifications among the stone bas-reliefs (Figure 3). These show masons building walls and using tools such as hammers and chisels. We also see the use of stones for the construction of these kinds of buildings.



Figure 3 Soldiers building forts, Trajanic Column, Rome, stone bas-reliefs. Photograph by Conrad Cichorius published in *Die Reliefs der Traianssäule*, Vol. 1, *Die Reliefs des Ersten Dakischen Krieges*, 1896, Verlag von Georg Reimer, Berlin, top, plate number 14, bottom, plate number 30 (Public domain).

Also in the Roman period, in the province of Caserta, Capua, Italy, there is another bas-relief depicting masonry (Figure 4). Dating from the first half of the second century, the image shows a wheel crane erecting a column and a sculptor working on a capital. It shows that this type of technology, that was used for centuries, was already in place to assist in the construction.



Figure 4 Capua, Italy, Second Century, detail, carved stone relief, part of a sarcophagus, showing a tread-wheel crane lifting a column with a mason carving a capital. Museo Provinciale Campano di Capua, Sarcofagi (Sala III-IV). Photograph: Dan Diffendale.

A very important tool for masonry is the mason's trowel, which first appears in the 4th century AD, in an early Christian painting found in the tomb of Trebius Justus in Rome (figure 5). In this image you can see the use of mortar in the masonry, and bricks that appear to have been fired [3].



Figure 5 Early Christian Painter (active fourth century in Rome). Tomb of Trebius Justus, Rome, fourth century AD. Source: <https://www.wga.hu/frames-e.html?/html/zearly/1/2mural/5vialati/latina7.html>.

3 9TH TO 17TH CENTURIES

In the Middle Ages, many constructions were represented in art, mainly churches and other buildings related to religious passages. In the medieval miniature entitled 'Flemish converts building a church under the supervision of Saint Amand' (Figure 6), taken from a manuscript produced between 1066 and 1107, we see the construction of a church. The design is very primitive (one can see the lack of proportion, the church being the same size as the workers), but the tools, such as the mason's trowel and the axes used to cut the bricks, are easily recognisable. [4]



Figura 6 Old Flemish miniature of “Flemish converts building a church under the supervision of St. Amand”, taken from the manuscript *The first life of St. Amand*, produced at the abbey of St. Amand in 1066-1107 (Bibliothèque municipale de Valenciennes, France, ms. 0502, f. 018).

In the mosaic found in the cathedral of Montreale in Sicily, which dates from the 1180s, there is a representation of the construction of the Tower of Babel (Figure 7). Several workers are depicted, with different tools and functions. At the top of the tower, two are working on masonry, while two others below are carrying bricks. A fifth worker with an ax is cutting stones for brick making. Another carries a ladder. At the back, the last one pays for the mortar in advance.



Figure 7 Mosaic artist active 1180s, Monreale Cathedral, “Building the Tower of Babel”. Source: https://commons.wikimedia.org/wiki/File:L%27art_de_la_construction,_Andrea_Pisano,_1343-1348.jpg?uselang=fr.

In this illumination entitled “Initial I: The Rebuilding of the Temple” (Figure 8), dating from around 1270 and made by an unknown artist, we see many elements of a construction: in addition to the use of a trowel, hammer and ladder, a square is shown, carried by the figure at the top of the temple. Such instruments are still used in construction today.

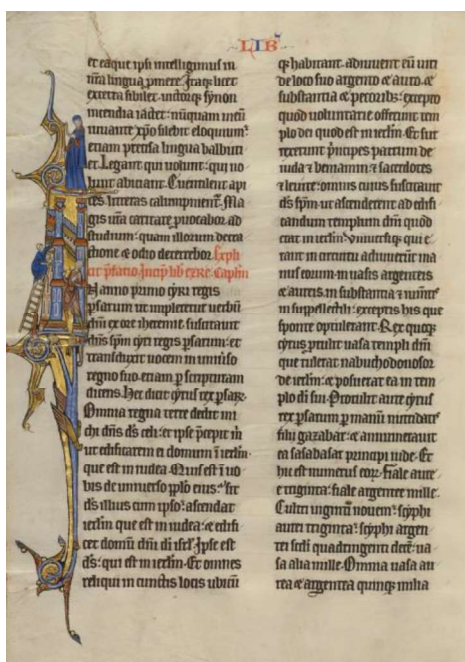


Figure 8 Unknown artist, “Initial I: The Rebuilding of the Temple”, around 1270, Artiste/fabricant inconnu. Source: <https://www.getty.edu/art/collection/object/103S1V>.

Japanese constructions were also represented in art from the Heian period (794AD – 1185AD). Many picture scrolls depicted scenes of carpenters constructing temples and shrines. These scrolls are a rich source of knowledge, showing the workers, the tools, the materials, and the techniques with a lot of detail. The scroll *Matsushimazaki Tenjin Engi* (The Origin of *Matsushimazaki Tenjin*) (Figure 9), dated from 1311, shows the construction of a shrine, from the delivery of the logs to the construction of the structure [5]. We see the use of many tools to work the wood, like axes, saws, chisels, hammers, planers, and the very important *sumitsubo*, a carpenter tool that use a line and ink to create straight marks in the wood.



Figure 9 Matsuzaki Tenjun Engi, Vol.. 4, 3rd section, 1311, Okusho, Hofu Tenmangu Shrine, Yamagushi Prefecture. Source: Akao, Kenzo et al. “Takenaka Carpentry Tools Museum. Permanent Exhibitions Catalog”. 4th ed. Takenaka Carpentry Tools Foundation. Kobe, 2021.

In the illumination of St. Hedwig and the New Convent (detail), by an unknown artist created in Silesia, Poland, in 1353 (Figure 10), we see the use of a crane to carry the bricks to the top of the church. By analysing other images from the Middle Ages, we can see that this type of crane was already widely used as it appears in many works. And we also see other common tools, such as a trowel and a scaffold.



Figure 10 St. Hedwig and the New Convent (detail), unknown artist, Silesia, Poland, 1353. Source: https://www.getty.edu/art/exhibitions/building_medieval_world/00437501.html.

In Pieter Bruegel the Elder's *The Tower of Babel* (Figure 11), dating from about 1525, we see the whole building process, depicted with compelling clarity, as it would have existed in the first quarter of the sixteenth century, and indeed for several centuries before that. The building is mythological and impossible, but its mode of construction is as it would have been for any major building project, such as a cathedral, in mediaeval Europe.



Figure 11 1563, Peter Bruegel the Elder, Flemish, 1525-1569, The Tower of Babel, oil on oak panel. Kunsthistorisches Museum, Vienna: kHM-Museumsverband. Source: https://www.wga.hu/frames-e.html?/html/b/bruegel/pieter_e/06/01babel.html.

4 18TH AND 19TH CENTURIES

The 18th and 19th centuries saw many technological changes, but analysing images of the time we see that in some regions, the techniques and tools were still very similar to the ones used in the last centuries. In this painting by the French painter Jean Baptiste Debret (1768-1848), done during the Artistic French Mission in Brazil, titled Slave Woodcutters (Figure 12), we see the use of a big saw to create wood planks, probably used to create floors and ceilings.

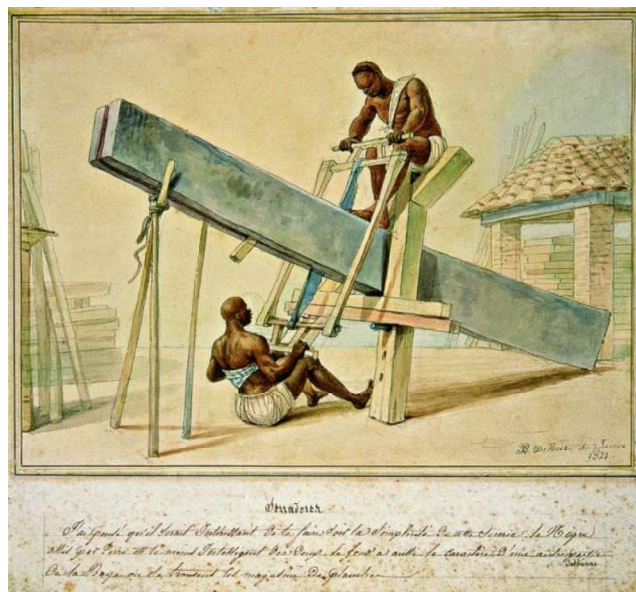


Figure 12 Slave Woodcutters, from 'Voyage Pittoresque et Historique au Brésil', engraved by Thierry Freres, 1835. Source: <https://vejario.abril.com.br/atracao/debret-e-a-missao-artistica-francesa-no-brasil-200-anos/>.

A very similar technique is found in an important Japanese print, called Mount Fuji from the mountains of Tōtōmi (figure 13), part of the famous series Thirty-six Views of Mount Fuji, by the artist Hokusai. This shows that the same techniques and tools were used in different cultures and parts of the world.



Figure 13 In the Mountains of Tōtōmi Province (*Tōtōmi sanchū*), from the series Thirty-six Views of Mount Fuji (*Fugaku sanjūrokkei*), by Katsushika Hokusai, ca. 1830-32, Japan. Source: <https://www.metmuseum.org/art/collection/search/36506>.

Technical manuals are an excellent source of images that help to understand the building process. In the manual *The Art of Building*, found in the Public Library of Évora, several illustrations show the construction in stone (Figure 14). This manual also deals with various other parts of construction, techniques, and materials. It is important to remember that in the 18th and 19th centuries we experienced a great technological revolution. As a result, various new materials, technologies, and techniques were used in construction, such as iron. In the same manual found in Évora, we see the use of metal in construction (Figure 15).

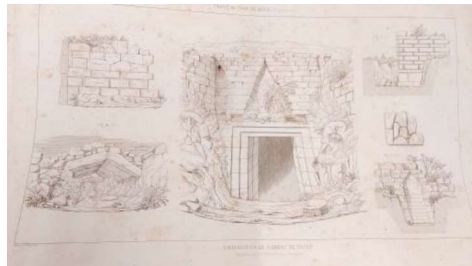


Figure 14 Theoretical and practical treatise on the art of building by Jean Rondelet, architect, member of the Institute. Supplement: Plates. Public Library of Évora. 1877. Photo: author.

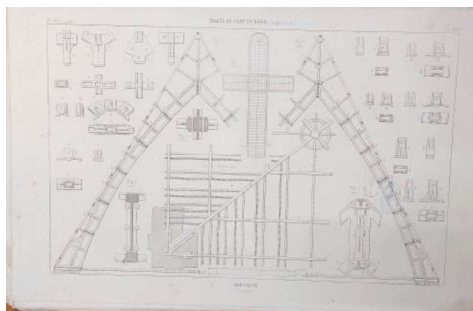


Figure 15 Theoretical and practical treatise on the art of building by Jean Rondelet, architect, member of the Institute. Supplement: Plates. Public Library of Évora. 1877. Photo: author.

5 20TH AND 21ST CENTURY

This image of the Empire State Building (Figure 16), dating from 1931, already shows a completely different image where modern construction techniques are used. Here we see the construction of a skyscraper, where metal structures have been used. Electrical machines are already used to connect the metal parts. But we see that the scaffolding used by the workers is still made of wood and very similar to many seen before. The popularisation of photography at the beginning of the 20th century, greatly facilitates the reproduction of images, including those of construction sites.



Figure 16 The Miriam and Ira D. Wallach Division of Art, Prints and Photographs: Photography Collection, The New York Public Library. (1931). Two workers riveting a corner beam. Source: <https://digitalcollections.nypl.org/items/510d47d9-a90c-a3d9-e040-e00a18064a99>.

20th century art continues to represent buildings, with all the innovations such as the use of modern machinery and the use of metal, as we see in this neo-impressionist painting from 1911 by Maximillien Luce (Figure 17).

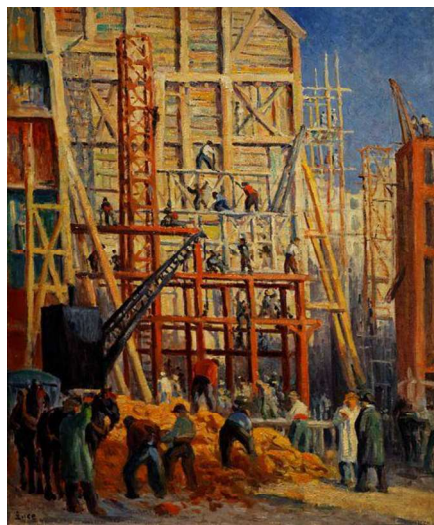


Figure 17 *Le Chantier*, Maximillien Luce, 1911. Source: https://commons.wikimedia.org/wiki/File:Le_chantier.jpg.

The use of reinforced concrete has made it possible to create projects such as the São Paulo Art Museum (MASP), designed by the architect Lina Bo Bardi. It has a clear span of 74 metres, considered the largest in the world at the time of its construction. In a photo of the construction of the museum (Figure 18), despite the very modern building, the scaffolding is still made of wood, just like the ones used in many millennia.

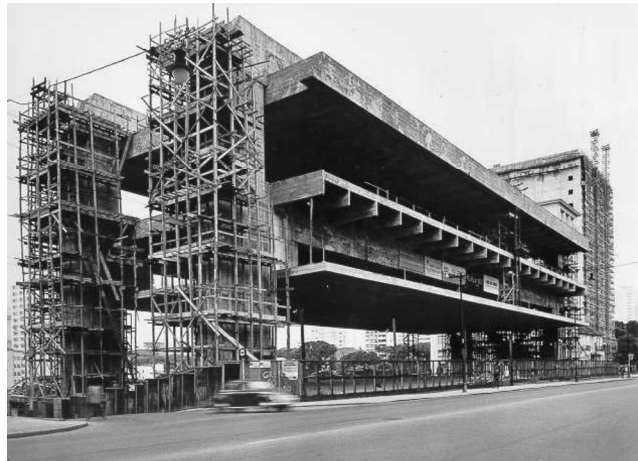


Figure 18 Construction of the MASP at Avenida Paulista (MASP collection), (1958-1968). Source: <https://www.archdaily.com.br/br/772263/fotografando-a-obra-de-lina-bo-bardi-parte-3>.

In this contemporary image by Mike Molloy (Figure 19), where we already see the use of technologies such as reinforced concrete, large cranes, and metal scaffolding.



Figure 19 Reinforced concrete construction. Photo by Mike Molloy. S/d. Source: <https://www.michaelmolloy.co.uk/construction-photography.html>.

6 CONCLUSION

At the beginning of this work, it was thought that it would be difficult to find pictorial representations of construction sites, but we discovered that there were many representations throughout history. With the most diverse means, such as frescoes, paintings, mosaics, illuminations, illustrations, photographs, the most varied aspects of construction have been depicted. Sometimes they are the focus of the image, sometimes they are just a detail. Most images from the mediaeval period onwards show construction related to religious temples. Perhaps the theme that has generated the most representations

of the theme is the passage on the Tower of Babel. Through these representations we learn a lot about building techniques, equipment, and materials.

An important conclusion of this work is that for millennia the techniques, materials and tools used in construction have changed little. We find that from the Egyptian period to the pre-industrial era, mostly wood, stone, and clay were used. We can see the use of new techniques such as ceramic bricks, but we know that their use does not stop with unfired bricks, as we know that they were used even in the 20th century in some parts of the world, such as Brazil.

It is only with the post-industrial changes, and the beginning of the use of metal, reinforced concrete, other modern materials, and electric tools, that we see great differentiations. Nevertheless, if we look at the current construction of houses and small buildings, we see that many of the techniques and equipment used up to now are still the same. The equipment, such as scaffolding and cranes, has been modernised and the materials have changed, but they still have the same principles. Although we have a wide range of tools today, the essential tools, such as the mason's trowel, plumb bobs, and squares, still have the same shapes. And all this can be seen in the pictures.

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