

Roman Walls

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## Contents

Abstract.....	iii
Part I: A Brief Study in Roman Military Walls.....	1
Part II: The Roman Use of Concrete on Trajan’s Column and Modern Cinder Block Construction.....	11
Appendix I: Soldiers as Builders .....	21
Appendix II: Important Terms .....	23
Annotated Bibliography.....	24
Project Summary and Self-Evaluation.....	40

## Abstract

The first part of this paper is meant to be a general introduction into the methodology, materials, and systems used to make Roman military walls. I did not focus on any specific sites, other than the exceptions and intercultural examples, leaving that for part two. Turf walls, stone walls, and the use of wood frames, are all covered. This demonstrates the Romans' use of many materials, as well as their ability to adapt their building projects to the situation. The purpose of walls-how they were perceived by the Romans and what their actual functions were- is one of the larger issues discussed. The Romans used walls as a means of control over the subjugated area, and not just for defense.

Scholars disagree on whether the quality or quantity of the Romans stonework is responsible for the legacy they left. While both have aided the Roman legacy, I argue that the longevity is more important. Quality and quantity mean nothing if they can no longer be observed, and much of Rome's stonework can still be studied. The masons who built the Roman walls stand as an excellent example of their work, having effectively laid the foundation for modern stone work and concrete.

The second part of this paper was written to tie together three issues: modern masonry, Roman construction, and the reliefs on Trajan's Column. More specifically, I have focused on the stone walls shown on these reliefs, ancient and secondary sources, and modern cinder block walls. Construction, and masonry, in the Roman Empire appear to be similar to my own experience. Materials have changed, standardization has increased, but the basic structure, or make-up of the walls has changed very little over time. The modern cinder block wall bears remarkable resemblance, in method, material, and design, to the Roman walls built in Dacia.

Eight scenes from Trajan's Column show Roman soldiers building walls. In each instance, the sculptors portray realistic scenes of construction, with only minimal artistic license causing confusion. Both Pliny and Vitruvius offer useful explanations of some of the tasks and materials in the reliefs. Michael Harold Strickland, Jean-Pierre Adam, and James E. Packer provide useful, modern, and scholarly perspectives. The Mason Contractor's Association of America, the Arizona Masonry Guild, Pamela H. Simpson, and my own experience all offer insight into modern construction and cinder block walls.

## **Part I:**

### **A Brief Study in Roman Military Walls**

Roman writers have not spared much ink on the subject of construction. The walls that held up the roofs that kept their parchment dry was not as exciting a topic as battles, and understandably so. However, those who wish to know more about the subject of Roman construction will find Pliny the Elder, Vitruvius, Vetegius, and Livy the only cooperative ancient sources. Much can be deduced from archaeology, but it is often limited in its usefulness to the arena of construction. Reverse engineering a construction site only works properly if all the original pieces are still present and intact. That is, however, never the case with Roman archaeology. Remains of rotten wood can tell an observer that a structure was built out of a certain kind of wood, but not how the joints were fitted together. Scholars have been trying to put archaeology and the ancient sources together to help understand how the Romans built. Unfortunately, neither are thorough enough to give the academic community an accurate understanding of the subject. If a practical knowledge of modern construction methods could be added to the equation, I believe much of the disparity could be overcome. It would not completely unravel the mystery, but it would lighten up several darkened corners.

The consistency of physics determines that the Roman builders and American builders work against the same laws of nature. So, while materials, tools, and projects may differ, there will tend to be many similarities: trusses, walls, et cetera. One of the more stark differences between ancient Roman construction and modern American construction is the use of stone. The Romans used wood only when dealing with temporary structures and for framing up the concrete and brick faced constructions. Timber frames are the most common form of construction in America. Steel studded walls, concrete blocks, and brick are used in special occasions and for

specific purposes. Concrete block is typically used for buildings that will be used for more industrial purposes (mechanic shops, malls, etc.). Brick is now mostly used as a decorative facing. While the Romans incorporated it into the walls as part of the structure, American builders use it for decoration only. Some buildings can be seen with solid brick construction, but those are often old and in ill-repair. The Roman use of block was that of solid stone, such as can be seen in the Servian Wall.

The famous Great Wall of China is another example of how construction shares common traits across time and geography. Sitting geographically and temporally between the ancient Roman buildings and modern American buildings, the wall was started by Qin Shin Huang in early 3<sup>rd</sup> century A.D. by connecting several pre-existing wall contains many different types of materials and construction. He ended China's Warring States period, subjugating and uniting the many kingdoms that had been fighting for generations. The section of the Great Wall of China that is often shown by the Chinese tourist industry, the section built by the Ming dynasty, is built in much the same way as the Roman Opus Testaceum, and modern American cinder block walls and is similar to those shown on Trajan's Column. The earliest iterations of the wall bore no resemblance to Roman walls, being a layer-cake made from gravel and mashed tamarisk. Later iterations of the wall were structurally similar in that they bore the block outer facings with rubble cores that the Romans used.

One material that the Romans used that the modern engineers do not is turf. Of course, it may be used in extreme circumstances by the military or a homeowner, but professional builders rarely rely on it for wall material. The Romans favored stone for permanent structures, but turf walls were often built around hastily assembled outposts during a military campaign. In his

updated graduate thesis, "Roman Fort-Defences to A.D. 117," Michael J. Jones describes this process:

Turf was perhaps the most widespread type. Its use was recommended by the ancient sources, and details of how it was used can be seen on Trajan's Column. According to the de munitionibus castrorum, turf was to be employed if possible to build ramparts (of camps). This preference for turf was echoed by Vegetius in his treatment of rampart-construction. But in both of these works, there is an undercurrent of the essentially impermanent nature of turf ramparts... Turves were cut into the shapes of bricks, and were misleadingly depicted in brick-form on Trajan's Column. (79-80)

This turf wall had a soil filling, much like Opus Testaceum had a rubble filling. However, Jones is confident that the walls on Trajan's Column are made of turf, but there are two major problems with that assertion. First of all, much of the artist depiction on Trajan's Column is characterized by a simplification of the buildings. Several reliefs show walls completely lacking in the third dimension. So, blocks of turf stacked one on top of the other would more than likely appear as a solid face rather than the corrugated brick that is clearly visible. The artist, and thus the carvers, went out of their way to show the even brick face. Secondly, consider that Trajan's Column is a distinct piece of royal propaganda meant to impress Romans with their emperor. Trajan would want to show permanent structures to emphasize his complete conquest of Decebalus and the Dacians.

Most of the forts built in Dacia would have been turf due the need for quick defenses. However, Jones also claims that stone walls in Britain were often built over the top of turf ramparts: "Many of the stone walls included in this study seem to have been built against a pre-

existing bank” (33). It is possible that this particular type of turf-to-stone remodeling was used in Dacia as well. However, whether or not the Dacians forts were stone, turf, or timber, it is most probable that Trajan’s Column is depicting stone forts. The turf fort would have been the practical thing to build, but it was good for Trajan’s propaganda to show strong, longer lasting, domineering stone forts. These, of course, were also built in Dacia, but would have been fewer in number.

Turf walls were more common on the battlefield, but stone walls were preferred for permanent defenses and border delineations. As mentioned before, turf walls could be easily transformed into stone walls by simply building over the top. Local stone was used whenever possible to save on the cost and hassle of transporting blocks, bricks, and mortar. There are several different structural designs of Roman stone walls. In his master’s thesis, “Roman Building Materials, Construction Methods, and Architecture: The Identity of an Empire,” Harold Michael Strickland defines them thus: “*Opus incertum* (uncertain work), *opus reticulatum* (network), and *opus testaceum* (brick work)” (19).

Today, the mortar that masons use to hold bricks and or cinder blocks together is sold as a different mixture than concrete, but both have similar origins and were much the same thing to the Romans. Indeed, the bonding agent is the same: lime. Lime is burned, and it becomes quicklime. When water is added again, the chemical bonding begins. That is what gives concrete and mortar their cohesive quality. Reese Palley, in his book *Concrete: A Seven-Thousand-Year History*, poses the question of why the knowledge and use of concrete falls in and out of fashion, or memory, throughout history. It might be argued that the Romans’ use and increasing quantity of mortar in their walls eventually led to them making solid concrete structures. However, the Romans cannot be said to be the first to use concrete, so the previous would be an erroneous, if



coincidental, assumption. Palley cites the Nabateans, who received it from the Egyptians, as a cultural knowledge bank from whom the Romans received the gift of concrete:

In Egypt the invention of lime-based concrete had created great monuments. Later in Rome the extension of empire was made possible by volcanic ash from Vesuvius. But only in the Nabatean desert was the very existence of a thousand-year-old empire entirely dependent on a thin skin of cementitious material. (28)

The Romans inherited the bastard son of the architectural world that had been passed around antiquity and finally gave him a chance to prove his legitimacy in practical application.

According to Palley, the Egyptians did not use lime's bonding capabilities to their fullest extent. The Nabateans also did not use it extensively, but they kept the tradition alive, and showed the Romans what could be done. The Romans, in turn, used their natural resources to put the lime-bonding process into full action, both as mortar and as concrete construction. The Romans not only used this small bit of chemistry effectively but also made widespread use of it in the spread of the empire.

Opus Testaceum was one of the most prevalent Roman wall designs which used lime as a cohesive element. Opus Testaceum is basically two spaced layers of brick or block filled with rubble in the middle. The block walls would have been mortared together about three feet apart, giving them enough strength to stand on their own. Once the mortar had dried, rubble would be added between the two walls. This was cheap support to walls, rubble being much less expensive than pre-cut stone block. It is most likely that this would have been done little by little. That is to say, three blocks might have been laid, rubble added, then more blocks, et cetera. When the Romans determined how to use rubble to their advantage in building, it greatly increased their efficiency. In his book, *Roman Building*, John-Pierre Adam describes this:

The use of rubble masonry bonded with lime mortar, beginning in the second century BC, was to lead the Romans to an astonishing diversity in the application of construction materials. Not only were all types of rock or artificial materials made use of, but the methods of dressing, jointing and presentation were open to many possibilities. (125)

With this method the Romans were able to be more frugal with their building expenses, yet maintain a respectable appearance in their architecture. A wall built out of rubble would be much less impressive than one faced with even blocks or stones, but no one sees the rubble in the middle of the wall, and it works just as well at keeping the enemies at bay.

Disagreeing with K.D. White's attempt to say that the Roman architects must be praised most for their arches, Strickland believes that the Roman's use of brick and concrete was their most colossal achievement because it allowed them to build what they did. Strickland writes "This writer disagrees with him and considers bricks and concrete construction to be the monumental achievement of the Romans because of the great volume of construction made possible by these two materials" (24). Altering the emphasis of Strickland position, I would say that it was the quantity itself that allows for the legacy of Roman architecture it provides many examples that outlast time through the endurance of stone.

The necessity of wood when building stone walls cannot be over looked. A solid stone wall could not be built without wood. While it might not have been a material that composed the final product, wood was necessary in the construction. Wooden frames kept the walls in perfect form until the mortar had dried. After that they were removed and discarded. More likely, reused or burned for firewood. The boards for frames were absolutely necessary; otherwise, the wall would dry lopsided and eventually fall.

One important feature of building stone walls is the framing. Before the mortar dries, it is imperative that the stones be kept in place to avoid shifting, breaking of the mortar, or leaning. The walls must simply be supported until they can support themselves. These must not be confused with wooden framed walls, like the kind used today, where the structure of the wall is made out of a skeleton of wood. These skeletal wooden walls had their own place in Roman construction, though they were for the walls in buildings, not military walls.

While the physical makeup, construction, and archaeology of walls may be somewhat straight forward, the jobs it served for the Romans were anything but simple. Indeed, walls fulfilled many functions for the Roman military. The most important and most obvious function of the wall is to keep the foes outside. Defense is the major motivation for any wall-like structure (save those which are specifically made for decoration and too small, or improperly placed, to keep any army out). It can be restated here that because of this, there is no such thing as a civilian (or city) wall. All major stone or turf walls are necessarily militaristic by nature.

Walls work defensively to keep the enemy out of the fort and also to keep them out of the land itself. If an area is occupied by a garrisoned fort, it is less likely that an army will risk passing through the area and thus expose themselves to the threat. Also, the defense helped secure the heart of the empire, not just the soldiers on the outskirts. In his article "The Defensive Systems of Roman Dacia," Nicolae Gudea says that "the strong defensive system of Roman Dacia was integrated within the general strategy of defence – the Transdanubian part of the frontier on the middle and lower Danube – and played an important role not only in the security of Danubian provinces, but even in that of Italy" (64). So, the walls defend in three ways: defending the heartland, defending the soldiers, and as a preemptive measure of intimidation.

Another important function of the wall is that of the defining boundary marker of civilization. When the Roman empire extends to the far reaches of the earth, and those far reaches of the earth are inhabited by unwashed masses of uncivilized barbarians, it is very important to delineate between what is now Roman and what is heathen. Even while the frontier would remain malleable with traffic and influence passing both ways, it might ease the mind of the Roman to know that he did not have to worry about who was the barbarian and who were the Romans. It may seem trivial to modern minds, but one has to consider the tensions between Illinois and Iowa, Iowa and Missouri. For all intents and purposes, it is all the Middle West of North America. However, as a native of Illinois, I will staunchly detest being called an Iowan. It may have been the same for the Romans. While I have the Mississippi River to remind me that I belong to Lincoln, the Romans, civilian and military, would have relied on walls to help determine or clarify their identity.

Roads must be paid for, tolls must be paid, and travelers must be found at a particular place so that they can be “asked” for their toll. The Romans would, no doubt, receive tolls paid by travelers along the road. This would be most easily accomplished by having all the roads go through gates in a wall so that all travelers could be accounted for, charged, and monitored at all times. Of course, it seems moot to think of the roads not going through gates. But the importance of this cannot be overlooked. If a road led to a Roman wall, whether a frontier wall such as Hadrian’s or the Antonine, or into a town or fort, the gate keepers would have complete control over that road. No one could simply turn aside and slip through the woods. It would funnel all travels through a Roman controlled portcullis.

The walls that surround Istanbul, or ancient Constantinople, remain an interesting example of the variety that can occur within Roman architecture. While most walls follow an

architectural pattern, varying in adaptation to the terrain and in local materials, the walls built by Theodosius follow a different pattern possibly similar to that found in the Aurelian Walls in Rome. This could be both the result of eastern engineering influences, and also the near thousand years between the advent of Opus Testaceum and the wall of Constantinople. It could simply be a technique used in only largest of walls. However, this basic pattern was known and used in Roman buildings elsewhere. It was particularly suited for and used in Theodosius' walls. Constantinople is geographically prone to earthquakes, and Theodosius and his architects were smart enough to take this into account. The walls, five to six meters thick, are typical in that they are stone block with the rubble core. However, several bands of brick are interspersed throughout, dividing the wall into sections. This creates a vibration barrier so that the walls stand up against the earthquakes better and still stand strong to this day.

As the rubble of the wall is popular because it cuts down on cost, it would be cost effective to put the bands of brick in every wall. Also, as earthquakes are not as common in the Roman heartland, there is no point in spending the money to install the layer cake walls. The walls of Constantinople exist because of the geography of the city. That is, they were built in light of the cities' proximity to a tectonic fault line (so that structural integrity might not be compromised). Because of this, however, we are allowed a glimpse at the versatility of the Roman builders. As stated before, the standardization of building techniques is a result of the standard laws of physics. Since the site of Constantinople offered the architects a variance, they quickly and effectively adapted. To think that the similar methods of walls is a result of the builders conservative views on architecture or an unwillingness to change would greatly underestimate them as a group with social group. The architects and builders were a powerful force in laying the foundation of the legacy of the Roman empire.

The wall served as a powerful, manifold function in the Roman world. It was more diverse defense. It was important for keeping out barbarians as well as defining barbarians. It was not so much as stopping traffic, but encouraging and directing it. It was defending against enemies as well as encouraging Romans to stay in Roman lands. The Romans are famous for their roads because they connected Rome to the rest of the world. No doubt the importance of the roads cannot be underestimated, but walls must be added to the Roman imperial equation. Roman walls were their method of control. The roads were the Romans' way to reach the ends of the earth, and the walls were their way of keeping from sliding off the edge of the world.

The Romans had a standard way of building a wall with many variations that they could use to adapt to the complex and diverse circumstances they were often required to build under. Turf walls can be built quickly and then turned into stone walls later. Timber can be applied to stone walls to keep them in form until they dry, or walls can be built out of timber frames and filled in. These methods, techniques, and variations come from a long line of building tradition. Seeing the Romans borrow from the Egyptians, Nabateans, and Greeks, is like the modern age borrowing from the Romans. It helps modern builders and scholars better understand the flow of information that has been passed down through the ages and practiced by countless people throughout the centuries.

## **Part II:**

### **The Roman Use of Concrete on Trajan's Column and Modern Cinder Block Construction**

Like language, law, and art, the fields of construction and engineering have been unalterably affected by the Romans. Besides the obvious influences, columns, arches, and other stylized areas, there are structural elements that remain under the grip of Roman ideas as well. Being that most of engineering is simply working against the laws of physics, which are constant, a specific method or design may remain in place almost indefinitely. For example, once the truss was invented to evenly distribute the weight of the roof onto the walls of a building, it changed little. Roman trusses are almost identical to modern American trusses, and it is unlikely that the Romans changed them much from the design they adopted. The great achievement of Roman engineering, then, is not so much what they made nor the quality but that their work still stands and their methods are still being used by modern engineers and construction workers. Scholars disagree whether the Romans invented the formula for concrete, but modern masons use their methods, techniques, and examples. The Romans were the first to make extensive use of concrete. So, while they might not have been the originators, they refined and popularized its use.

One of the most prominent structures that the Romans built out of concrete was the wall. Usually these walls were not solid concrete, but a hybrid form consisting of both stone block and concrete. They were, in a sense, brick walls with more mortar than usual. This method would

have allowed for walls that were both versatile, as the concrete allowed them to be easily formed, as well as economical, as the blocks would save the engineers from making the entire structure out of either substance.

The key to concrete is its cohesive nature. In *De Architectura*, Vitruvius describes lime as the bonding agent of concrete. He writes, “tum etiam de calce diligentia est adhibenda, uti de albosaxo aut silice coquatur” (96). In English, that is “...we must next be careful about *lime*,” he writes, “to burn it out of white stone or lava” (97). The Romans found this formula to be a simple, quick, and easily industrialized way to build walls. The immense use of concrete also made it so the masons could be flexible with the shapes of the stones used, even though this was typically standardized as well.

The reliefs on Trajan’s Column, built in 113 AD to commemorate Trajan’s Dacian campaigns, provide an excellent visual source of the methodology that went into Roman wall construction. Trajan’s Dacian wars, A.D. 101 and A.D. 106, are portrayed on the hundred foot column, wrapping around in a six hundred foot ribbon. Part of the conquest of what is now modern day Romania is the building of fortifications to house the legions of soldiers while they subjugated the Dacia king, Decebalus, to Roman rule. In his article “The Defensive Systems of Roman Dacia,” Nicolae Gudea, says that “the strong defensive system of Roman Dacia was integrated within the general strategy of defence – the Transdanubian part of the frontier on the middle and lower Danube – and played an important role not only in the security of Danubian provinces, but even in that of Italy” (64). The walls the Romans built in Dacia were intended, not only to protect them during the campaign and to mark their territory, but also to differentiate between the Roman world and the barbarian frontier.



The reliefs on Trajan's Column show the forts built on the Dacian frontier in several stages of development. Civil and military engineering methods might not have been entirely similar in the Roman world, but so much of Roman masonry was standardized, making it seem that the various types of walls were divided by strength, style, and materials, as opposed to their military or civil purpose. Also, any high stone wall is, by nature, military. While authors like Vitruvius and Pliny offer useful explanations on certain aspects, such as stone choice and pseudo-superstitious ideas about grid systems, the reliefs on Trajan's Column show what actually took place. Depending on how they are counted, the reliefs on Trajan's Column reveal thirteen plates which depict the construction of roads, walls, forts, and the clearing of forests. Eight of these deal specifically with masonry. In this paper, I will show how these eight scenes of wall construction on Trajan's Column (Cichorius XI, XII, XIV, XV, XLII, XLVI, XCV, XCVI) not only represent the techniques described by ancient authors, but also similar methods used by construction teams today.

In my own experience working in construction, I have garnered a working knowledge of the basic methods in which modern engineers and construction workers build, pour, and lay walls of various materials. The modern cinder block wall bears a remarkable similarity to the Roman Opus Testaceum. Opus Testaceum is a fairly broad term that refers to brick-faced concrete walls, and that is how I will use it in this paper.

The website for the Mason Contractor's Association of America (MCAA) authors a special page dedicated to the history of mason work ([www.masoncontractors.org](http://www.masoncontractors.org)). In this brief history, the MCAA suggest that the ancient masons had a highly developed wall design, just like the truss. The modern cinder block is not much different from the ancient design. While Opus Testaceum is more of a brick/concrete hybrid, the modern cinder block is entirely concrete. Opus

Testaceum is, essentially, two brick walls about three feet apart filled with rubble and concrete. Cinder block walls are less than a foot thick and filled with concrete but sometimes left empty. Despite these differences, the walls function the same: outside layer and inside layer with space between, concrete being integral to both.

Cichorius' Plates XI and XII depict the first instance of Roman wall construction on Trajan's Column. In these scenes, Roman soldiers can be seen laying blocks for the walls, but besides the fact that they are probably a mix of brick and concrete, little can be determined about the walls. Frank Lepper and Sheppard Frere's commentaries on the reliefs on Trajan's Column focus more on the landscape. In Plate XII, there is more variety in the action, including levering with wooden posts, possibly the tamping down of concrete, mixing the concrete into the walls, and the transportation of materials to the site. The wicker baskets appear to be the concrete that is used to hold the bricks in place.

Concrete acts as mortar as well as filler to make the wall bigger. Wall building follows a simple step-by-step system: wooden frames erected, the walls poured or built within, and then the frames removed after the mortar has dried. The only difference is that few modern masons add brick to the wet concrete construction as a structural component. The Romans had ways of using bricks as a veneer and incorporating it into the load bearing part of the wall. Brick is almost always an aesthetic work for modern masons. In his graduate thesis for Clemson University, Michael Harold Strickland dates Opus Testaceum to the first century AD, placing it in the proper time period for use in Dacia (21). Strickland describes how popular Opus Testaceum was because of its standardization, which made it easy to use on many buildings in Rome and on the frontier. Saying much the same about cinder blocks, Pamela H. Simpson writes "thousands of low-cost commercial and domestic structures were built of rock-faced hollow

concrete block” (108). Concrete block is similar to Opus Testaceum in that it is, as Simpson’s title says, “Cheap, Quick, and Easy” (108). Opus Testaceum would have been the perfect wall type for a military base: it would have to have been built rather quickly for the fear of enemy attacks. Strickland also proposes that the sheer volume of Roman construction is the reason for their dominance in engineering and architecture, and Opus Testaceum helped them accomplish that (24).

More details appear in Plates XIV and XV. In Plate XIV, Roman soldiers are shown building wooden palisade walls and hammering together wooden frames for the brick walls. The bricks would hold up once the concrete had dried, but it would need support to hold up against the weight of the wet concrete until it did. One man in the bottom left hand corner is carrying a tree limb. Although partly obscured by the wall, it appears that one or more of these men might be tamping down the concrete, or the dirt, attempting to make it settle artificially. Pliny the Elder, in his *Naturalis Historia*, describes tamping: “et ruderi novo tertiam partem testae tusae addi, dein rudus, in quo II quintae calcis misceantur, pedali crassitudine festucari” (146). The English reads “to fresh rubble should be added a third of its weight in pounded potsherds; and then the rubble, mixed with two-fifths of its weight in lime, should be rammed down to a thickness of one foot” (147). The dirt must be tamped so that the concrete has a solid base to dry on, and the concrete must be tamped so that no air pockets or inconsistencies cause the finished product to be unstable or to crack later.

Plate XV shows more soldiers tamping concrete into the walls, carrying it in wicker baskets, and building more wooden frames. The men in the middle of the scene are building with wood, away from any stone wall. They might be preparing another section of the wall, or they may be building an entirely wooden structure. One man in the bottom, right hand corner appears

to be tamping down freshly cut earth for the first layer of blocks which is now in place. This may be a chronological inconsistency on the part of the artist, but it remains unclear.

The walls shown on Plate XLII appear to be almost complete. The middle of the wall is not visible, as the artist does not make the three dimensional aspect clear. This middle is where the rubble and concrete would be. The other visual, and circumstantial evidence that the wall is in the style of *Opus Testaceum*, however, suggests that this is merely an oversight or the same kind of artistic liberty that allows Trajan to be so much larger than the rest of his men. All the other elements are there: the bricks, the wooden frames, and the baskets of, presumably, concrete.

In *Trajan's Army on Trajan's Column*, Sir Ian Richmond describes Roman soldiers as construction workers and engineers. Richmond focuses his scholarly efforts on the military presence on Trajan's Column. In passing, however, Richmond comments on the use of the wicker baskets by the Roman soldiers. He describes the scene as "another passes up a basket of excavated earth to a comrade" (24). In Plate XLII there are several men carrying wicker baskets. It is unclear exactly what these baskets contains, but Richmond claims that they are full of turf and soil being dug up and hauled away. This explanation could work on this plate as one man with a basket appears to be turned away from the wall, as if he were walking away. It is impossible to determine whether the basket, being jointly held between two men, is being passed to or from the wall.

I would like to propose a more plausible explanation that modern construction can help provide. It is unlikely that the baskets contain soil being hauled away and more likely that the baskets contain lime or rubble to be used in the construction of the wall itself. The man's odd stance could be explained as the same artistic oddity that caused the walls in this scene to lack a

three dimensional quality. Construction, new building, and foundations must be built on settled ground that has been tamped down. If something is built on unsettled ground, it will cause damage when the ground does settle (foundation cracks, the entire building shifting, etc.). For this reason, it would be unwise for the Romans to continue digging after they had made it so far into construction unless these soldiers were digging a separate ditch. This is possible, but it is still more likely that the ditch would have been dug first. Also, the masons on the reliefs would be professionals. They would work far too quickly for the foreman to have some men digging out the foundation while others were laying block.

Demolition, clearing trees, etc., can be found on Plate XIII, and this would have been closer to the digging of the foundation, not the building of the wall, in the overall plan of construction. It is more likely that the artist is simply showing another part of the construction. Furthermore, Strickland argues that “investigations of Roman structural remains, have identified a fairly standard type of masonry foundation. This consisted of large stone rubble with mortar to a depth of about three feet” (19). In other words, there is simply not that much earth to carry away from the construction site unless it were from a ditch or moat. As it would most definitely take more soldiers than the fourteen to make the wall, there are only fourteen builders on this plate, the artist is probably only showing the most important jobs on the site. Also, as the concrete is an integral part of the construction at that point, and the digging should be done, the baskets are most likely for the lime used in the walls.

In Plates XLVI and XLVII brick laying and concrete pouring are depicted. A gateway is also being framed out of wood. In the second plate there are copious stacks of timber, most likely for the framing of the walls. Most unique out of all this, however, are the odd ridges that the

soldiers within the walls seem to be standing between. In their commentary of the Cichorius reliefs, Lepper and Frere explain these ridges in the following way:

Obsessed by the notion that the 'ridges' in these scenes represented major mountain-crests, Cichorius made a vast enclosure out of this fairly normal Roman turf fort and located it at the top of the Red Tower Pass, at 'Caput Stenarum'. But, rough though the surface of the ground may have been, the soldiers are getting turves out of it much as in other scenes of this sort... (105)

Just as the three dimensional aspect of the wall in Plate XLII was understated in the relief, it appears the ridges for the landscape were overstated in Plate XLVI, leading some to believe that this particular fort was built on a mountain top. This discussion is more useful in determining topography and geography and less so when discussing walls. I would like to suggest instead that these ridges, which are tall enough to obscure some of the workers, might be artistically simplified piles of stone, brick, and or concrete material. It always helps to have building materials close at hand, and it gives an explanation for what the ridges might be and why the artist included them.

The last fort construction in the depictions of the Dacian Wars appears on Plates XCV and XCVI. Here soldiers can be seen clearing trees, smoothing out natural rocks, and laying bricks. Again, a completed wall is shown without a proper three dimensional element. As in Plates XLVI and XLVII, ridges (or piles of materials) once again appear, but they are less of a focal point to the picture than they were on the previous reliefs. In Plate XCVI, there are two soldiers pouring cement, two laying brick, and two doing an indistinguishable act of either uprooting a tree or planting a post in the ground. Scholars have discussed the progressive nature of reliefs on Trajan's Column, and this is true for the walls too. There is a large, almost complete

wall in this scene. It appears that the position of the wall in the overall story tends to be connected with how complete it is shown to be in its stage of construction. This particular scene is so close to the end of the story of the column that Dacian soldiers are kneeling before Trajan while the Roman soldiers build.

Modern cinder block walls offer much of the same versatility as Opus Testaceum. Essentially, they are just like bricks. They can be placed in the same staggered pattern or used in a wide variety of engineering feats. They are standardized but versatile enough to be used for almost any industrial project. While cinder block walls have no stone block, both cinder block and the Roman style walls incorporate concrete and mortar, which constitute the majority of their make-up. Working with stones restricts the mason, thus causing the move toward entirely concrete structures. Whether concrete walls are poured on site or made of cinder blocks, it allows the masons to be more in control of the project, ensuring a more stable product, quicker turn-around time, and a less specialized field of work. This last aspect is more important now when workers move from job to job or young men only work summers. The Romans employed professional masons in their military ranks, allowing them a higher quality of worker guaranteed on the job site. Today, however, a skilled mason may be overseeing a crew of inexperienced workers. It is beneficial, then, to have a simple, easy process to work with so that the head mason can quickly train new workers.

The reliefs on Trajan's Column ask as many questions as they answer concerning Roman walls and their construction, but it keeps the dialogue going. The artistic license, the lack of the three dimensional scope, and the seemingly chronological inconsistencies of some of the scenes (where two actions such as digging a foundation and laying block appear simultaneously), all contribute to the uncertainty of interpretation. In spite of this, however, the reliefs show Roman

soldiers at work, building walls in ways that support ancient authors such as Cassius Dio, Vitruvius, Pliny and Livy, and adds vividness to their descriptions.

Roman building methods changed how masons construct our world, and the reliefs on Trajan's Column offer an excellent visual example. By studying the masonry engineering of the Romans, one can easily see their skill and knowledge, and also how we to this day rely on their experience to shape our own world.

A modern mason would find the scenes on Trajan's Column interesting because they resemble a modern construction site, which differ only in the areas of power tools and weapons. Just as the basic design of the truss has not changed in two thousand years, the basic stone wall has not changed. This is not because of stubborn builders with a refusal to change but because of a near perfect balance between the laws of physics and the skills and knowledge of the engineers. Most concrete or block buildings outlive their engineers. The majority of cinder block walls last so long that they have to be demolished when the need arises. The Romans began working with a product that we now use today with equal effectiveness. When considering the longevity of the reputation of the Roman Empire, one cannot overlook one important fact: masonry lasts. If it were not for stone, and the men who worked it, Rome would retain only a fraction of its vivid shape in our minds. Rome lives on in stone.



### **Appendix I: Soldiers as Builders**

For battlefield construction, the United States military relies on special battalions of specially trained soldiers that have training or a background in building trades. The Seabees debuted this type of unit in the Pacific during World War II. Private, civilian companies were making good profit building for the military previous this, but they were not allowed weapons according the rules of war. When the work zone came under fire, the workers could not be paid enough to stay and work. Or, under the pressure, they would attempt to fight. The construction battalions solved this problem. They were soldiers, but they all knew how to build. Since then more specialty corps have been established. Red Horse is the Air Force equivalent.

The Romans never had this problem in their wars for the Roman Empire. When the Romans would have to build a fort, the soldiers were the builders that would put it together. Rather than using civilians, or special battalions, the Romans simply were the special construction battalions. W.H. Hanson, in his article "Building the Forts and Frontiers," says that "The Roman army had no separate engineering corps as do modern armies, but it has been assumed that, at least until the 2<sup>nd</sup> c. A.D., building skills were largely the prerogative of the legions" (33). It was expected of the Roman legions to be able to build their own shelters and forts, only sometimes enlisting the help of other Roman soldiers. In his treatment of the Roman soldiers in his book *The Antonine Wall*, David J. Breeze describes this:

The legions formed the main building force on the Antonine Wall, though some work was undertaken by auxiliary units. It was mainly the auxiliary units which occupied the forts on the Wall, though legionaries are also attested on the frontier, apparently on garrison duty. (39)

It would not be right to say that the Romans were the Seabees, or Red Horse, or that they were all specialists, but they had a higher population in their ranks of soldiers trained in construction. They were good enough that all construction projects for the military could be carried out by the military.

## Appendix II: Important Terms

Lime – Lime is an organic substance that can be burned to make Quicklime. Then, when water is added, it becomes a powerful bonding agent. It is commonly used in concrete.

Opus Testaceum – This is a common wall type used in the 1<sup>st</sup> and 2<sup>nd</sup> Centuries AD and comes later than Opus Incertum and Reticulatum. Opus Testaceum is made up of two brick faced exteriors filled with a rubble core.

Opus Incertum – Using bigger stones than Opus Testaceum, Opus Incertum stills follows the same pattern: two exterior faces filled with rubble.

Opus Reticulatum – The facing stones on an Opus Reticulatum wall are shaped like spikes driven into the rubble/mortar core of the wall. Again, it has the same basic pattern of the previous wall types. These spike-shaped facing stones gave the final appearance of little diamond shaped facing stones.

Tamping – When earth is excavated, it is unsettled, soft, and not suitable for building upon. It can be artificially settled by tamping. This is accomplished by ramming a blunt board or post into the ground.

Vitruvius – In his ten book work, *De Architectura*, Vitruvius thoroughly outlines various aspects of Roman construct, materials, and building. He covers the qualities of wood and when best to harvest them for different purposes, the varieties of stone and their uses, and how to properly construct an arch, plaster a wall, and much more.

### Annotated Bibliography

Adam, Jean-Pierre. *Roman Building: Materials and Techniques*. Trans. Anthony Mathews. Bloomington, Indiana UP, 1994. Print.

Jean-Pierre Adam provides an exceedingly thorough account of Roman building methods, techniques, and materials in his *Roman Building*. Beginning with surveying, he then divides the branches of construction by the material being worked with or the place being built/remodeled (large stone block, mixed materials, masonry, arches and vaults, carpentry, wall veneer, floors, civil engineering, and domestic or commercial). Adam's chapter on walls is more thorough than most authors, describing *Opus quasi reticulum*, *Opus vittatum*, *Opus mixtum*, *Opus spicatum*, which most scholars of Roman walls do not bother with.

Bennett, Julian. *Trajan: A Life and Times*. Bloomington: Indiana UP, 1997. Print.

Understanding the life of the emperor who built Trajan's Column is a moot necessity. It is imperative. Julian Bennett dedicates a whole chapter to Trajan's exploits in Dacia, and several other chapter to his particular ideas of public policy, law, and what would be propaganda. This book also contains an abridged version of Cassius Dio's account of the Dacian Wars.

Blake, Marion Elizabeth. *Roman Construction in Italy from Tiberius Through the Flavians*.

Focusing more on the civilian application of construction, Marion Blake still gives a remarkable overview of stones in the vicinity of Rome and their use in certain building projects. Tracing some stones from their volcanic origins, Blake's detail can become extraneous, but it could also be described as thorough. For work on public buildings, homes, and civic buildings, this book would be an excellent resource.

Breeze, David J. *The Antonine Wall*. Spain: John Donald, 2006. Print.

The Antonine Wall is an excellent example of Roman wall construction, and David J. Breeze's treatment of it in his book is a well-informed introduction to the site. Both archaeologically, historically, and contextually, the book offer a simple guide to the wall and everything surrounding that one might need to know. The book also offers a considerable explanation on Roman soldiers and how they acted as builders, as well as Roman construction in general. This book turned me onto the topic of Roman construction to begin with.

Bruce, J. Collingwood. *Handbook to the Roman Wall*. Ed. Sir Ian Richmond. 12<sup>th</sup> Ed. Newcastle Upon Tyne: Hindson & Andrew Reid LTD, 1966. Print.

Bruce J. Collingwood's *Handbook to the Roman Wall* goes in to immense detail about Hadrian's Wall. He provides historical background, an overview of the entire wall and its forts, and in-depth descriptions of the locales of each fort. Most importantly, however, is his description of the quarrying and wall building methods used by the Romans. This must have been similar to the way the Roman built their walls in Dacia, and it will provide a source for comparative research.

Campbell, Brian. *The Roman Army, 31BC – AD 337*. London: Routledge, 1994. Print.

Brian Campell has compiled original sources from members of the Roman military. He has organized the letters into the categories of soldiers, officers, the emperor, in the field, peacetime, law and community, politics, veterans, and the later empire. All of the letters in these categories deal with these issues in difference variances. It is a useless book for determining what the Romans were saying about life in the military at this time.

Craig, James R., David J. Vaughan, and Brian J. Skinner. *Resources of Earth*. Eaglewood Cliffs: Prentice Hall, 1988. Print.

The ancient authors discuss the materials used, wood, stone, and lime, but no author does it justice to the degree of an expert. More knowledge, that which can be found in *Resources of Earth*. This book offers immense accounts and descriptions of the natural resources available from the earth. There is a special chapter devoted to the materials known and used in antiquity.

Davies, G.A.T. "Trajan's First Dacian War." *The Journal of Roman Studies*. 7.- (1917): 74-97. *JSTOR*. 11 Sept. 2012.

G.A. Davis tracks the criticism of Cichorius' work on Trajan's Column, namely Petersen, agreeing with Petersen that Cichorius' geographical assumptions about the scene shown on the reliefs to be inaccurate. Claiming that the pass taken by Trajan could not be along the Maros and Strell rivers, as Cichorius postulated, but through the Red Tower Pass, Davis elevates the idea of mountain combat, and changing the interpretation of certain geographical features in the following scenes. He also disagrees with Petersen, who was a great critic of Cichorius, who said that the Romans took the Vulcan Pass through the mountains. Davis relies more on Dio Cassius' textual account of the Trajan Wars than the previous interpretations and the cold evidence of the column itself.

De Camp, L. Sprague. *The Ancient Engineers*. New York: Ballantine Books, 1960. Print.

To provide a historical context, and to underscore the significance of the influence of the advances and perfections of architecture and engineering, L. Sprague De Camp gives a clear, concise history of the Roman contribution to the world of engineering. He notes that architecture became a popular profession in Rome, so that even sons of emperors began to educate themselves in it. No doubt, with this in mind, Trajan's interest in the column and what it portrays, with its many reliefs of him surveying architectural and engineering work, takes on a new significance.

Derry, T.K., and Trevor I. Williams. *A Short History of Technology: From the Earliest Times to A.D. 1900*. New York: Oxford UP, 1961. Print.

Providing a thorough history of the entire history of technological advancement, if such a thing can be done, T.K. Derry and Trevor Williams history provides context for Roman construction technology that K.D. White and Vitruvius do not supply. However, their treatment of the Roman period of technology cites only secondary sources in the bibliography, and not one Roman primary text. Whether or not the context provided by this work will prove to be paired with workable information is yet to be seen.

Gordon, Arthur E. *An Introduction to Latin Epigraphy*. Berkeley: California UP, 1983. Print.

This weighty introduction to Latin epigraphy covers methods, subject matter, technical specifics, and even includes a list of the major collections of Roman epigraphy that is available for scholarly observation. There is a special chapter devoted to Roman stone cutting which could be applied to various situations. It includes photographs of one hundred inscriptions, including the one from Trajan's Column.

Gudea, Nicolae. "The Defensive System of Roman Dacia." *Britannia*. 10.- (1979): 63-87.

*JSTOR*. 11 Sept. 2012.

A native Romanian and descendent of the conquered Dacians, Nicolae Gudea stresses Dacia's important as a strategic outpost in breaking the barbarian frontier, as well as reinforcing the Roman line. Any now army hoping to attack Italy would now have to go through the land of Dacia. It was, in a sense, a buffer zone. The immense mineral well was, no doubt, an added bonus, but it was probably not the driving motive behind Trajan's invasion. By analyzing the remains of the Roman defensive system, namely walls and forts, Gudea draws conclusions about how the Roman front line would have most successfully operated. That is, where there routes of communication ran, and how they used the terrain to their advantage in their war.

Hamberg, Gustaf Per. *Studies in Roman Imperial Art*. Copenhagen: Ejnar Munksgaard, 1945.

Print.

The artistic measure of Trajan's Column is necessary to determine so that the motive of its creation can be more surely reconciled with the possibility of propaganda and purely artistic reasons. Gustaf Per Hamberg's *Studies in Roman Imperial Art* will provide an excellent comparative source of artistic work, so that the artistic value of the Trajan's Column can, then, be understood. Trajan's Column is one of Hamberg's prime examples, and he compares it to Marcus Aurelius' Column. He comes to the conclusion that Trajan's Column proposes a kind of contest.

Hanson, W.S. Ed. "The Army and Frontiers of Rome: Papers Offered to David Breeze on the Occasion of his Sixt-Fifth Birthday and His Retirement from Historic Scotland." *Journal of Roman Archaeology*. Portsmmouth: Thomas Shore, 2009. Print.



This collection of papers is an excellent resource for anyone in need of information on Roman frontier. Being presented to an icon in the field, they are some of the best. *A 'Secret Empire' (Imperii Arcanum)* by B. Rankov, studying Roman expansionism, and *Building Forts and Frontiers* by W.S. Hanson were especially relevant to my work with Roman walls and forts.

Jones, Michael J. *Roman Fort-Defences to A.D. 117*. Great Britain: British Archaeological Reports 21, 1975. Print.

This is one of the most thorough documents on Roman forts in Britain during the 1<sup>st</sup> and 2<sup>nd</sup> Century. Michael J. Jones covers, not only walls, but the space and context around the walls help bridge the gap between the archaeology and the theory about how Roman walls function. The books covers almost two dozen sites in Britain. It was relevant for comparative reasons.

Jones, H. Stuart. "The Historical Interpretation of the Relief's of Trajan's Column." *Papers of the British School at Rome*. 5.7 (1910): 435-459. *JSTOR*. 11 Sept. 2012.

H. Stuart Jones does not bother trying to determine whether or not the art on Trajan's Column is historically accurate, nor does he bother attending to the inscription at its base. Jones merely views the art as a narrative, like one might view the glyphs on the inside of Ramses II's burial temple. Judging by the popularity of artistic experiment during Trajan's life, Jones assumes that the sculptor of Trajan's Column was also involved in his own experiments. This is what Jones credits as the origin of the excessive ornamental carving on the reliefs. Giving his analysis of the scenes on the column, Jones finds several points of disagreement with Cichorius and Petersen's interpretations, basing his arguments solely on the artistic congruity of the carvings.

Keppie, Lawrence. *Understanding Roman Inscriptions*. Baltimore: John Hopkins UP, 1991.

Print

Focusing less on the technical details than Gordon, Lawrence Keppie provides a broader range of less specific topics concerning epigraphy. He gives his introduction to stonecutting, but then focuses on concepts like the emperor, local government, roads, military, trade, various time periods, and how Latin inscriptions changed and diversified depending on the context.

Landels, J.G. *Engineering in the Ancient World*. Berkeley: California UP, 1981. Print.

J.G. Landels states in the preface to his book that his intention is to outline the basic methods of Greek and Roman engineering in their own rights, but also they apply in other contexts. His discussion of power sources (man, animal, water, wind, and steam) is what makes his work so unique in light of all the ancient engineering work. Water supplies, efforts to lift heavy weights, and issues of transport (sea and land) are also covered thoroughly. Finally, discusses the work of Hero of Alexandria, Vitruvius, Frontinus, and Pliny and their roles in documenting the information still available today.

Lepper, Frank and Sheppard Frere. *Trajan's Column: A New Edition of the Cichorius Plates*.

Gloucster: Alan Sutton Publishing, 1988. Print.

Containing notes and photographs of the whole relief of Trajan's Column, this edition of the Cichorius Plates is an invaluable resource. The photogravure plates that Cichorius published in the 1860's appear in their entirety in this work. It offers the picture of an each, numbered and given a brief description. More importantly than this, Frank Lepper and Sheppard Frere have provided commentary on what is happening in each scene, as well as notes about the more particular historical and contextual aspect of

the relief. Using their work on Trajan's Column, any scholar already has a starting point of organized information to work from.

MacDonald, William L. *The Architecture of the Roman Empire*. New Haven: Yale UP, 1965.

Print.

Dividing the study of Roman architecture into emperors, Nero, Domitian, Trajan, etc., William L. MacDonald isolates their specific works and shows how each emperor had his effect on the architectural style by means of what he required of his architects. He gives background and synopsis of the architects Severus, Rabitius, Apollodorus, and Hadrian. An excellent issue, which few other scholars attempt to understand, is the relationship between structure and design. No doubt, important.

MacKendrick, Paul. *The Dacian Stones Speak*. Chapel Hill: North Carolina UP, 1975. Print.

Paul MacKendrick, his book, "The Dacian Stones Speak," provides a thorough, focused, and illuminating account of the history of Romanian archaeology. His fourth chapter is "The Roman Conquest: A Column and a Trophy," giving an account of the history, warfare, and archaeological remains of Rome invading Dacia. The fifth chapter deals more with Rome's stay in Dacia, not just the invasion. Here is where many of the forts, walls, and roads are discussed. MacKendrick also includes a useful chronology of Dacian history from ancient times to the 8<sup>th</sup> century A.D.

*Mason Contractors*. Mason Contractor's Association of America. N.A. Web.

<http://www.masoncontractors.org>

Providing a more thorough, in depth, synthesis of modern masonry, the "Mason Contractors Association of America" have put together an exceedingly helpful website. They offer an brief overview of the history of masonry, starting with the ancient world.

There is a section devoted to an apology of masonry, giving a quick introduction to why masonry is a good method of construction. This, while technically propaganda, provides a quick synthesis of the many benefits of modern masonry, so that they can be compared to ancient benefits and methods. Most importantly, the website provides a technical page devoted to the specific methodology of masonry construction techniques. This website is also open to the public.

*Masonry for Life*. Arizona Masonry Guild. 2007. Web. <http://www.masonryforlife.com>

Sponsored by the Arizona Masonry Guild, "Masonry for Life," is a reliable source of current, legal, and effective information, guidelines, and history on modern masonry. They offer a consumer based page which, although designed to sell the idea of masonry to the American, offers information on the benefits of stone, step-by-step instructions, how-to, and frequently asked questions. There is also a product guide, which could provide insight into the modern materials used, and not just the methods. This website is free and open to the public.

Packer, James E. *The Forum of Trajan in Rome: A Study of the Monuments*. Berkely: California UP, 2001. Print.

A full, authoritative account of the Forum of Trajan, James Packer's book offers information on every aspect, including Trajan's Column. Beginning with a concise, contextual history of the forum, Packer also gives a history of the scholarship and archaeological research that has been done on the Forum of Trajan in Rome. He then covers the restoration of the Forum, and then Packer gives his own opinions and theories based out of his twenty-five years of research on the topic. This work is cited in almost every other work after his publishing on the subject. Its use as a bibliographic synthesis

is also not to be overlooked. Packer is aware of the scholarship, and the full edition contains a map of the archaeological remains of the forum.

Palley, Reese. *Concrete: A Seven-Thousand-Year History*. New York: The Quantuck lane Press, 2010. Print.

Offering a historical approach to the topic, Reese Palley does not skip over the classical beginnings of concrete. His first five chapters are devoted to the pre-historic context and maturation during the Roman empire. Claiming that the Nabateans were the link between Egypt's failed use of concrete and Rome's successful use of it, Reese then goes into architectural detail about how concrete made the dome possible, one of Rome's lasting marks on architecture.

Richmond, Sir Ian. *Trajan's Army on Trajan's Column*. London: The British School at Rome, 1982. Print.

Sir Ian Richmond directly addresses the idea of the Roman soldiers as construction workers and craftsmen, in his book, *Trajan's Army on Trajan's Column*. The translation between reality and column is, of course, of the utmost importance. Richmond understands this, and devotes a section of his book to the understanding of the Roman as workers, explaining the methods they used to build their own camps. He also writes about their buildings, prison-camps, fortresses, and bridges.

Rossi, Lino. *Trajan's Column and the Dacian Wars*. Trans. J.M.C. Toynbee. Ithaca: Cornell UP, 1971. Print.

An excellent connection of the historical wars Trajan fought in Dacia and the monument he created for commemorate them, Lino Rossi's book offers a simple, but concise comparison of the history and the reliefs on the column itself. Rossi gives an

account of the strength, organization, and habits of the Roman army in Dacia at the time. This is important because it would have been soldiers from this army who built the walls depicted on Trajan's Column. The most important aspect of the book is Rossi chapter on the connection between the Roman army and how it appears on the column. The translation between reality and the column are of the utmost importance.

Salmon, Edward Togo. "Trajan's Conquest of Dacia." *American Philological Association*. 67.- (1936): 83-105. *JSTOR*. 11 Sept. 2012.

Setting forth four goals, Edward Togo Salmon attempts to explain the cause and or causes of Trajan's wars in Dacia, how the invasion was used to split the Transdanubian tribes, further investigation of Trajan's bridge, and lastly he makes an attempt to judge the size of Trajan's army. As Trajan did not annex Dacia after the first war, knowing that it was rich with resources, the economic cause of the war can be ruled out. If it had been the case, Trajan would have begun to bleed the country as soon as he could. Rather, he waits, indicating that he is not interested in the wealth of Dacia. The cause of the war, and the divisive attack against the Transdanubian tribes, can then more easily be connected. Trajan's interest, at least with the first war, is to split the Transdanubian frontier, driving a wedge between their camps, efforts, and communication.

Sear, Frank. *Roman Architecture*. Ithaca: Cornell UP, 1982. Print.

Comparatively brief in its overview of Roman architecture, Frank Sear focuses more on the specific architecture, rather than including any methodology, material information, or technique. Two factors he does add, are a historical and geographical contextualization of the architecture of Rome. The whole books moves in a linear, historical way, working through the important periods in Roman history, and discussing

the developments in architecture. Once he concludes with Trajan and Hadrian, he moves to the outskirts of the Roman world, North Africa, Europe, the East, and how discusses how the provincial outposts adapted their heritage to the new, Roman styles. Sear ends with a brief synopsis of Late Roman architecture.

Simpson, Pamela H. "Cheap, Quick, and Easy: The Early History of Rockfaced Concrete Block Building." *Perspectives in Vernacular Architecture*. 3.- (1989): 108-118. *JSTOR*. 11 Sept. 2012.

Bringing a modern perspective to Roman technology, Pamela H. Simpson's article "Cheap, Quick, and Easy," investigates the modern use of what the Roman's called *Opus Testaceum*. The process of using concrete with stone facing is, indeed, still because it is inexpensive, fast, and simple to construct. This method helped contribute to the Roman's quantity of construction, and why it continues to be a popular method today. Starting at the Romans and working her way to Harmon Palmer's first concrete block making machine, Simpson lightly brushes the history of concrete construction, specifically focusing on the block's popularity in the early 20<sup>th</sup> Century.

Speidel, M. *Roman Army Studies*. Vol. I. Amsterdam: J.C. Gieben, 1984. Print.

The Dacian forts, walls, and roads were built by Roman soldiers who were skilled builders and craftsmen incorporated into the military. *Roman Army Studies* will help anyone understand exactly how this particular method of military building could have taken place. This book will illuminate the specifics of Roman military organization, rank, duties, and various eccentricities that may or may not have existed within the eastern European legions.

Strickland, Michael Harold. "Roman Building Materials, Construction Methods, and

Architecture: The Identity of an Empire.” Diss. Clemson University, 2010. Print.

Michael Strickland’s work in the methods and materials of Roman construction provides a solid synthesis of what is known about the subject. Basing his work off the idea that empires are known mostly by what they leave behind, art and architecture, Strickland notes that the Roman’s affinity for building and remodeling is exceptionally strong. This gives us an advantage when studying them as opposed to other, less construction prone societies. Strickland’s primary sources consist of Vitruvius, Livy, Frontinus, and Pliny. While his structural and architectural summaries are mostly focused on civic buildings, his summaries of the materials commonly used and their applications can be effectively used to look at the military aspects of Rome’s construction.

Sturgis, Russell. *A History of Architecture*. Vol. I. New York: Baker & Taylor Company, 1906. Print.

Russell Sturgis gives just as much credence to the ancient Egyptians as he does the Romans and Greeks in his book. This offers an excellent source for comparative architectural research. Questions of Egyptian influence on Roman building, therefore, could be posed and informed by Sturgis’ book. Viewing the Imperial Roman architecture as art, rather than a civic service, his focus is slightly different than most scholars. He connects aspects of Roman stylistic sensibility to modern Italian architectural patterns, but beginning the history of the style from the Etruscan period. As Sturgis focuses on architecture as art, he spends a deal of pages on veneer, decorations, and the overall aesthetic effect of the architecture.

*Trajan’s Column*. Dir. Nancy Fisher. Perf. Robert Milli. Treccani Video Library, 1989. Film.



Robert Milli's narration of the *Trajan's Column* documentary offers a simple historical overview of the column itself and the wars that it depicts. This resource is most effective in its synthesizing of the historical context, while not being much help in determining the significance of any particular detail on the column. Like any documentary, it asks more questions than it answers. This provides frustration, but also many starting points from which to begin an investigation.

Ulrich, Roger B. *Roman Woodworking*. New Haven: Yale UP, 2007. Print.

Woodworking is typically considered to be an art demanding finesse, and that the work done by the craftsmen who partake in this art do detailed work. Roger B. Ulrich, however, covers every construction, and engineering example of wood use in his book. He gives an introduction to the profession, and ends with the types of timbers that were used by the Romans because they were found in Italy. Foundations, tools, framing methods for walls, furniture, and veneers are also covered.

Vitruvius. *De Architectura*. Trans. Dr. Frank Granger. Vol. I & II. Cambridge: Harvard UP, 1962. Print.

Vitruvius's "Ten Books on Architecture," translated by Dr. Frank Granger for the Loeb edition, is an accessible Latin and English text, combined with introductions that provide history and context for Vitruvius' life and work. While Vitruvius spends a great deal of parchment speaking of history, religion, and the nature of what he believes an architect should be, Book I, Book II, and Book X, all provide solid, concise explanations of Roman ideas of architecture, materials, and military engineering. His work is referenced in almost every secondary source on ancient architecture.

Wace, A.J.B. "Studies in Roman Historical Reliefs." *Papers of the British School at Rome*. 4.3 (1907): 229-276. *JSTOR*. 11 Sept. 2012.

"Studies in Roman Historical Reliefs," by A.J.B. Wace is an valuable text when analyzing the carving on Trajan's Column. Giving basic information on Roman habits, tendencies, and concepts of relief carving, Wace will provide a solid basis for comparison when working with Trajan's Column. Wace formulates his paper around the comparison of the reliefs on Trajan's Column, The Arco Di Portogallo, Palazzo Sacchetti, and the Frieze of the Arch of Constantine. These four papers, collected into one, is also concerned with the Hellenic influence on Roman reliefs. These four sets of reliefs, from different times, incorporating different styles, will allow the uniqueness and uniformity of Trajan's Column to be drawn in sharper contrast.

Waelkens, Marc. "From a Phrygian Quarry: The Provenance of the Statues of the Dacian Prisoners to Trajan's Forum at Rome." *American Journal of Archaeology*. 89.4 (1985): 641-653. *JSTOR*. 11 Sept. 2012.

Some are concerned with the validity of the artists of Trajan's Column conceptions of the war, Marc Waelkens, in his "From a Phrygian Quarry," offers a piece of evidence that would help shed some light on how the artists might have gleaned their information. A statue of a Dacian prisoner, nearly finished, and that was meant to be taken to Trajan's Forum, was found in a quarry in Phrygia. The question remains, then, if the sculptors at the quarry are a reliable source of Dacian information. The statue was arrayed in traditionally barbarian clothes, but had no head, only the socket for which one could be attached at the neck. Waelkens provides a list of statues in Trajan's Forum made from similar marble.

White, K.D. *Greek and Roman Technology*. Ithaca: Cornell UP, 1984. Print.

Like Vitruvius, K.D. White puts together a summary work of the Greek and Roman technology involved in engineering and architecture. White dispenses with the philosophy, history, and royal nods, however, giving the information in a more modern, clear way. He divides the work into two parts, essentially, the natural technology and the artificial technology. To be clear, that is the natural resources, history, and elements of the Classical world (available materials, ideas, context), and then the artifice, the application of said technology to the Classical world (building cities, metallurgy, aqueducts). Alongside his primary literary sources, White also examines artifacts from the Classical world.

Whittaker, C.R. *Rome and its Frontiers*. London: Routledge, 2004. Print.

C.R. Whittaker's treatment of Roman frontiers is not altogether thorough, but unique in its approach and topics. Whittaker understands the complicated nature of frontiers today, and how they were no less complicated in antiquity. If his collection of topics related to the Roman frontiers is what a particular scholar is looking for, his book would be of great help; namely, if someone was studying historians on the frontiers, Vindolanda, sex, or India.

### **Project Summary and Self-Evaluation**

My experience of working with Roman construction has been one of the most fulfilling projects of my undergraduate careers. I found the topic while reading about the Antonine Wall, thinking that I would focus my attention on Roman archaeology in Britain. David J. Breeze had a portion of his book, *The Antonine Wall*, dedicated to explaining the construction methods used on the wall, how the soldiers were the builders, and how this all contributed to a proper understanding of the wall. That is when I realized that I might be able to satisfy my own interest in construction and work on a Classical project of the same topic. Thus, I set out to make my project an analysis of Roman construction so that I could compare it to modern methods. My goal was to review what I could of the ancient sources and archaeological remains and compare it to my own experience, seeing what results would show.

After being turned onto Trajan's Column and Vitruvius, I began delving into Roman construction as it is represented in primary sources and secondary sources of those scholars who have already studied this topic with a different focus. I was reassured that I found no scholarly work already done with the perspective that I hope to use. It appeared that no scholar with practical construction experience had viewed Trajan's Column. While I would not call myself a professional in the field of construction as I have not made my living at it for more than a summer at a time, I have spent a great deal of time doing construction on an off since I was about seven years old. Using this practical knowledge of jobsites, construction, and general building, I hoped to come to some unique conclusions about Trajan's Column.

After studying the plates on Trajan's Column, all eight, which depict the construction of forts and reading primary and secondary sources, I was able to conclude that the column is fairly

accurate in its representation. Despite some artistic license, such as Trajan's abnormal and unrealistic height, and a wall that wall carved with only two dimensions, the column acts as a good visual representation of what Vitruvius wrote about in *De Architectura*.

There is, also, the purpose of the column to be taken into account. It acted, not only as Trajan's method of self-illumination, but as propaganda. While most of the forts built in Dacia were probably built of wood and surrounded by turf walls, stone walls were shown on Trajan's Column. No doubt Trajan wanted to show his permanent, strong presence in Dacia with forts that were more domineering than turf. Also, block walls look more clean-cut than turf forts. It distinguishes the Romans from the barbaric Dacians better if the forts are stone. However, even though the forts Trajan had depicted may not be exactly what he built in Dacia, they are still fairly accurate to the form used in masonry construction by the Romans.

Reflecting on my project, I feel that I was able to put together a solid paper. I have done more research for this project than any other I have endeavored during my undergraduate career. The paper is lacking in specific archaeological examples of the types of walls discussed, which I feel is its weakest point. For the most part, however, my goal was accomplished, though there are still aspects of this paper that I would like to continue to work on for the future. Many of the research techniques that I used during this project were ones that I had learned as an English major, yet I had not used them as extensively as I have during this project. I believe my ability to look at the evidence, critically evaluate it, and come to my own conclusions was used well and matured.



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June 18, 2013

## **Evaluation of R. Michael Cook's Senior Independent Project on Roman Wall Construction**

You have worked hard on this project for a full year. I was pleased to see how your focus changed as you began your research last summer. I was also impressed with your ability to meet deadlines and to keep me regularly informed of your progress. You are one of the few Classics students pursuing an independent study who actually sent me written summaries on a regular basis. For this you are to be commended.

The annotated bibliography demonstrates excellent research and grasp of the relevant secondary material. The bibliography in itself is a valuable resource which sets the foundation for future research on this topic, should you wish to pursue further study.

Especially impressive in this work is your application of personal experience and knowledge in construction to your reading of Trajan's column. Your observations about several scenes which have challenged a number of scholars, make good, practical sense. They illustrate the benefit of applying hands-on experience to scholarly work and should be made more available to others working on this topic. I would encourage you to think about ways to make your suggestions more widely known in a scholarly journal, perhaps in a more detailed scholarly study of the topic or even a short note on particular panels of the column.

I learned a great deal from this project and thank you for giving me new insights into a Roman monument which has always fascinated me. I hope that you will have an opportunity to see Trajan's Column with your own eyes someday soon.

The high quality of your work is proven by the fact that your paper was selected as one of the three read at the 2013 Eta Sigma Phi convention at Wake Forest University in Winston-Salem, North Carolina, and that you will also read this paper at the 2014 Eta Sigma Phi Undergraduate Panel at the meetings of the American Philological Association and the Archaeological Institute of America in Chicago. I look forward to sitting proudly in the audience as you give this paper at APA.

It is my opinion, based upon these comments and observations, that you have earned a grade of A for your paper and for your project, including research and writing.

It has been a great pleasure to work with you, Robert, and I wish you the best of success as you begin your career as a graduate student in Classics at the University of Missouri. I would encourage you to share this project with your graduate professors.

Sincerely,

Thomas J. Sienkewicz  
Minnie Billings Capron Professor of Classics