

Aqueducts

¹ Every ruler wants to leave behind some legacies to be remembered by. This frame of mind has rung true since the beginning of time. Imagine if we were to rank all the civilizations that ever existed in history by the number of physical structures they had put up. The winner would most likely be ancient Rome.



² For nearly a millennium, Rome was at the top of the world. It commanded a vast territory that spilled across three continents -- Europe, Africa, and Asia. At the height of its power, the Roman Empire constructed many buildings. Those buildings used technology far more advanced than what was available then. In fact, even in today's environment where we have all sorts of gadgets at our disposal, we still scratch our heads and wonder aloud, *"How did the Romans do it?"*

³ As a tribute to the Romans' engineering achievements, here is the story behind the empire's lifeline -- aqueducts.

⁴ Legend has it that the city of Rome sprang into its existence in 753 B.C., when twin brothers, Romulus and Remus, built it near the River Tiber. At first, the water supply from the stream itself was enough to support all the residents. But as the metropolis began to expand and the population swelled, it soon became an issue. To solve the problem, the Romans decided to build a series of aqueducts.

⁵ Aqueducts were like our modern-day pipelines. For ages, they were the primary means for water delivery. While the idea was neither new nor difficult to conceive, the Romans revamped it to a degree that they simply became known as the best aqueduct makers!

⁶ The Romans' aqueducts followed two basic principles. The first and foremost was to let water flow naturally, meaning from a higher point to a lower point. That law of nature had to be observed because there was no motorized pump at the time. The second rule was to let water run through underground conduits whenever possible. By doing so, the Romans were able to minimize the level of contamination. After all, who would want to drink water loaded with dirt, animal feces, or other types of pollutants?

⁷ With those two guidelines in mind, the Roman engineers set out to draw the

blueprints. In no time, they realized that the ever-changing landscape would prove to be their biggest obstacle. As they carefully surveyed the terrain that they wanted to build an aqueduct across, they had to find ways to deal with the rolling hills and the river valleys. Their solution was to build a pipe that zigzagged along the curves of the land and descended very gently from the source to the destination. When the channel encountered certain areas where it must dip below the rest of the route, the Romans would make do with the "inverted siphon" approach. This method applied pressure to force water to travel through a U-shaped pipe before it continued on its downward sloping course. When the channel reached a river valley, the Romans would build an arched bridge to cross it. This unique adaptation would be one of the rare occasions that the pipe would stay above the surface. The entire passage of an aqueduct could range from several miles long to nearly a hundred. Throughout it all, the Romans managed to make it decline at an angle of only several inches for every one hundred feet. When the water at last reached its destination, it went straight into one of several distribution tanks. Those tanks had smaller channels leading to different parts of the town for everybody's use. Inside the city, its residents relied on this intricate network to irrigate their crops, get their drinking water, run their fountains and bathhouses, flush out their sewers, or answer any other need they might have. Notably, government officials would usually set aside some tanks exclusively for the emperor and wealthy citizens. The latter were charged a premium to have water funneled to their private villas. Who would know that the Romans' concept of paying for your own water would carry over to our modern society?

⁸ Over the years, the Roman Empire had built a lot of aqueducts for their cities. But none of them could boast a bigger collection than the capital itself. All told, Rome once had eleven aqueducts for a combined length of nearly 260 miles. The Aqua Appia was the first one the Romans built. Its history dated back to 312 B.C., long before the Roman Empire even came into being. During the imperial era, Emperor Claudius (41 A.D. - 54 A.D.) was credited for constructing two aqueducts, the Aqua Claudia and the Anio Novus. Both were completed two years before his murder and ranked among the longest. Emperor Severus Alexander was the last Roman ruler to build an aqueduct for the capital. That eleventh channel, called the Aqua Alexandrina, was open for use in 226 A.D.

⁹ Later in history when the Roman Empire began to weaken, its rulers could no longer manage the kingdom effectively. That fact was certainly not lost on the Goths, the Germanians, or other enemies. In the 5th and 6th centuries, Rome was repeatedly captured and sacked. It was during several of those offenses that the invaders destroyed almost all of Rome's aqueducts. Without the running water that the Romans had come to rely on so heavily, the city soon spiraled into a disaster. Along with the collapse of the empire, the population in Rome dwindled from nearly

a million to just ten thousand. This once mighty city would never quite recover from the downfall. Its engineering brilliance slowly faded away and eventually became a thing of the past.

