

What Do Civil Engineers Do?



Ever wonder where creativity meets science, and dreams become realities?



his is the world of Civil Engineers, who design, build, and maintain the very infrastructure of Virginia. You will meet four young civil engineers who followed a remarkable journey that started in school with STEM (Science, Technology, Engineering, and Mathematics). This allowed them to become engineers, equipped with the tools to solve problems, innovate, and shape the future. They learned that STEM isn't just about equations or formulas; it's about curiosity, persistence, and a passion for creating a better world.

Learn about how historic and current civil engineering projects across Virginia benefit us all, by using the link to an interactive map. Highlighted are National Historic Civil Engineering Landmarks, with historical photographs and stories about how these projects improved the quality of life for Virginians. How civil engineers took on the biggest challenges and by designing and building canals, bridges, and tunnels allowed the development of transportation systems to grow Virginia. How today, civil engineers design, build, and operate the projects and systems for drinking water, highways, railroads, buildings, dams, airports, and so much more that adds to the quality of our lives. So instead of just worrying about climate change, you can join these problem-solvers and help take on the challenges of tomorrow.

So, let's embrace the magic of STEM and build a brighter, more innovative future together!

ASCE | Virginia Section
Serving the Commonwealth for Over 100 Years

Niko Ambrose, EIT



My Role in the Industry

As a Virginia Department of Transportation land development engineer, I engage with counties/cities and their consulting engineers to develop new projects. This includes commercial and residential development, pedestrian and bicyclist facilities, and

roadway design. My job offers a balance of office and fieldwork, and the ability to contribute to my community.

How I Became an Engineer

From a young age, I was curious about infrastructure and the “how” behind necessities we use every day, like bridges, traffic signals, buildings, etc. While in school, I realized the possibilities of being in a profession that is devoted to developing and building communities. Civil engineering allows me to give back to the communities I grew up in and fulfill lifelong interests.

What Inspires/Motivates Me

Civil engineers have a unique chance to make impacts. I have seen many cases where engineering innovations created change and transformed cities. I am motivated by my community and the goal of sustainable development. The world is growing at a faster pace than ever, and I am dedicated to ensuring this growth will have a positive effect on future generations.

Robert Anderson



My Role in the Industry

I am a land development engineer with an engineering consulting firm. Our team designs everything up to the building on a new construction site. We provide water pipes, sanitary networks, storm systems, and site features that people use every day. From small fast-food restaurants to huge conference centers and everything in between, our team has designed projects people visit every day.

How I Became an Engineer

I loved Legos, science, building things from scratch, and unfortunately for my parents, taking things apart. This love translated into a degree in civil engineering, and my experiments grew in scale as a captain for the concrete canoe competition. Now I have the science and knowledge to design large construction projects in the real world.

What Inspires/Motivates Me

I love having problems to solve, seeing my designs come to life, and learning and challenging myself every day. Each new project is a completely different design experience and comes with new and exciting challenges. It is a great feeling knowing many people will be benefited by my work.

Michelle Mittel Roy



My Role in the Industry

I'm a geotechnical engineer with an engineering consulting firm. My role is to work with other engineers and building/site owners to learn about what kinds of soil- and earth-related help they need for their projects. This could consist of tasks such as drilling holes and

running tests to classify soil, designing walls that hold back/sit on the earth, or figuring out why a building is settling/sinking into the ground.

How I Became an Engineer

I've always enjoyed learning how stuff works, which led to my passion for logistical planning and problem-solving. I ask a lot of questions, keep an open mind to all suggestions and recommendations, and actively listen to all project team members.

What Inspires/Motivates Me

Working in a team environment to solve problems and help others has been really motivating. I enjoy developing the foundations of each project (literally and figuratively) and helping civil engineers and owners from the ground up. I love learning about this beautiful earth in a way that challenges/utilizes my technical knowledge and shows me how to think about the world in a different and unique way.

Brenda Villarreal, PE



My Role in the Industry

After graduation, I began my career as a bridge engineer. With time, I progressed into an advisory role at my firm working all over the U.S. on different emergency management projects—wildfires, earthquakes, hurricanes, you name it. I'm now a senior

consultant for infrastructure and capital projects working all over the world and most recently in Doha, Qatar.

How I Became an Engineer

I earned my Bachelor's degree in Civil Engineering from Virginia

Tech where I focused on structures. I took several classes that helped me build on my knowledge of structural design.

What Inspires/Motivates Me

Civil engineering is a field that requires creativity, problem-

solving skills, and a willingness to learn and adapt. It's a field that can take you anywhere you want to go, and I'm excited to see where it takes me next!

Blue Ridge Parkway



While formal authorization from Congress was granted on June 30, 1936, construction began on the Blue Ridge Parkway on September 11, 1935 at Cumberland Knob. The 469-mile roadway links Shenandoah National Park in Virginia to Great Smoky Mountains National Park in North Carolina and has been the most visited unit of the National Parks System every year, except four, since 1946. Built by private contractors under federal contract and several New Deal agencies, the parkway incorporates context-sensitive design to minimize effects on the natural beauty of the Blue Ridge Mountains. The parkway was completed in 1987.

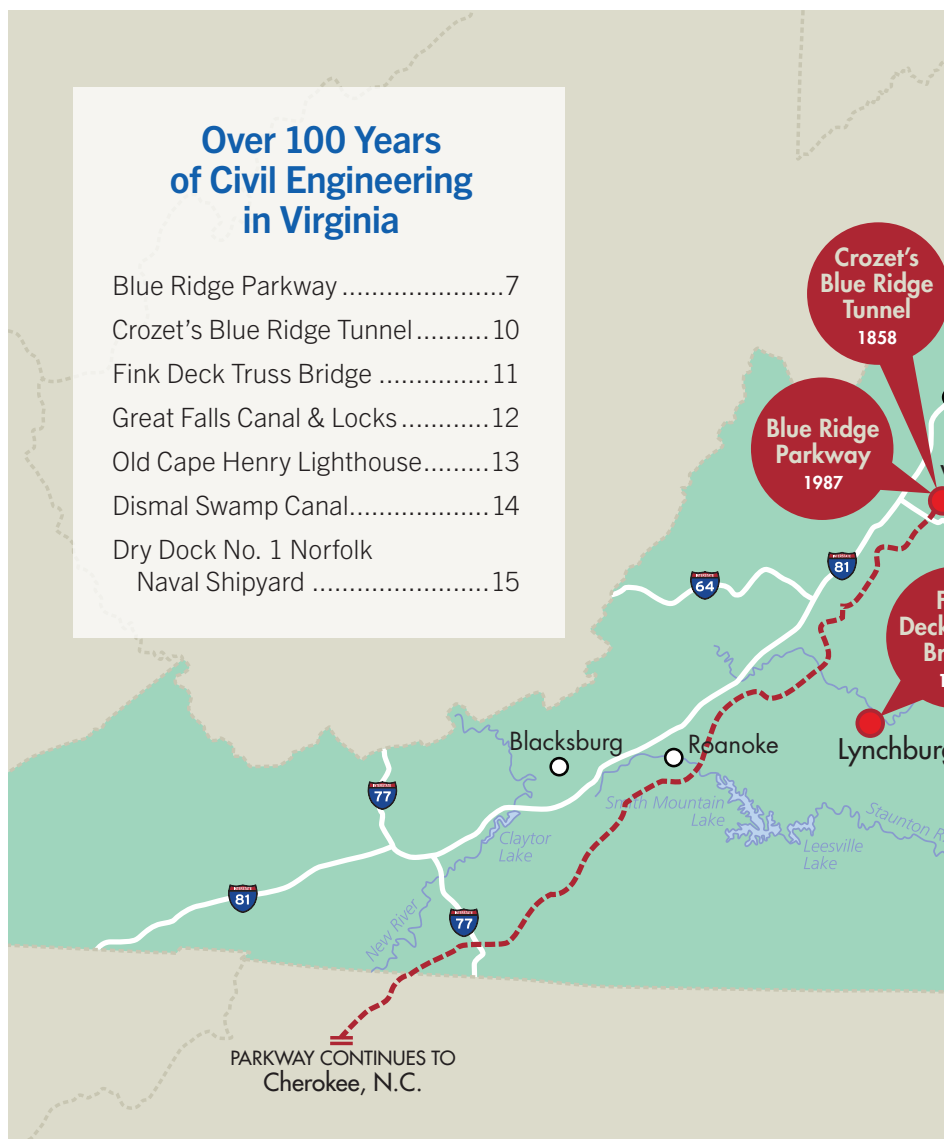
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NATIONAL HISTORIC LANDMARKS

Over 100 Years of Civil Engineering in Virginia

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CIVIL ENGINEERING S IN VIRGINIA



Crozet's Blue Ridge Tunnel



The 4,273-foot Crozet's Blue Ridge Tunnel was the longest railroad tunnel in North America when constructed in 1849–1858. Irish and enslaved craftsmen and laborers excavated the tunnel using hand drills and black powder. Chief Engineer Claudius Crozet designed a singular elliptical cross-section to minimize rock removal. Its slope from west to east presented challenges for drainage and ventilation. Crozet developed unique solutions to these problems. In April 1858, the first train traveled the Blue Ridge Tunnel, which remained in use for over 85 years. The demands of larger locomotives and World War II freight traffic necessitated its replacement in 1944.

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Fink Deck Truss Bridge



This 56-foot, single-span Fink deck truss was built around 1870 to carry trains of the Atlantic, Mississippi and Ohio Railroad (now the Norfolk Southern Railway). The original location of this structure is unknown. In 1893 it was relocated to carry Old Forest Road over the Norfolk and Western Railway in Lynchburg, Virginia. In 1985 the bridge was again relocated to Riverside Park in the City of Lynchburg to preserve its historic significance. This structure is notable as one of only two remaining examples of this design developed by Albert Fink, a German-born civil engineer. During the mid-nineteenth century, the era of railroad expansion, Fink constructed numerous examples of this unique design.

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Great Falls Canal & Locks



These works were the major feature of the first river navigation system constructed to facilitate trade with the west. This waterway development was begun under the leadership of George Washington as President of the Patowmack Company, 1785–1789. The Great Falls Canal and Locks are one segment of the Patowmack Canal, which involved five individual bypass canals to make the Potomac River navigable north of Washington, D.C. It took 17 years to construct the Patowmack Canal system, which opened in 1802 and operated for 26 years. The Patowmack Canal Charter was acquired by the Chesapeake and Ohio Company, which then constructed a still water canal along the river in Maryland.

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Old Cape Henry Lighthouse



The Old Cape Henry Lighthouse was the first construction project authorized by the 1st U.S. Congress during its initial session (March 1789–March 1791). Constructed by John McComb, Jr. of New York City, this project set the stage for all subsequent public works projects of the Federal Government. In addition, this specific lighthouse was a vital navigation aid on all shipping through the Virginia Capes, thereby enhancing international and coastal trade with the Mid-Atlantic States. The lighthouse was completed in 1792.

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Dismal Swamp Canal



Colonel William Byrd II initially suggested a canal through the Dismal Swamp in 1728. Subsequently, George Washington's Dismal Swamp Land Company (1763) attempted to drain the swamp for logging. A Dismal Swamp Canal was ultimately proposed by Virginia Governor Patrick Henry in 1784 and completed in 1805 after 12 years of hand excavation by enslaved laborers. The 22-mile canal connects Virginia's Chesapeake Bay and North Carolina's Albemarle Sound, and is the oldest continually operating canal in the United States. In addition to improving trade between the two states, the canal was known as a route for freedom seeking runaway slaves.

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Dry Dock No.1

NORFOLK NAVAL SHIPYARD



The War of 1812 taught America the importance of a strong navy. Designed by Loammi Baldwin, Jr. and completed in 1834, Dry Dock No. 1 at the Norfolk Naval Shipyard was of a size and complexity not previously known in the United States. Measuring 314 feet long and 100 feet wide, the dry dock was constructed with New England granite and utilized eight lift pumps powered by steam engines. This dry dock, as well as its companion dry dock in the Boston Navy Yard, strengthened the United States' naval capabilities. Dry Dock No. 1 is still in use today.

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Resources

To learn more about Civil Engineering in Virginia
click on the QR codes.



See the video “What Do Civil Engineers Do?” and learn more about Civil Engineering

Learn more about Civil Engineering in Virginia



View a complete list of ASCE's National Historic Civil Engineering Landmarks

Visit the Virginia Section's Interactive Landmark Map

