

# NV Energy Linemen Think “Inside the Box”

Field crews circumvent a disruptive replacement project by installing an inner structural envelope inside a vault.

By **Eric Troska**, *NV Energy*

**M**ost companies encourage employees to think outside the box, but for NV Energy and its consultants, thinking “inside the box” and installing an inner structural envelope on the inside of an aging electric vault was the solution to an otherwise delicate, costly and power-disrupting replacement.

Father Time and Mother Nature had degraded the vault to the point that chunks of concrete wall had fallen off, rebar was exposed and dirt was starting to migrate into the vault space. Compounding the problem, the vault contained multiple electrical circuits and fiber-optic lines owned by other companies.

To tackle the problem, NV Energy initially invited a structural engineer to provide an in-depth evaluation and to make recommendations. The engineer advised the utility to replace the vault, as its structural integrity was greatly compromised.

The engineer was concerned that the vault could suddenly cave in, putting workers at risk and creating a public safety concern for the possibility of a large, gaping hole in a major intersection in downtown Reno, Nevada.

## A Daunting Challenge

The vault, which was installed about 40 years ago, measures 14 ft tall, 8 ft wide and 14 ft long. Traditionally, linemen would dig up the old vault and then bury a new one. However, in this particular situation, the top of the vault was about 4 ft below the street. As such, it would have required a massive excavation effort. NV Energy linemen had to find an efficient way to handle the required equipment and temporarily store the dirt removed from all sides of the vault. Additionally, digging up the vault at the crossroads of a busy intersection would have resulted in shutting down two streets.



Degraded conditions in an underground vault required a creative fix.



Material for the “vault-in-a-vault” solution was all lowered through the normal access door.



View of old and new vault walls.

Complicating the challenge was the fact that gas, sewer and water lines converged in that same intersection. A traditional replacement of the underground vault would have interrupted electrical service for lengthy periods of time. NV Energy also faced the risk of causing outages or problems with the fiber-optic service and natural gas supply, and disturbing old water and sewage lines.

NV Energy soon realized that it needed a new approach to the situation. The solution needed to be cost-effective and safe, and be as non-disruptive to customers and the public as possible.

### Researching Alternatives

NV Energy always welcomes input from other companies. In fact, team members made contact with the Western Underground Committee. To determine how to best phrase its inquiry, the project team turned to its standards department, who helped the team outline the problem and then ask for specific solutions. The committee maintains an e-mail [list-serve](#) comprised of members from other utilities, and it initiated a call for assistance.

NV Energy quickly received a message from a Western Underground Committee member in Southern California. The member was working with a new company called Voltek and suggested its product as a possible alternative. The utility then made direct contact with Voltek representatives and explored various options.

### Designing a Box Within a Box

Simply put, Voltek was working on a prototype solution of building a vault within a vault. Because the new vault fits inside the existing vault in pieces, it can help keep the costs down and minimize the impact on the road or intersections above. Additionally, linemen are not required to remove the old cable and install new conductor, as a cable trap panel eliminates the need for linemen to perform complex cable splicing.

At that time, the vendor offered a prototype, but the utility liked the concept so well that it agreed to try it out in an actual situation. NV Energy quickly realized that if the product



Jeff Kelly, NVE line working foreman, and Vic Camp, Voltek inspector, mixing up grout for the Voltek vault system track.

worked in this particular situation, it might prove to be an additional tool to help it meet customer needs in a timely, safe and efficient manner.

According to the manufacturer, this product is said to restore structural integrity and safety to the area within a decaying underground vault, without major disruptions above and/or below the ground. Once installed, the old vault can continue to decay around the outside of the structurally sound Voltek system.

The product is comprised of greenish-gray composite panels that measure about 4 inches thick. The specially designed customized panels are strong but lightweight. The structural elements, which can be manufactured in the proper width, height and thickness to fit a variety of different sized vaults, are waterproof, noncorrosive, chemical and fire proof, and UV and weather resistant.

To install the panels, the NV Energy linemen lowered them into the existing vault using a line truck from Altec Industries. The workers were able to lower the custom sections into the vault through the existing manhole, and then they maneuvered them into place by hand.

From there, the task of fitting the panels together was similar to building a structure out of Lego building blocks. To help ease the installation process, Voltek provided an engineered solution and a set of plans. That way, the linemen knew exactly how the panels had to fit together to make a box.

Over the two-year time frame from when NV Energy discovered the problem with the vault to when the project took place, NV Energy's linemen conducted a significant amount of preparation work prior to the actual installation of the vault. For example, the company sent some of its linemen to Southern California to work with Voltek and create a mockup. That way, when it was time for the actual installation to take place, the linemen were well trained and properly prepared.

An engineer, inspector and representative from Voltek were also on site in Reno throughout the project to help the four linemen to overcome challenges. If a problem arose, they were able to work through it together.

For example, the linemen discovered that during the instal-



Cabletrap process eliminates the need for new cable splicing.

lation process, the original vault floor was not nearly as level as they assumed. Fortunately, one of the linemen had experience working with concrete, and he was able to use his skills to properly level the installation track and grout it in place.

Another challenge faced by the linemen was that – by design – the finished vault was a few inches shorter and narrower all the way around. This void between the structures could enable pieces of the old vault to fall and damage the new Voltek structure. The companies turned to Pavers Plus Inc. to flow-fill material in the space between the two vaults and avoid any possible safety or structure integrity concerns.

## Safety Precautions

Regardless of the size and scope of a project, safety is always a key concern and focus of both project managers and crews. All of the linemen had confined-space and vault-rescue training before working on the unique process of building a vault within a vault. Additionally, the linemen employed normal vault precautions of testing for natural gas or methane. They also relied on external ventilators.

Another concern was the possibility of harmful fumes from the adhesives used in the panel-assembly process. The Voltek vault panels use a tongue-and-groove solution with a special adhesive. Adhesive fumes in confined spaces can cause a problem, so Voltek used an adhesive with minimal fumes that would properly adhere in varying temperatures.

The timing of the job required that the NV Energy linemen and Voltek technical personnel work during the frigid and snow-packed conditions that are prevalent in northern Nevada during the winter months. Fresh-air ventilators served a dual purpose. Not only did they provide the workers in the vault with fresh air, but heaters were hooked in line to make sure the Voltek vault panels and adhesive was at the correct temperature for proper installation.

The linemen also had to secure the area around the vault to ensure they wouldn't put the public in harm's way. By using the Voltek system, they were able to keep traffic and service disruption to a minimum. In fact, the linemen were able to install the new vault by only closing one lane down on a major street and working during graveyard shifts.

## New Tool in the Toolbox

Because it was a learning experience for the whole team, it took a few weeks to complete the vault-replacement project in downtown Reno. However, as linemen and project managers become well versed with the panel system, they anticipate that a similar vault replacement project could be done within a week's time.

By going outside of the box, researching best practices and exploring a new type of technology, NV Energy was able to better use a cost-effective solution, avoid major utility interruptions of service and have a new tool to continue to meet the needs of its customers in the best possible way. **TDW**

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### Companies mentioned:

Altec Industries [www.altec.com](http://www.altec.com)  
 NV Energy [www.nvenergy.com](http://www.nvenergy.com)  
 Pavers Plus Inc. [www.paversplus.com](http://www.paversplus.com)  
 Voltek [www.voltekinternational.com](http://www.voltekinternational.com)  
 Western Underground Committee  
[www.westernunderground.org](http://www.westernunderground.org)