

## CASE STUDY



## PROJECT SNAPSHOT

### OWNER

American Electric Power (AEP)

### FACILITY

- Niagara Hydroelectric Plant, Vinton, VA
- Original construction in mid-1950's

### PROJECT

Penstock Restoration

### DIMENSIONS

- 172.50 LF of 78" steel pipe with a 45° slope
- 57.50 LF of 66" steel pipe with a 45° slope

### PROBLEM

Failing penstock pipes with pre-existing failed polyurethane liner

### RESTORATION METHOD

- Utilized the Quadex Lining System®
- spray-applied Quadex GeoKrete®
- 1" thickness for full structural rehab

### PROJECT TIMELINE

September 18-22, 2017

### INSTALLATION CONTRACTOR

Quadex Lining Systems®

# Failing Penstocks, Steep Slopes Make for Difficult Pipe Rehabilitation

## AEP NIAGARA HYDRO ELECTRIC PLANT 78" AND 66" STEEL PENSTOCKS

**VORTEX PRODUCTS USED**

**1** GeoKrete®



### THE CHALLENGE

The CIPP process was considered but the combination of limited access and steep grades would have made it very expensive and too risky. The pipe entry was down an embankment that didn't allow vehicles, not to mention the site's access was extremely limited and would have required a helicopter to get CIPP liner into place.

The Quadex Lining System® (QLS) spin-cast process, on the other hand, requires a much smaller footprint and features a highly-portable, custom designed application sled. Due to the ability of the GeoKrete material to be pumped fairly long distances, in this case the balance of the equipment was securely positioned at the top of the slope where it could be safely operated.

What makes QLS truly unique is the GeoKrete® Geopolymer applied to the structures. Developed by Quadex LLC, it is a fully structural, corrosion resistant material that will not crack, peel or degrade over time.



External view of 45° angled penstocks.



Penstock pipe after GeoKrete® application.



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### THE QLS PROCESS

Although the job was unique in the pipe's extreme slope, the application of GeoKrete was not altered. Prior to lining, the failed polyurethane liner was removed and the pipe was prepped and patched where necessary. Ready for application, the QLS sled was able to precisely spin-cast the GeoKrete, at a 1" thickness, onto the inner wall of the penstocks. The application sled is winch-controlled to allow for consistent and uniform application throughout the entire length of the pipe.

As a value-added procedure the pipe's headwall, leading from the penstock, was also GeoKrete lined and shaped.

In closing, although AEP initially selected QLS for GeoKrete's performance properties, the QLS crew's strong safety score was also a factor. This installation proved to be a challenge due to the extreme slope grade. Safety, awareness and special attention to harnessing was paramount.



*Urathane removal was tedious.*



*Peering down the steep slope of penstock.*



*Remote access and narrow pathways.*



*GeoKrete Liner - Structural renewal and restored flow capacity.*