



Infrastructure Innovators Since 1994

QuakeWrap, Inc.

6840 S. Tucson Blvd., Tucson, AZ 85756

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www.quakewrap.com

PROJECT PROFILE

120-inch Diameter Penstock Rehabilitation with QuakeWrap

Repair System: QuakeWrap FRP technology applied to rehab 72 and 120-inch (2 and 3 m) diameter riveted steel penstock sections.

Owner: Town of Lake Lure, North Carolina

FRP Installer: FRP Construction

Design and Materials: QuakeWrap, Inc.

Location: Lake Lure, North Carolina

Project Synopsis:

- The penstock with the 120-inch main line at the Lake Lure hydroelectric power dam was built nearly a century ago with riveted steel.
- Non-destructive test performed by others indicated up to 80% wall loss on the penstock due to corrosion over time.
- Project engineer (SDG Engineering) recommended a fully-structural lining system for the internal pressure from 100-ft of hydrostatic head.
- QuakeWrap (design and materials) and FRP Construction (installation) team was selected for a design-build solution.
- QuakeWrap designed a fully-structural carbon fiber reinforced polymer (CFRP) liner system to retrofit the 67-ft penstock between the valves at the upstream and downstream ends.
- A dual-layer glass fabric laminate was applied as the first layer to obtain impermeability, create a dielectric barrier between the host steel pipe and carbon fiber laminate, and contribute additional strength to the system in both directions of significant stress (hoop and longitudinal).
- Overall system is comprised of a tack coat (high-adhesion epoxy), two layers of carbon and glass fiber laminae (QW B20C and B2610G), and a 40-mil top coat (abrasion resistant epoxy).
- End terminations were performed with dual steel band EPDM compression seals, which were pressure tested upon installation.
- Installation was performed successfully by FRP Construction in two weeks using the wet layup method, fulfilling the owner's schedule to fill the reservoir back to its normal levels for the annual recreational activities began in the spring.

**Contact an engineer today at
info@quakewrap.com**



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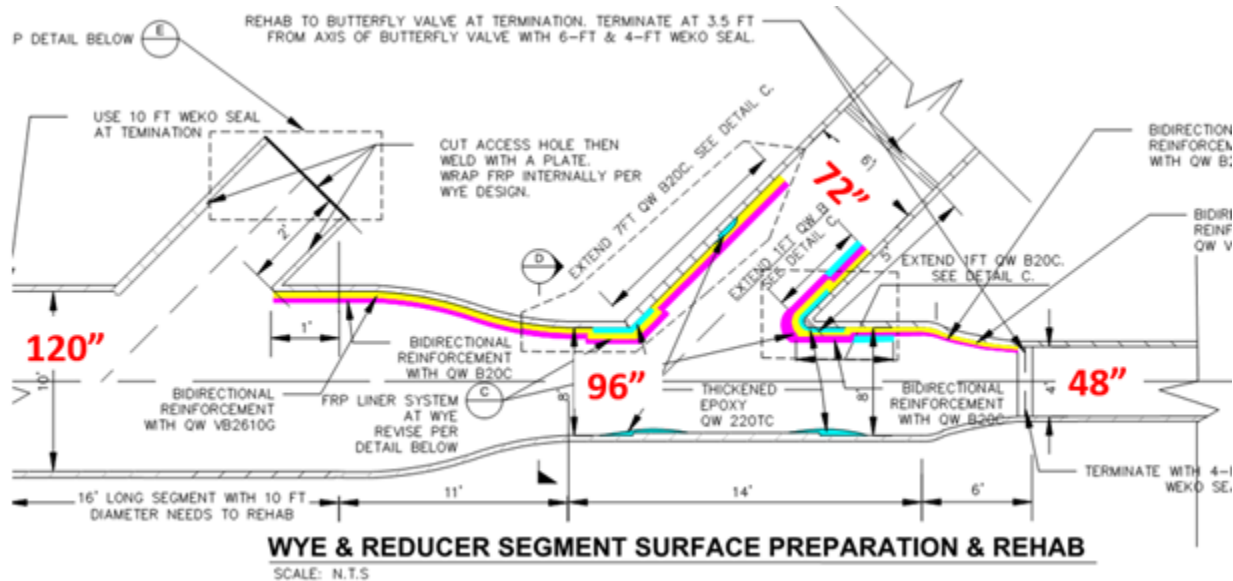
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Project highlights:

- The geometry of the pipe was very challenging and included an initial 120-inch diameter that was reduced to 96-inch and further reduced to a 48-inch diameter pipe with a butterfly valve. A 72-inch pipe branching off of the 96-inch pipe and terminating with a butterfly valve was also present.



Project Photos



Surface preparation

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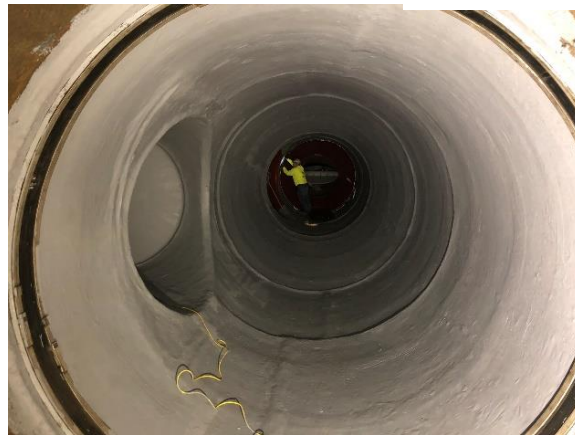
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Application of tack coat.



Carbon fiber laminate installation



Finished liner with a 40-mil topcoat.

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