

## DiamondWrap® HP™ 12” Damaged Elbow Repair in Canada

---

**Customer:** Natural Gas Storage, Transmission, and Distribution Company

**Location:** Canada

**Pipe Diameter:** 12”

**Design Pressure:** 500 psi

**Pipe Contents:** Natural Gas

**Pipe Defect:** External Corrosion, Gouges, and Arc Burns on a Gas Transmission Elbow

**Development:**

This gas cogen line was suffering from external corrosion, gouges, and arc burns. Many miles of pipeline would have to be blocked in and purged in order to cut the line and weld in a fresh section of pipe, costing the company hundreds of thousands of dollars. Additionally, the configuration that required repair consisted of two 45 degree elbows that changed the depth and direction of the pipeline. This configuration is not repairable with welded sleeves, and other traditional repair methods such as a clamp would not be as easily installed. A rigid composite repair system would also not be feasible. The result would be a costly repair with heavy equipment and lots of hot work, lost production time, and lost gas. Following are pictures of the damaged pipe.



**Design:**

Citadel Technologies’ team of engineers designed repairs for each defect according to ASME PCC-2 Article 4.1, and recommended a DiamondWrap® HP™ repair solution. Only 4 layers of DiamondWrap® HP™ were required to repair the defect, even with the high design pressure.

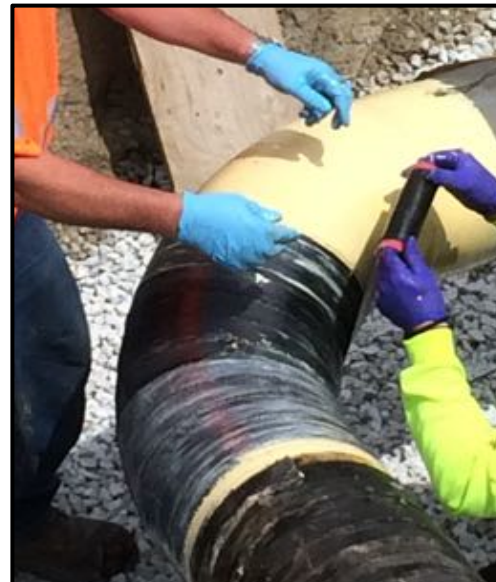
**Installation:**

Citadel conducted on-site training for employees of the natural gas company and the contractor within a half day. The following day, a supervisor from Citadel looked on as the newly certified installers applied each step of the process. The high compressive modulus filler putty was installed in the defect areas and around the welds to transfer the load to the carbon fiber repair system. The primer was installed next to increase the bond between the repair and the pipe. Finally, 4 layers of carbon fiber were installed over the both 45 degree elbows.

The actual installation time was approximately an hour, with just two trained technicians. No heavy equipment or hot work was required for the installation, and the line was in operation with no disruption in production. Below are photos of the installation process, as well as the completed repair.



Applying the primer



Installing DiamondWrap® HP™

## Completed DiamondWrap® HP™ repair

**Conclusion:**

This pipeline was able to maintain full operation throughout the installation of the repair with no need to shut down or reduce capacity. The natural gas company saved hundreds of thousands of dollars by selecting Citadel Technologies' engineered composite repair systems. Citadel Technologies successfully designed and implemented this permanent repair (50+ years) with a cost-effective and reliable solution.