

STRAIN-BASED DESIGN METHODS FOR COMPOSITE REPAIR SYSTEMS

Chris R. Alexander – Stress Engineering Services

ABSTRACT

Composite materials are commonly used to repair corroded and mechanically-damaged pipelines. Most of these repairs are made on straight sections of pipe. However, from time to time repairs on complex geometries such as elbows, tees, and field bends are required. Conventional design methods for determining the amount of required composite materials are not conducive for these types of repairs. Over the past several years, the author has developed a methodology for assessing the level of reinforcement provided by composite materials to damaged pipelines using finite element methods. Instead of stress as the design basis metric, the method employs a strain-based design criteria that is ideally-suited for evaluating the level of reinforcement provided to non-standard pipe geometries. The finite element work has been validated using experimental methods that employed strain gages placed beneath the composite repair to quantify the level of reinforcement provided by the repair. This paper provides a detailed description of the strain-based design method along with appropriate design margins for both the reinforced steel and long-term performance of the composite materials.

Alexander, C., "Strain-based Design Methods for Composite Repair Systems," Proceedings of IPC2008 (Paper No. IPC2008-64076), 7th International Pipeline Conference, September 29-October 3, 2008, Calgary, Alberta, Canada.