



North American Society for Trenchless Technology  
2007 No-Dig Conference & Exhibition



San Diego, California  
April 15-20, 2007

Paper A-1-01

## PRINCIPLES AND PRACTICE FOR THE DESIGN AND SELECTION OF PRESSURE PIPE LINING SYSTEMS

Dec Downey, John Heavens<sup>1</sup> and Simon Ngo<sup>2</sup>

<sup>1</sup> Jason Consultants Ltd, London, UK

<sup>2</sup> U Tech Engineering Co Ltd., Hong Kong

**ABSTRACT:** In recent years, a number of Cured in Place lining systems for the renovation of pressure pipes have been introduced. In some cases, these have been marketed as “stand alone,” or “fully structural” solutions. Unfortunately for users, there is no clear consensus for the exact meaning of these terms. This paper reviews the literature on the subject, and identifies the key issues to be resolved.

The paper includes a review the principles and purpose of pressure pipe lining; in particular, the classification of structural capability in AWWA Manual M28, ASTM F-1216 and the relevant CEN/ISO standards and discussion of the criteria used to differentiate fully structural, semi-structural and non structural capabilities. This is expressed through the use of four classes of liner. Particular consideration is given to the Fully Structural category (Class A/iv) and the verification that the liner can independently sustain the operating pressure over its design life, without support from the host pipe and can survive dynamic stresses associated with host pipe failure.

The paper then reviews the information available for a number of lining systems, when judged against these criteria and identifies significant differences in interpretation and the dilemma for potential users. The paper reviews the experience of a contractor using close fit and cipp solutions on a major water main rehabilitation programme in Hong Kong.

The paper concludes with proposals for a consensus based on a common approach to design/safety factors, a better understanding of the potential benefits of such systems in extending the service life of pipes and a properly executed risk and cost benefit analysis.