

Model of Elastic Fracture Toughness for Ductile Metal Pipes with External Longitudinal Cracks

Authors : Guoyang Fu, Wei Yang, Chun-Qing Li

Abstract : The most common type of cracks that appear on metal pipes is longitudinal cracks. For ductile metal pipes, the existence of plasticity eases the stress intensity at the crack front and consequently increases the fracture resistance. It should be noted that linear elastic fracture mechanics (LEFM) has been widely accepted by engineers. In order to make the LEFM applicable to ductile metal materials, the increase of fracture toughness due to plasticity should be excluded from the total fracture toughness of the ductile metal. This paper aims to develop a model of elastic fracture toughness for ductile metal pipes with external longitudinal cracks. The derived elastic fracture toughness is a function of crack geometry and material properties of the cracked pipe. The significance of the derived model is that the well-established LEFM can be used for ductile metal material in predicting the fracture failure.

Keywords : Ductile metal pipes, elastic fracture toughness, longitudinal crack, plasticity

Conference Title : ICCEDP 2018 : International Conference on Civil Engineering and Disaster Prevention

Conference Location : London, United Kingdom

Conference Dates : June 28-29, 2018