ASSESSMENT OF POLYETHYLENEPIPELINESUNDER LANDSLIDE

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ABSTRACT

With increasing global demands for energy resources, pipeline systems, called as lifelines, play a significant role in urban processes. For safety considerations pipeline systems in urban areas buried in soil. Therefore, landslide is one of general problems in water conducting pipelines which occurred increasingly within last decade. During landslide, excessive plastic deformations occur in pipeline which lead to local plastic failures in critical parts of pipeline system. In case of landslide it is important to avoid crossing slopes but in practice because of environmental restrictions it can't be avoided. Generally geotechnical processes, such as landslide, are so complicated so many researches have been focused on landslide and its effects on lifeline systems. This paper has been focused on failure in polyethylene buried pipelines under non-uniform deformations of landslide. Within design process of pipelines, critical problem is to determine allowable strain and stress limits in pipeline under landslide. Here a finite element model of polyethylene pipeline has been prepared in ABAQUS software with a contact element to model interaction of soil and pipeline. Final model include soil profile and pipeline system crosses perpendicular to landslide direction. In this paper variation of surrounding soil and geometry of pipeline have been investigated. This paper tries to investigate failure potential of pipeline under excessive deformations and variation of these parameters. A failure criterion has been proposed based on strain limits of pipeline. Finally failure potential have been assessed by means of fragility curves. Given results in this paper could be used in practical design codes of water conducting pipeline systems.

INTRODUCTION

The term "pipeline" refers to a long line of connected segments of pipe, with pumps, valves, control devices, and other equipment/facilities needed for operating the system. Their purpose isto transport a fluid, mixture of fluids, solids, fluid solid mixture. The term pipeline also includes a relatively large pipe spanning a long distance. Buried pipeline systems are commonly used to transport water, sewage, oil natural gas and other materials. Pipelines are classified as lifelines since they carry materials are essential to support human life.

Permanent ground deformation is a significant hazard for many manmade structures including houses, highways, tunnels, bridges, as well as water, gas, oil and sewer pipelines. The principal forms of this ground deformations are surface faulting, land sliding, seismic settlement and lateral spreading due to soil liquefaction. Landslides are one of the key problems for stability analysis of pipelines. During Landslides, buried pipelines are subjected to forces and deformations imposed on them through interactions at the soil-pipeline interface.

Past design practices for pipelineshave focused on avoidance of areas that have a reasonable probability of experiencing geo-hazards. This approach has been generally successful when there are limited restrictions on selecting a pipeline route. Therefore, many studies have been focused on pipeline integrity management strategies to mitigate geo-hazards and consist of understanding the geo-hazards and propose