Recommended Practice for Movement in In-service Pipelines

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Foreword

The few pipeline failures that have followed movement operations demonstrate the need for an industry recommended practice on movement of pipelines. A movement operation increases the longitudinal stress in the segment of the pipeline being moved. In most cases this additional stress has caused no significant problems. In 1978, however, a propane pipeline failed after being moved while in service. Although the movement may not have contributed to the failure, the incident demonstrated the need for uniform guidelines to ensure that the movement of an in-service pipeline is done with reasonable safety. Consequently, the American Society of Mechanical Engineers, the American Petroleum Institute, and the Office of Pipeline Safety Regulation of the U.S. Department of Transportation jointly sponsored a study to establish guidelines for safely moving pipelines without taking them out of service. After the release of the "Guidelines for Lowering Pipelines While in Service" by authors at the Battelle Columbus Laboratories, the American Petroleum Institute solicited qualified engineers responsible for the design, construction, and operation of petroleum pipelines to review the Battelle work and other available work and to prepare an industry recommended practice on the safe lowering and/or raising of in-service pipelines.

The purpose of this recommended practice is to address the criteria, methods, values, and recommendations that should be considered in the design and execution of practical and safe pipeline-movement operations. However, it is impossible to foresee all possible pipeline-movement situations or circumstances. This recommended practice is to be used as a guide for moving pipelines while they remain in service. It is not a rigid standard.

This recommended practice is not intended to be an endorsement of moving pipelines as a method for addressing the safety of an existing pipeline at a new road crossing, railroad crossing, foreign utility crossing, or any other crossing. It is merely intended to provide guidance to pipeline operators and contractors who choose the alternative of moving.

This recommended practice has been revised to reflect that the methodology used in moving pipelines can be used for other pipeline movement operations.

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Recommended Practice for Movement of In-service Pipelines

1 Scope

This recommended practice covers the design, execution, inspection, and safety of a pipeline-lowering or other movement operation conducted while the pipeline is in service. (In this document, the terms lowering and movement can be used interchangeably.) This recommended practice presents general guidelines for conducting a pipeline-movement operation without taking the pipeline out of service. It also presents equations for estimating the induced stresses. To promote the safety of the movement operation, it describes stress limits and procedures. Additionally, it outlines recommendations to protect the pipeline against damage. The practicality and safety of trench types, support systems, and lowering or other methods are considered. Inspection procedures and limitations are presented.

The calculations in this recommended practice are based on methods developed from elastic free deflection theory to determine induced stresses and deflection profiles. Other calculation methods such as finite element analysis may be used instead. See the publications listed in Section 2 and the bibliography.

1.1 Applications

This recommended practice applies to onshore steel pipelines. Moving in-service pipelines can be a safe, cost-effective means of relocating a pipeline without loss of service. The recommendations presented in this recommended practice should be applicable to any lowering or other movement of existing pipelines that is undertaken either to accommodate new roads, railroads, foreign utilities, ditches, or creeks or to accommodate any condition for which moving the pipeline is the chosen alternative.

1.2 Exceptions

The recommendations in this document should not be applied retroactively to pipelines that were moved prior to the effective date of this recommended practice. Also, these recommendations should not be applied to movement due to mining or natural subsidence. The movement of pipelines with attached appurtenances is beyond the scope of this recommended practice.

The following pipelines were not considered in developing the methods, criteria, values, and recommendations presented in this document:

a) offshore pipelines;

b) pipelines with valves, flanges, fittings, concrete coatings, or attached appurtenances in the section to be moved;

c) pipelines joined by oxyacetylene welds, mechanical joints, or girth welds of known poor quality (unless welds are reinforced by full encirclement sleeves or other acceptable means).

1.3 Safety Considerations

Caution—The recommendations in this document promote safety under conditions normally encountered in the pipeline industry. Requirements for abnormal or unusual conditions are not specified, and some details of engineering and construction are not provided. All movements of in-service pipelines should comply with applicable safety standards.

1.4 Conventions

In this document, each equation term is defined in Annex A and beneath the first equation that uses it. Also, negative values for stress indicate compressive stress and positive values indicate tensile stress.