

ALIGNMENT OF SUSTAINED LOAD STRESS INDICES IN THE ASME B31 CODE



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Prepared by:

George Antaki

Leica Engineering Company Inc.



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FOREWORD

Loads on piping systems and pipelines are categorized in ASME B31 as sustained, occasional or thermal loads. None of the ASME B31 codes explicitly define “sustained loads.” But because they are often called out as “sustained loads such as pressure and weight,” sustained loads are understood to mean pressure and weight. In the case of buried pipe, the soil weight on the pipe would also be a sustained load. Occasional loads are loads “such as wind or earthquake” to which we may add pressure transients (waterhammer). Finally, thermal expansion and contraction loads and loads due to thermal gradients constitute the third category of loads on piping systems. Unlike ASME VIII – ASME III, ASME B31 does not refer to “primary” or “secondary” loads or stresses.

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ABSTRACT

Loads on piping systems and pipelines are categorized in ASME B31 as sustained, occasional or thermal loads. None of the ASME B31 codes explicitly define “sustained loads.” But because they are often called out as “sustained loads such as pressure and weight,” sustained loads are understood to mean pressure and weight. In the case of buried pipe, the soil weight on the pipe would also be a sustained load. Occasional loads are loads “such as wind or earthquake” to which we may add pressure transients (waterhammer). Finally, thermal expansion and contraction loads and loads due to thermal gradients constitute the third category of loads on piping systems. Unlike ASME VIII or ASME III, ASME B31 does not refer to “primary” or “secondary” loads or stresses.

Each of these load categories (sustained, occasional, thermal) have their own design equations. In the current codes, there are three areas among the piping and pipeline codes design equations for stresses due to sustained loads which deserve attention, clarification and possibly improvement:

- Consistency of design equations
- Consistency in the use of stress indices and stress intensification factors
- Use of fatigue-based factors to calculate stresses due to sustained loads

The objective of this report is to address these areas and to propose design equations for sustained loads which would be technically sound, practical, and could be applied consistently by all ASME B31 Code books and the ASME Section III Code.