

spring as that being above the pipeline. The rationale for this nomenclature is that the spring over the pipeline represents the soil mass pushing downward onto the pipeline, while the spring under the pipeline represents the soil mass pushing upward towards the pipeline. To avoid any confusion, this text considers the movements relative to the pipeline. The pipeline moving upwards (uplift) will be resisted by the upward spring, and the pipeline moving downwards will be resisted by the downward, or “bearing” spring. The term “bearing” is taken from geotechnical engineering as a foundation “bears” on the underlying soil. The use of the term downward spring is minimized in this text, in favour of bearing spring. This is similar nomenclature used by American Lifelines Alliance (2001).

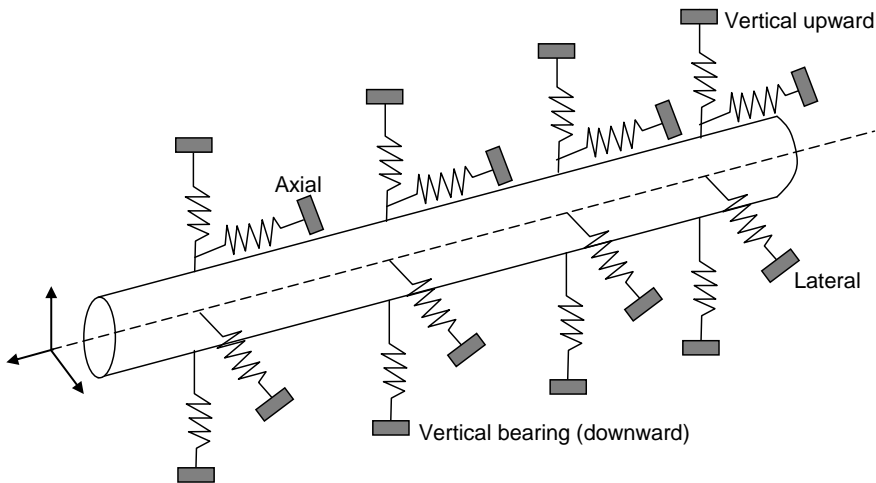


Figure 7.1 Winkler representation of pipeline showing springs representing the four independent soil loading directions.

In Winkler models, each soil spring is characterized by two parameters, the maximum soil resistance and the yielding displacement. These concepts are described in the next section.

One of the most popular sources for soil-pipe interaction formulae, that is, the soil spring parameters, was published by the American Lifelines Alliance (2001). The ALA document provides the basic equations for the various soil springs applied in a Winkler-spring foundation.