Technical Report on Pressure-relief System Calculations

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Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, Suite 1100, Washington, DC 20001, standards@api.org.

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1 Scope

This technical report is not a design code. It only provides equations and examples for performing relief system calculations. Users are responsible for performing their own calculations and using appropriate references for equations. This report contains a variety of calculation examples for equations and methods found in API Standard 520, *Sizing, Selection, and Installation of Pressure-relieving Devices, Part II—Installation*.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Standard 520, *Sizing, Selection, and Installation of Pressure-relieving Devices, Part II–Installation*, 7th Edition

3 Terms and Definitions

3.1
physical acoustic line length
The axial linear distance from the PRV inlet flange to the first significant acoustic reflection point. See API 520, Part II, Annex C.

3.2
speed of sound
The distance traveled per unit time by a sound wave as it propagates through an elastic medium.

3.3
spring constant
A characteristic of a spring that is the ratio of the force affecting the spring to the displacement caused by it.

4 Force Balance Assessment—Vapor Example

4.1 General

This is an example of a force balance assessment from API 520, Part II, Section 7.3.6.d for simple installation in vapor service using reference [1] and [4].

4.2 Example Calculation

1) Obtain the valve and installation information.

— Valve: 1½·F·2 bellows, vapor certified.

— Relief fluid phase at inlet of PRV: Vapor.

— Certified orifice area (A_N) = 0.3568 in^2.

— Certified coefficient of discharge value (K_d) = 0.855 unitless.

— Disc backpressure area (A_{pop}) = 0.4638 in^2.

— Lift (x_{max}) = 0.182 in.