Instructions to Voters/Comments on API 520 Part II Ballot "Free-Draining of Inlet and Outlet Lines of PRDs" 2nd Ballot

- This is the 2nd Ballot for this work item and reflects changes made during the ballot 1 comment resolution. Significant changes were made, therefore TF decided to reballot.
- It covers AI 2017-03 and modifies existing section 4.6, adding a new definition in API 520 Part 1, and adding a new informative Annex D .
- Your comments should be limited to the **red-lines portions of the ballot only.**
- Don't worry about formatting issues, particularly with the equations since these are a mess. These will be fixed during final editing.
- If you are voting negative, please indicate which of your comment or comments are the reason for your negative vote. API's Balloting system will categorize all of your comments as Negative.

Thanks to Matt Brewer and his work group for their efforts.

Phil Henry
API 520 Task Force Chair

API 520 Part I Definitions

3.1.XX
free-draining
The ability of lines to allow fluids (usually liquid and/or foreign matter) to drain by gravity flow ~~under gravity~~without the use of a physical drain or drain piping.

API 520 Part II Section 4.6

4.6 Free-Draining
The PRD inlet and outlet lines should be free-draining (no pockets) ~~(no pockets)~~ away from the PRD. See Section 11, Annex D, and API 521, Sections 5.5.17 and 5.5.18. Accumulated solids or trapped liquid can interfere with PRD operation.

API 520 Part II Section 5.3

5.3 Layout

The inlet piping system to PRDs should be free-draining, see 4.6.

5.~~3~~4 Isolation Valves in Inlet Piping

5.~~4~~5 Process Laterals Connected to Inlet Piping of PRVs

5.~~5~~6 PRV Inlet Line Length and Pressure Loss

5.~~6~~7 Inlet Stresses that Originate from Static Loads in the Discharge Piping

5.~~7~~8 Inlet Stresses that Originate from Discharge Reaction Forces

API 520 Part II Section 6.1

6 Discharge Piping

6.1 General

6.1.1 For general requirements for discharge piping, see 4.6, Figure 2, Figure 3, Figure 6, and Figure 10.

6.1.2 The discharge piping installation shall provide for proper PRD performance and adequate drainage (free-draining systems are preferred; see Section 11). Consideration should be given to the type of discharge system used, the backpressure on the PRD, and the set-pressure relationship of the PRDs in the system.

6.1.3 Auto-refrigeration during discharge can cool the outlet of the PRD and the discharge piping to the point that brittle fracture can occur. Piping design, including material selection, shall consider the expected discharge temperature.

API 520 Part II Section 11

11 Drain Piping

11.1 Installation Conditions that Require Drain Piping

11.1.1 Discharge piping from PRDs shall be drained properly to prevent the accumulation of liquids on the downstream side of the PRD. The outlet piping to closed systems should be free-draining to a liquid disposal point, thereby eliminating the need for a physical drain or drain piping from the discharge piping or the ~~PRV~~PRD.

11.1.2 When the discharge piping is not free-draining and the device is located where liquids could accumulate at the outlet, drain piping ~~should~~ shall be provided. This drain piping could be installed on the discharge piping or installed at the PRV in the body connection provided for this purpose.

11.1.3 Since conventional relief valves and rupture disks are differential pressure devices, accumulation on the downstream side of the device can affect the pressure at which the device will activate. In addition, the accumulation of liquid downstream for all relief devices can result in deficiencies in the discharge system, such as corrosion, plugging, and slug flow.

Annex D
(informative)

Free-Draining and Sloping of PRD Inlet and Outlet Lines

D.1 General

See Section 4.6, 6.1.2, and 11.1 for guidance on ~~free~~ free-draining lines~~. requirements.~~

The need for sloping ~~and/~~or free draining is often communicated to piping and structural designers ~~with~~ through notes and symbols ~~for specific piping lines~~ on engineering drawings (e.g. P&ID's). Quality assurance is required so that sloping or free-draining requirements makes it through the full design process and into installation. ~~A line that is specified to be sloped or free drain does not always carry that designation throughout the full design process and into installation. Errors can arise in translating a note or symbol on a drawing into isometrics, fabrication, and into installation.~~ Also, shifting ~~and~~ or uneven settling of the lines and their supports can occur during installation or during operation. Pipe support components (e.g., clamp pipe hanger) can also fail if not properly maintained and inspected. All these factors can cause PRD inlet and outlet lines in operation to be different from the original design intent. Field quality checks can be performed to determine if the installation meets the specified design requirements for sloping ~~and/~~or free-draining~~. All these factors can cause PRD inlet and outlet lines in operation to be different from the original design intent.~~

Examples of free-draining lines are ~~either~~ vertical lines and~~/or~~ properly sloped horizontal lines with no pockets. ~~Properly sloped lines with no pockets are also free draining. Lines with pockets, but with drain facilities may be a way to mitigate lines that are not free draining. See Section 11.~~

D.2 Factors to consider for determining requirements for pipe slope

No consensus requirements have been established for determining the degree of slope of lines due to the many process and mechanical design factors. API 521, Section 5.5 suggests a slope of ~~1/4~~¼ ~~"~~in. per 10 ft (21 mm per 10 m) for laterals.

~~Some factors to consider for the degree of pipe sloping are:~~ When determining the degree of slope of lines there are many factors to consider, these include but are not limited to the following:

a) Extent of pipe deflection
b) Construction ~~Tolerance~~tolerance
c) Potential for settlement of line supports (e.g., pipe rack)
~~d) Potential for sloping in the wrong direction~~
~~e) Out of round lines (e.g. butt ends not matching especially for thin-walled piping)~~
~~f)~~d) Length of horizontal lines (e.g. shorter runs may not introduce a risk)
e) Pipe fittings which create low points (e.g., reducers)
~~g) Welding contraction~~
~~h)~~f) Expansion and ~~Contraction~~ contraction due to ~~from~~ ambient temperature changes ~~diurnal~~ or process heating and cooling

~~i)~~g) Movement on ~~Floating~~ floating ~~Facilities~~ facilities (e.g., inclination due to heeling and listing)

~~j)~~h) Corrosion mechanisms

i) Insulation and heat tracing present to mitigate liquid or solid accumulation

~~k)~~j) Presence of liquids or foreign matter during modes of operation (e.g., normal operation, non-routine, steam out, chemical cleaning, hydrotesting)

~~l)~~k) Drain facilities (e.g., on pocketed piping) or weep hole present (e.g., on PRD outlet discharging to atmosphere)

~~m)~~l) Plugging and ~~Freezing~~ freezing (e.g., waxing, viscous, hydrates, freezing)

m) Drainage ~~Rate~~ rate (e.g. effect of viscosity, volatility, ~~and~~ amount of liquid)

n) Flow capacity restriction to/from the pressure relief devices from high differential pressure

o) Potential for slug formation and impact on reaction forces