

DEP SPECIFICATION

RELIEF DEVICES – SELECTION, SIZING AND SPECIFICATION (AMENDMENTS/SUPPLEMENTS TO API STD 520 PART I:2014)

DEP 80.36.00.30-Gen.

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DESIGN AND ENGINEERING PRACTICE

DEM1



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PART I INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the sizing, selection and specification of pressure relief devices.

This DEP does not cover tank vents, or pressure surge valves that protect liquid filled lines from overpressures caused by water hammer.

This DEP is based on API STD 520 Part I:2014. Part III of this DEP amends, supplements and deletes various clauses of API STD 520 Part I:2014. Part III follows the clause numbering of API STD 520 Part I for easy reference.

All clauses of API STD 520 Part I not modified by this DEP remain valid as written.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual (DEM) 1 – Application of Technical Standards.

This DEP is a revision of the same number dated February 2016; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorized access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General Definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

NOTE: In API STD 520 Part I, the term **Vendor** is used. In this DEP, the term **Vendor** is considered to be equivalent to Manufacturer/Supplier.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorized to act for, and on behalf of, the Principal.

NOTE: In API STD 520 Part I, the term **Purchaser** is used. In this DEP, the term **Purchaser** is considered to be equivalent to the Principal.

The word **shall** indicates a requirement.

The capitalized term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Oxygen service	For the purposes of this DEP, "oxygen service" is considered to be a service with an oxygen content greater than 21 vol% with the balance being inert
Very toxic (substances)	Refer to DEP 01.00.01.30-Gen. for additional details concerning the definitions of "very toxic - acute", "very toxic - chronic", and "very toxic - environment".

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (PART IV)

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated February 2016. The only changes are to DEP cross-references to reflect changes in the DEP library in 2017.

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://www.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.

PART II GENERAL

Part III of this DEP is written as amendments and supplements to API STD 520 Part I:2014. Wherever reference is made to API STD 520, it shall be understood to mean API STD 520 Part I:2014 as amended/supplemented by this DEP.

For ease of reference, the clause numbering of API STD 520 has been used throughout Part III of this DEP.

Clauses in API STD 520, which are not mentioned in this DEP, shall remain valid as written.

PART III AMENDMENTS/SUPPLEMENTS TO API STD 520 PART I**4 Pressure-relief Devices****4.2 Pressure-relief Valves (PRVs)**

Add the following to this clause:

1. Relief valves in wet gas service shall have heat tracing to prevent condensation and accumulation from freezing. See DEP 80.45.10.10-Gen., Section 1.3.2 for definitions of dry gas.

In LNG and other dry services, liquids created by the Joule-Thompson effect will evaporate; therefore, relief valves in these services do not require heat tracing.

4.2.1 Spring-loaded PRVs

Add the following to this clause:

1. For services where there is a liquid relief scenario, dual trim (liquid and vapor) relief valves should be chosen as the preferred relief valve trim.

4.2.1.2 Spring-loaded PRVs Designed for Liquid Service Applications**4.2.1.2.10**

Add the following to this clause:

1. Where vapor trim is specified, the Manufacturer shall confirm the specified vapor trim valve is suitable for liquid relief.

4.2.1.3 Balanced PRVs

Add the following to this clause:

1. Balanced-bellows valves shall not discharge to the suction side of reciprocating equipment since pressure pulsation can result in the fatigue of the bellows.
2. Balanced-bellows valves shall not be used in coking or fouling services because the bellows can become fouled and not operate properly.
3. A corrosion-resistant material shall be specified for the bellows since, in the event of a bellows failure, the relief valve will perform as a conventional relief valve and fluid could enter the bonnet space and escape through the bonnet vent.

4.2.1.3.4

Add the following to this clause:

1. For cold climates and/or dirty services, the potential of vent line plugging shall be assessed and mitigated in the course of the design.
2. Cryogenic services, such as LNG shall not use balanced PRVs as the vent line may plug.
3. See DEP 80.45.10.10-Gen. Part III, Section 10.3.3 for requirements on venting the bonnet to a safe location.

Add the following new clause:

4.2.1.4 Thermal Expansion Relief Valves (TERVs)

1. The TERV for piping systems shall be flanged, with a minimum orifice area of 0.71 cm² (0.110 in²).

4.2.2 Pilot-operated PRVs

4.2.2.1 General

Add the following to this clause:

1. Use of diaphragm-style pilot-operated PRVs should be limited to use as an alternative to pressure/vacuum vents. Diaphragm-style pilot-operated PRVs should only be used on process equipment with the approval of the Principal.
2. Pilot-operated PRVs shall only be selected for clean gas or liquid service so that the sensing line cannot be blocked with hydrates, ice, wax, solids, or dirt.
3. The design SHALL [PS] include heat tracing of the pilot operated PRV components or purging of the vent line where cooling of process fluids to temperatures as low as the Lowest One-Day Mean Ambient Temperature (LODMAT) can cause plugging in the pilot, sensing line, pilot-operated PRV inlet, or dome.
4. Where tracing or purging systems are installed, alarms SHALL [PS] be installed to alert operators when the tracing or purge is lost.
 - a. The escalation statement of the alarm should include the action to initiate repairs and in the interim to monitor pressure in the equipment protected by these relief valves as the pressure relief path may be compromised while the tracing or purge is lost.

4.2.2.4 Application and Limitations of Pilot-operated PRVs

Add the following to this clause:

1. If pilot-operated PRVs are used, the minimum process pressure required to seat the main valve should be assessed.

4.2.2.5 Pilot-operated PRV Accessories

4.2.2.5.1 General

Add the following to this clause:

1. Backflow preventers shall be included when discharging into a closed header system or when operating or upset conditions may be below atmospheric pressure.
2. Pilot Filters and/or purging of the sensing line shall be included for dirty services.
3. Preventative Maintenance of pilot filters shall be defined and handed over to maintenance to safeguard integrity of the relief system.
4. For installed spare pilot filter designs:
 - a. The flow testing of the design shall include the switching valve lined up to each filter.
 - b. Operating procedures with administrative controls shall be developed to avoid inadvertent closure of the pilot sensing line.
5. For positive displacement rotating equipment, Pressure Spike Snubbers shall be included in pilot operated valve specification.
6. Modulating design should be the default pilot operated valve design rather than pop-action design.

Final determination of design type, between modulating and pop-action, is dependent on the specific service and installation.