

DEP SPECIFICATION

RELIEF DEVICES - SELECTION, SIZING AND SPECIFICATION

DEP 80.36.00.30-Gen.

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DESIGN AND ENGINEERING PRACTICE

DEM1



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1. INTRODUCTION

1.1 SCOPE

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

The selection, sizing, and specification of relief devices shall be in accordance with the following standards, as clarified, amended or supplemented by this DEP:

- a) ASME Section 1; ASME Sect. IV; ASME Sect. VIII, Divisions 1 or 2;
- b) API Standard 520, Part I and Recommended Practice 520, Part II;
- c) ISO 23251;
- d) API Standard 526;
- e) API Standard 527;
- f) ISO 28300.
- g) ISO 4126
- h) Pressure Equipment Directive (97/23/EC)

NOTES: 1. API Standard 521, 5th edition is identical to ISO 23251:2006.
2. API Standard 2000, 6th edition is identical to ISO 28300:2008.

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

Refer to DEP 80.45.10.10-Gen. and DEP 80.45.10.11-Gen. to determine the hydraulics and other requirements of the relief and flare system.

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

This is a revision of the DEP of the same number dated February 2011; 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 authorised 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.

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

The word **shall** indicates a requirement.

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

The word **should** indicates a recommendation.

1.3.2 Specific definitions

For pressure relief valve (PRV) terminology and related terms, refer to API Std 520 and DEP 80.45.10.10-Gen.

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets (). Other documents referenced by this DEP are listed in (11).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated February 2011. The following are the main, non-editorial changes.

The "SHALL [PS]" elements in this DEP were critically reviewed and updated as required. The updates are summarized below.

Section	Paragraph	Change
2.2.1	1	Removed SHALL [PS] because requirement is covered by DEP 31.38.01.11-Gen.
2.3.3	1	Removed SHALL [PS] where the risk ranking did not meet the criteria for a SHALL [PS]
2.3.3	2	Removed SHALL [PS] where the risk ranking did not meet the criteria for a SHALL [PS]
2.3.4.2	Table 1, note 2	Removed SHALL [PS] where the risk ranking did not meet the criteria for a SHALL [PS],
2.3.7.2 a	1	Removed SHALL [PS] where the risk ranking did not meet the criteria for a SHALL [PS]
2.3.8	1	Removed SHALL [PS] where the risk ranking did not meet the criteria for a SHALL [PS]
2.3.10.1	1	Added SHALL [PS] to be consistent with DEP 34.51.01.31-Gen.
3.1		Added paragraph "General criteria"
3.2.3	2	Removed SHALL [PS] where the risk ranking did not meet the criteria for a SHALL [PS]
3.2.4.4	2	Removed section inclusive SHALL [PS]. Section is part of DEP 80.45.10.11-Gen. and requirement is covered by this DEP

Section	Paragraph	Change
3.2.5.2	1	There was no SHALL [PS] statement in this section, removed from the SHALL [PS] list in the informative.
3.1.7.3 c	1	The SHALL [PS] statement in this section has been deleted as this is redundant with the SHALL [PS] in (4.1)
5.3.1	2	Added SHALL [PS] to be consistent as with other DEPs and design assumption

This update achieves harmonization and rationalisation by including relevant design and engineering practices from the following regional and local standards:

- a) 12-GS-2
Design of Pressure Relief System Hardware
- b) 12-GS-10
Testing of New Pressure Relief Valves
- c) BSP-12-Standard-500
Brunei Shell Petroleum Company, Process Safeguarding Standard
- d) ES/099
Engineering Reference Document Standard Safety Relief Valves
- e) NSP 12-G-7-30
Overhaul and test procedure for safety valves

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be sent to the Administrator at standards@shell.com, using the DEP Feedback Form. The DEP Feedback Form can be found on the main page of "DEPs on the Web", available through the Global Technical Standards web portal <http://www.shell.com/standards> and on the main page of the DEPs DVD-ROM.

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.

2. RELIEF DEVICE SELECTION

2.1 GENERAL CRITERIA

Technical requirements for pressure relief valves (PRVs) and thermal expansion relief valves (TERVs) shall conform to MESC SPE 77/135. Outlet flange ratings for PRVs that relieve to a flare system or atmosphere shall be in accordance with API 526. For PRVs that relieve to a pressurised system, the outlet flange shall be selected according to the maximum back pressure and temperature it is subjected to.

Material selection for PRV and Terv components shall be compatible with the associated piping class material selection.

The minimum inlet flange rating should be class 300; the minimum outlet flange rating shall be class 150.

2.2 MECHANICAL DESIGN

2.2.1 Inlet and outlet connection

The inlet and outlet connections including flange face finish shall be consistent with the pipe specifications for the systems to which they connect. PRVs having threaded inlet connections shall not have threaded inlet bushing connections that may unscrew from the body during installation.

2.2.2 Threaded connections

Limitations to threaded connections shall conform to DEP 31.38.01.11-Gen.

2.2.3 Pressure relief device design temperature

2.2.3.1 The design temperature SHALL [PS] be determined by the inlet and outlet temperatures that result from extreme operating and relieving conditions. The temperature reduction resulting from possible internal valve leakage (e.g., flashing of liquid) shall be included in the determination of the design temperature. For the definition of design conditions reference is made to DEP 01.00.01.30-Gen. Elevated temperature arising from an external fire is not a basis for the design temperature or material selection.

2.2.3.2 To determine the minimum temperature at the throat of the relief device, an isentropic flash calculation to the choking pressure should be carried out.

2.3 SPECIFIC SELECTION CRITERIA

2.3.1 General

PRVs shall normally be of the spring-loaded type. For special applications, pilot-operated PRVs, buckling pin valves, and where permitted by local regulations, assisted PRVs may be employed.

Capacities established and guaranteed by the relief device Manufacturer for the applicable service conditions shall be used for selecting the relief device.

2.3.2 Conventional spring-loaded pressure relief valves

If the built-up back pressure plus the variable superimposed back pressure does not exceed the allowable overpressure, PRVs shall be conventional safety relief valves unless considerations other than back pressure justify the use of a different type of relief device. The set pressure and CDP may require adjustment for this backpressure, see API Std 520 Part 1, Paragraph 5.3.2.

Spring-loaded PRVs connected to a closed discharge system shall always have a closed bonnet.

2.3.3 Balanced type pressure relief valves

Balanced PRVs (or alternatively pilot operated PRVs) SHALL [PS] be used when the built-up back pressure plus the variable superimposed back pressure is higher than that allowed