SLOVENSKI STANDARD
oSIST prEN ISO 23251:2011

01-junij-2011

Petrokemična industrija ter industrija za predelavo nafte in zemeljskega plina - Sistemi za sproščanje in izravnavanje tlaka (ISO/DIS 23251:2011)

Petroleum, petrochemical and natural gas industries - Pressure-relieving and depressuring systems (ISO/DIS 23251:2011)

Erdöl-, petrochemische und Erdgasindustrie - Druckentlastungs- und Druckausgleichssysteme (ISO/DIS 23251:2011)

Industries du pétrole, de la pétrochimie et du gaz naturel - Systèmes de dépressurisation et de protection contre les surpressions (ISO/DIS 23251:2011)

Ta slovenski standard je istoveten z: **prEN ISO 23251**

ICS:

75.180.20	Predelovalna oprema	Processing equipment

oSIST prEN ISO 23251:2011 **en,fr**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN ISO 23251

April 2011

ICS 75.180.20

Will supersede EN ISO 23251:2007

English Version

Petroleum, petrochemical and natural gas industries - Pressure-relieving and depressuring systems (ISO/DIS 23251:2011)

Industries du pétrole, de la pétrochimie et du gaz naturel - Systèmes de dépressurisation et de protection contre les surpressions (ISO/DIS 23251:2011)

Erdöl-, petrochemische und Erdgasindustrie - Druckentlastungs- und Druckausgleichssysteme (ISO/DIS 23251:2011)

This draft European Standard is submitted to CEN members for parallel enquiry. It has been drawn up by the Technical Committee CEN/TC 12.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....3

Foreword

This document (prEN ISO 23251:2011) has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" in collaboration with Technical Committee CEN/TC 12 “Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries” the secretariat of which is held by AFNOR.

This document is currently submitted to the parallel Enquiry.

This document will supersede EN ISO 23251:2007.

Endorsement notice

The text of ISO/DIS 23251:2011 has been approved by CEN as a prEN ISO 23251:2011 without any modification.

DRAFT INTERNATIONAL STANDARD ISO/DIS 23251

ISO/TC **67**/SC **6** Secretariat: **AFNOR**

Voting begins on **2011-04-07** Voting terminates on **2011-09-07**

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Petroleum, petrochemical and natural gas industries — Pressure-relieving and depressuring systems

Industries du pétrole, de la pétrochimie et du gaz naturel — Systèmes de dépressurisation et de protection contre les surpressions

[Revision of first edition (ISO 23251:2006)]

ICS 75.180.20

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

Conformément aux dispositions de la Résolution du Conseil 15/1993, ce document est distribué en version anglaise seulement.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

Contents

Page

Foreword v

Introduction vi

1 Scope 1

2 Normative references 1

3 Terms and definitions 1

4 Causes of overpressure and their relieving rates 10
4.1 General 10
4.2 Overpressure protection philosophy 11
4.3 Determination of individual relieving rates 14
4.4 Individual overpressure causes and their relieving rates 16
4.5 Guidance on vacuum relief 62
4.6 Vapour depressuring 64
4.7 Relief system design documentation 72
4.8 List of items required in flare-header calculation documentation 76
4.9 Special considerations for individual pressure-relief devices 77

5 Disposal systems 78
5.1 General 78
5.2 Fluid properties that influence selection and design of disposal systems 78
5.3 System design load 81
5.4 System arrangement 84
5.5 Piping 87
5.6 Disposal to a lower-pressure system 103
5.7 Disposal to flare 104
5.8 Disposal to atmosphere 147
5.9 Design details for seal and knockout drums 164

Annex A (informative) Determination of fire relief requirements 167
A.1 Nature of a fire 167
A.2 Background of the empirical method in 4.4.13.2.3.2 167
A.3 Alternative Analytical Method 168
A.4 Data on latent heat of vaporization of hydrocarbons 186

Annex B (informative) Special system design considerations 188
B.1 Single pressure-relief device protecting several components in a process system 188
B.2 Description of a typical process system 188
B.3 Procedure to calculate the design pressure or MAWP of equipment components 188

Annex C (informative) Sample calculations 191
C.1 Flash calculation 191
C.2 Sizing a subsonic flare stack 193
C.3 Flare knockout drum 208
C.4 Sizing a vent stack 212
C.5 Noise calculation 213
C.6 The use of the Annex A analytical method to reproduce fire test data 215

Annex D (informative) Typical details and sketches 226

Annex E (informative) High integrity protection systems (HIPS) 229
E.1 Introduction 229
E.2 Background 229
E.3 Relevant regulations and industry standards 230
E.4 Procedures for applying HIPS 233

E.5 Test intervals for HIPS 234
E.6 Documentation 235
E.7 Training 235
E.8 Additional source material 235

Bibliography 236

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 23251 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

Introduction

The portions of this International Standard dealing with flares and flare systems are an adjunct to ISO 25457) [10], which addresses mechanical design, operation and maintenance of flare equipment. It is important for all parties involved in the design and use of a flare system to have an effective means of communicating and preserving design information about the flare system. To this end, ISO and API has developed a set of flare data sheets, which can be found in ISO 25457 Annex E. The use of these data sheets is both recommended and encouraged as a concise, uniform means of recording and communicating design information.

The Bibliography lists the documents that are referenced informatively in this International Standard, as well as other documents that are not cited in this International Standard but that contain additional useful information. Some of the content of the documents listed might not be suitable for all applications and therefore needs to be assessed for each application before use.

Petroleum, petrochemical and natural gas industries — Pressures-relieving and depressuring systems

1 Scope

This International Standard is applicable to pressure-relieving and vapour-depressuring systems. Although intended for use primarily in oil refineries, it is also applicable to petrochemical facilities, gas plants, liquefied natural gas (LNG) facilities and oil and gas production facilities. The information provided is designed to aid in the selection of the system that is most appropriate for the risks and circumstances involved in various installations.

This International Standard is intended to supplement the practices set forth in ISO 4126 or API RP 520-1 for establishing a basis of design.

This International Standard specifies requirements and gives guidelines for examining the principal causes of overpressure; and determining individual relieving rates; and selecting and designing disposal systems, including such component parts as piping, vessels, flares, and vent stacks. This International Standard does not apply to direct-fired steam boilers.

Piping information pertinent to pressure-relieving systems is presented in 5.5.

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.

ISO 4126 (all parts), *Safety devices for protection against excessive pressure*

API STD 520-I:2008, *Sizing, Selection and Installation of Pressure-Relieving Devices in Refineries — Part I: Sizing and Selection* [1)]

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
accumulation
pressure increase over the maximum allowable working pressure of the vessel allowed during discharge through the pressure-relief device

NOTE Accumulation is expressed in units of pressure or as a percentage of MAWP or design pressure. Maximum allowable accumulations are established by pressure-design codes for emergency operating and fire contingencies.

1) American Petroleum Institute, 1220 L Street, N.W., Washington, D.C., 20005-4070, USA.

3.2
administrative controls
procedures intended to ensure that personnel actions do not compromise the overpressure protection of the equipment

3.3
assist gas
fuel gas that is added to relief gas prior to the flare burner or at the point of combustion in order to raise the heating value

NOTE In some designs, the assist gas can increase turbulence for improved combustion.

3.4
atmospheric discharge
release of vapours and gases from pressure-relieving and depressuring devices to the atmosphere

3.5
availability
fraction of time that a system (e.g. safety instrumented system, atmospheric relief system or flare relief system) is able to perform the designated service if required for use

3.6
back pressure
pressure that exists at the outlet of a pressure-relief device as a result of the pressure in the discharge system

NOTE The back pressure is the sum of the superimposed and built-up back pressures.

3.7
balanced pressure-relief valve
spring-loaded pressure-relief valve that incorporates a bellows or other means for minimizing the effect of back pressure on the operational characteristics of the valve

3.8
blowdown drum
knockout drum with or connected to a stack open to atmosphere

NOTE 1 The term blowdown drum is sometimes also used for knockout drums connected to flare or other disposal systems, but it is not used in this context in this International Standard.

NOTE 2 The term blowdown is sometimes used in the context of emergency depressuring of a plant or part of a plant, but it is not used in this context in this International Standard.

3.9
blow-off
loss of a stable flame where the flame is lifted above the burner, occurring if the fuel velocity exceeds the flame velocity

3.10
breaking-pin device
pressure-relief device actuated by static differential or static inlet pressure and designed to function by the breakage of a load-carrying section of a pin that supports a pressure-containing member

3.11
buckling pin device
pressure-relief device actuated by static differential or static inlet pressure and designed to function by the buckling of an axially-loaded compressive pin that supports a pressure-containing member

3.12
built-up back pressure
increase in pressure at the outlet of a pressure-relief device that develops as a result of flow after the pressure-relief device opens

3.13
buoyancy seal
dry vapour seal that minimizes the amount of purge gas needed to protect against air infiltration

NOTE The buoyancy seal functions by trapping a volume of light gas in an internal inverted compartment; this prevents air from displacing buoyant light gas in the flare.

3.14
burnback
internal burning within the flare tip

NOTE Burnback can result from air backing down the flare burner at purge or low flaring rates.

3.15
burning velocity
flame velocity
speed at which a flame front travels into an unburned combustible mixture

3.16
burn-pit flare
open excavation, normally equipped with a horizontal flare burner that can handle liquid as well as vapour hydrocarbons

3.17
burst pressure
value of the upstream static pressure minus the value of the downstream static pressure just before a rupture disk bursts

NOTE If the downstream pressure is atmospheric, the burst pressure is the upstream static gauge pressure.

3.18
closed disposal system
disposal system capable of containing pressures that are different from atmospheric pressure

3.19
cold differential test pressure
CDTP
pressure at which a pressure-relief valve is adjusted to open on the test stand

NOTE The cold differential test pressure includes corrections for the service conditions of back pressure or temperature or both.

3.20
combustion air
air required to combust the flare gases

3.21
confined fire
fire inside a building or a compact process module where the walls and/or surrounding equipment can re-radiate and preheat the combustion air causing higher heat fluxes than an unconfined (i.e., open) fire