Flare Details for Petroleum, Petrochemical, and Natural Gas Industries

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Introduction

A flare is a critical mechanical component of a complete system design intended for the safe, reliable, and efficient discharge and combustion of hydrocarbons from pressure-relieving and vapor-depressurizing systems.

The high-level safety and operating goals of a flare are summarized as follows:

— to provide safe, reliable, and efficient discharge and combustion of hydrocarbons with a high combustion efficiency;

— to ensure that the discharged hydrocarbons burn with stable combustion over the entire defined operating range;

— to ensure a continuity of the flare flame under severe weather conditions;

— to ensure that ground-level concentrations of specified compounds do not exceed environmental limits;

— to ensure that the back pressure does not exceed the maximum allowable;

— to ensure that velocity throughout the flare piping and the flare burner does not exceed the maximum specified;

— to ensure that the opacity limit at the smokeless flow rate range does not exceed that defined;

— to ensure that the flare radiation intensity does not exceed the maximum allowable;

— to ensure that noise levels do not exceed the maximum permissible.

For new designs, the development of a design can be advanced using the guidance and examples of good engineering practice that are identified in this standard.

A flare design basis is developed in consideration of the performance expectations, the functional requirements, and mechanical details required to fulfill the safety and operating goals established for each application. Section 4 provides the basis for design and functional requirements related to the primary components critical to fulfilling these safety and operating goals. Section 5 and Section 6 provide requirements more specific to the arrangement and mechanical details of design.

The functional requirements in this standard are supported by the technical guidance provided in Annex A, Annex B, Annex C, Annex D, and Annex K. The technical guidance provided in the informative annexes addresses alternative designs or techniques and provides good practices on the basis of which, through sound engineering judgment, the practitioner may make appropriate design decisions and selections.

Datasheets are provided in Annex F in order to properly communicate and preserve the finalized basis of design and requirements. Annex E provides instructions for completing the flare datasheets in Annex F. With this addendum, Annex E and F were updated to include multi-point ground flares.

Annex G, Annex H, Annex I, and Annex J are unchanged with this addendum. Addendum 2 adds the new Annex K, which provides requirements and recommendations for the design and use of multi-point ground flares within ethylene production facilities.

Users of this standard should be aware that further or differing requirements may be needed for individual applications. This standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly

applicable where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this standard and provide details.

The International System of Units (SI) is used in this standard. Where practical, United States customary (USC) units are included in brackets for information.

A bullet (●) at the beginning of a section or subsection indicates that either a decision is required or further information is to be provided by the purchaser. This information should be indicated on datasheets (see examples in Annex F) or stated in the inquiry or purchase order.

The Fourth Edition of API Standard 537 contains the completed migration and integration of technical content from API Standard 521, Sixth Edition, initiated with API Standard 537, Third Edition, Addendum 1. In the Fourth Edition of API Standard 537, the subject matter previously contained in Annex G (added in Addendum 1) is incorporated throughout the standard under the appropriate subject headings.

Annex G is completely revised relative to Addendum 1 and now contains new subject matter related to flame properties. Three additional annexes have been provided (Annex H, Annex I, and Annex J) together with revised datasheets that now include multi-point staged ground flares (Annex F) and instructions for their use (Annex E). Annex H continues the migration of technical content, however now from the Seventh Edition of API Standard 521. Annex I provides informative content on the use of unmanned aerial systems for flare inspections, and Annex J contains a new component to the standard; a purchaser’s checklist which is complementary to the datasheets for the purchaser’s specification of requirements.

Flare Details for Petroleum, Petrochemical, and Natural Gas Industries

1 Scope

This standard specifies requirements and provides guidance for the selection, design, specification, operation, and maintenance of flares and related combustion and mechanical components used in pressure-relieving and vapor-depressurizing systems for petroleum, petrochemical, and natural gas industries. Although this standard is primarily intended for onshore facilities, guidance related to offshore applications is included.

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 Recommended Practice 2A-WSD:2000, *Planning, Designing and Constructing Fixed Offshore Platforms—Working Stress Design*

API Standard 521, *Pressure-relieving and Depressuring Systems*

API Standard 560, *Fired Heaters for General Refinery Service*

ASME B16.5 [1], *Pipe Flanges and Flanged Fittings NPS ½ Through NPS 24 Metric/Inch Standard*

ASME STS-1, *Steel Stacks*

ASTM A123/A123M [2], *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products*

ASTM A143/A143M, *Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement*

ASTM A153/A153M, *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*

ASTM A384/A384M, *Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies*

ASTM A385/A385M, *Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)*

ASTM A475-03, *Standard Specification for Zinc-Coated Steel Wire Strand*

ASTM A586-04a, *Standard Specification for Zinc-Coated Parallel and Helical Steel Wire Structural Strand*

ASTM B633, *Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel*

EN 1092-1:2007 [3], *Flanges and their joints—circular flanges for pipes, valves, fittings and accessories, PN designated—Part 1: Steel flanges*

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[1] ASME International, Two Park Avenue, New York, New York 10016, www.asme.org.

[2] ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org.

[3] CEN European Committee for Standardization, Rue de la Science 23, B-1040 Brussels, Belgium, www.cencenelec.eu.