# Flare Details for General Refinery and Petrochemical Service

ANSI/API STANDARD 537 SECOND EDITION, DECEMBER 2008

ISO 25457:2008 (Identical), Petroleum, petrochemical and natural gas industries—Flare details for general refinery and petrochemical service







#### **Special Notes**

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be utilized. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

#### **API Foreword**

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

Shall: As used in a standard, "shall" denotes a minimum requirement in order to conform to the specification.

Should: As used in a standard, "should" denotes a recommendation or that which is advised but not required in order to conform to the specification.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API standard. Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually by API, 1220 L Street, N.W., Washington, D.C. 20005.

Suggested revisions are invited and should be submitted to the Standards Department, API, 1220 L Street, NW, Washington, D.C. 20005, standards@api.org.

### **Contents**

Page

API Fo	reword	ii
Forewo	ord	v
Introdu	ıction	<b>v</b> i
1	Scope	1
2	Normative references	
3	Terms and definitions	
4	Design	
4.1 4.2	Introduction	
4.2 4.3	System design  Process definition	
4.3 4.4	Types of flares	
4.4 4.5	Flare burners	
4.6	Mechanical design	
4.7	Pilots	
4.8	Pilot-ignition systems	
4.9	Pilot-flame detection	
4.10	Piping	
4.11	Auxiliary components	
5	Mechanical details — Elevated flares	18
5.1	Mechanical design — Design loads	
5.2	Design details	
5.3	Materials of construction	22
5.4	Welding	
5.5	Inspection	23
5.6	Surface preparation and protection	
5.7	Attachments	
5.8	Aircraft warning lighting	
5.9	Platforms and ladders	
6	Mechanical details — Enclosed-flame flare	
6.1	Combustion chamber	
6.2	Burners	
6.3	Burner piping	
6.4	Pilots	
6.5	Wind fence	
6.6	Radiation shielding	27
	A (informative) Flare equipment overview	
A.1	Types of flares and components	
A.2	Flare burner	
A.3	Pilots	
A.4	Ignition equipment	
A.5	Flame-detection equipment	
A.6	Verification test	
A.7 A.8	Purge-gas conservation seals  Knockout drums and liquid seals	
A.8 A.9	Blowers and drivers	
A.9 A.10	Blower staging and control equipment	
A.10 A.11	Pressure-staging equipment	
A.12	Flow and pressure sensing equipment	
	B (informative) Components of multi-burner staged flare equipment	
B.1	Burners	
<b>⊸</b> . ı		30

B.2	Pilots	91
B.3	Ignition equipment	91
B.4	Flame-detection equipment	91
B.5	Buoyancy and velocity seals	91
B.6	Manifolds	92
B.7	Operations	92
B.8	Maintenance	92
B.9	Troubleshooting	92
Annex	x C (informative) Enclosed-flame flares	93
C.1	Purpose	93
C.2	General description	
C.3	Operating considerations for enclosed-flame flares	100
C.4	Maintenance	104
C.5	Troubleshooting	105
Annex	x D (informative) Instructions for flare data sheets	106
D.1	Introduction	
D.2	General information forms — Instructions	108
D.3	Elevated-flare forms — Instructions	114
D.4	Enclosed-flare forms — Instructions	116
Annex	x E (informative) Flare data sheets	118
E.1	Sl units	
E.2	USC units	136
Biblio	graphy	154

#### **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 25457 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

Users of this International Standard should be aware that further or differing requirements may be needed for individual applications. This International 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 International Standard and provide details.

In International Standards, the SI system of units is used. Where practical in this International Standard, US Customary units are included in brackets for information.

A bullet (•) at the beginning of a clause or subclause indicates that either a decision is required or further information is to be provided by the purchaser. This information should be indicated on data sheets (see examples in Annex E) or stated in the enquiry or purchase order.

## Petroleum, petrochemical and natural gas industries — Flare details for general refinery and petrochemical service

#### 1 Scope

This International 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 vapour-depressurizing systems for petroleum, petrochemical and natural gas industries.

Although this International Standard is primarily intended for new flares and related equipment, it is also possible to use it to evaluate existing flare facilities.

Annexes A, B and C provide further guidance and best practices for the selection, specification and mechanical details for flares and on the design, operation and maintenance of flare combustion and related equipment.

Annex D explains how to use the data sheets provided in Annex E; it is intended that these data sheets be used to communicate and record design information.

#### 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 1461, Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods

ISO 2408:2004, Steel wire ropes for general purposes — Minimum requirements

ISO 8501-1:2007, Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings

ISO 10684, Fasteners — Hot dip galvanized coatings

ISO 13705:2006, Petroleum, petrochemical and natural gas industries — Fired heaters for general refinery service

ISO 15156 (all parts), Petroleum and natural gas industries — Materials for use in  $H_2$ S-containing environments in oil and gas production

ISO 23251, Petroleum, petrochemical and natural gas industries — Pressure-relieving and depressuring systems

EN 1092-1:2007, Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges