

**GENERAL REQUIREMENTS
FOR
FLARES AND FLARE STACKS**

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1. SCOPE

This Standard covers the minimum requirements for the general design, material, fabrication, testing and preparation for shipment of flarestacks, ignitors, flare tip, structure, and accessories.

2. REFERENCES

Throughout this Standard the following standards and codes are referred to. The editions of these standards and codes that are in effect at the time of publication of this Standard shall, to the extent specified herein, form a part of this Standard. The applicability of changes in standards and codes that occur after the date of this Standard shall be mutually agreed upon by the Company and the Vendor:

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

A 312 (TP 304, 309, 321) "Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes"

API (AMERICAN PETROLEUM INSTITUTE)

RP 521 "Guide for Pressure-Relieving and Depressuring Systems, (Section 5 Disposal Systems Drums and Seals)"

IPS (IRANIAN PETROLEUM STANDARDS)

C-PI-240	"Plant Piping Systems"
E-PR-460	"Process Design of Flare and Blowdown Systems"
E-SF-400	"Industrial Stairs, Ladders, Platforms & Scaffolds"
C-TP-101	"Surface Preparation"
E-TP-100	"Paints"
E-EL-100	"Electrical System Design (Industrial & Nonindustrial)"
M-IN-280 Part 1	"Packaged Equipment Instrumentation"

3. UNITS

This Standard is based on International System of Units (SI), except where otherwise specified.

4. DESIGN

4.1 General

4.1.1 The sizing of flare stack shall be in accordance with IPS-E-PR-460.

4.1.2 Suitable lifting lugs shall be provided on each component.

4.2 Siting

The siting of flares must take into account availability of space, particularly in relation to possible future development at the relevant site, national and local regulations, and the avoidance of hazards to personnel and equipment.

4.3 Type of Flare

Flares will normally consist of an elevated stack, but low level or ground flares will be considered in cases where no H₂S or other highly toxic material is present in the vent gas and a suitable sterilization area is available.

Flares in refinery and chemical works which have the dual purpose of burning surplus gas continuously and also burning gas in large quantities in emergencies, should normally be of the smokeless type for the continuous burning case. Where steam is used for this purpose, it may be applied externally to the stack, or internally at the upper section of the stack; however the internal system is not to be used in extremely cold climates due to the danger of internal blockage of the stack caused by steam condensing and the condensate freezing.

The quantity of steam should be based on the continuous burning condition and not on emergency conditions.

If a flare has to burn a stream of H₂S above 10% concentration or other highly toxic material, this gas stream should be led via a separate line of all welded construction to the flare. Where a cartridge type flame arrester is used on the flare stack, the point of entry should be below this.

Where a water seal is used at the base of the flare stack, the H₂S line should have its own flame arrester, and the line connected near the flare tip.

4.4 Flare Tip

4.4.1 Unless otherwise specified on the data sheet the flare tip shall be smokeless.

4.4.2 A flame-lick preventor of an approved design shall be fitted.

4.4.3 The top 4 meters of the flare tip shall be fabricated from stainless steel as per ASTM-A 312, TP 309, or approved equal.

4.5 Flashback Prevention

4.5.1 Flashback prevention for the main flare may be achieved by flame arrester, molecular seal, or by a continuous gas purge, as agreed by the Company. Proposals for the use of water seals are to receive prior Company agreement.

4.5.2 The molecular seal shall be fabricated from stainless steel according to ASTM 312, TP 304 or approved equal.

4.5.3 The molecular seal shall be fitted with a stainless steel drain line to grade. A positive sealing device (e.g., a loop seal) shall be fitted to prevent entry of air.

4.6 Water Seal

A positive water seal in the form of a sealed dipleg shall be provided on all flares to prevent air leakage into the flare system and to provide a means of absorbing the energy from an explosion in the flare stack or a blow back. The following basis shall be used in designing the water seal:

4.6.1 The height of inlet centerline to the surface of water in the seal drum shall be at least equal to 3000 mm. A seal height of 300 mm shall be provided below the normal sealing water level.

4.6.2 A water line with a restriction orifice maintaining a flow of approximately 4.5 m³/hr. shall be provided for the water seal below the normal water level.

4.6.3 Water shall leave the seal through a seal leg having a sealing depth equivalent to 150% of the total stack pressure at maximum capacity or 1.5 m, whichever is greater. This water should be piped to the dirty water sewer.

4.6.4 Steam shall be admitted to the water seal through a restriction orifice in order to maintain the temperature of the water at 38°C.

4.6.5 Trycocks shall be provided at the normal water level and 150 mm below and above the normal water level.

4.7 Structure

4.7.1 All structural steel, including platforms and ladders shall be designed and fabricated in accordance with IPS-E-SF-400, and shall be fully galvanized.

4.7.2 Unless otherwise specified by the Company, a caged ladder with rest platforms at 15m intervals shall be provided, leading to a top platform which gives access to flare tip.

4.7.3 The flarestack and associated structural steel shall be designed to withstand a lateral seismic force equal to 25% of the total installed equipment weight.

4.7.4 Self-supporting flarestacks are preferred for height of up to 30 meters. For heights in excess of 30 meters a 3 or 4 sided derrick type structure shall be used. Guyed supports may be used.

4.7.5 A circular 360° maintenance platform shall be provided about 1 m below the flare tip. An access ladder and safety cage shall be provided for the main flare tip assemblies and shall be S.S. 309.

4.7.6 A painter's trolley ring shall be provided below the tip maintenance platform.

4.8 Flame Front Generators

4.8.1 Flame front generators shall be of the type that does not require connection to an external electricity supply and shall be certified Flame proof.

4.8.2 The Flame front generator shall be designed to light the pilots during wind speeds of up to 50 M/S.

4.8.3 The Flame front generator panel shall be fully protected against the effects of dust storms, rain storms and ambient and sun temperature extremes.

4.8.4 A suitable personnel shield shall be fitted around the flame front generator panel to protect operators from the weather extremes described in 4.8.3 above.

4.9 Pilots

4.9.1 A minimum of three pilots per flarestack shall be provided.

4.9.2 The pilots shall be fabricated from cast Cr/Ni (Cr 22-24%-Ni 12-15%) alloy or ASTM-A 312, TP 309 stainless steel or approved equal.

4.9.3 The last four meters of the top of pilot and ignition piping shall be fabricated from ASTM-A 312, TP 309 stainless steel.

4.9.4 The pilots shall be suitable for lighting the flare gas at the maximum discharge velocity of Mach 0.5.

4.9.5 The pilots shall be fitted with windshields designed to prevent extinguishing of the pilots at wind speeds of up to fifty meters/sec.

4.10 Flare Lines

Flare lines must be sloped, and drained of condensate into drainage pots, which are to be provided as required by the line configuration and manufactured to line specification. The pots are to be fitted with a level gage (sight glass) and automatic pump out facilities, frost protected where required. Expansion of flare lines should preferably be accommodated by providing flexibility in the piping layout or alternatively, by expansion loops. Sliding expansion joints are not permitted.

4.11 Piping

4.11.1 All piping and pipe fittings shall be in accordance with IPS-C-PI-240 "Plant Piping Systems".

4.11.2 All piping shall be assembled and hydrostatically tested prior to put in operation.

5. INSTRUMENTATION

5.1 All instrumentation shall be in accordance with the requirements of IPS-M-IN-280 Part 1 packaged equipment instrumentation.

5.2 Pressure regulators shall be provided for air and fuel gas to ignitor. A strainer, shut-off valve and pressure indicating gage shall be provided downstream of each pressure control valve.

5.3 All plant-mounted instruments shall be provided with name plates. Where necessary, the fixing facilities shall be made locally.

If not otherwise specified, the contractor shall make proposals, for approval by the Purchaser at an early stage in the project, on how to fix the instrument name plates.

Note:

When impulse lines are very long and the tapping points are not visible from the instrument location, a nameplate shall be fitted at these 'tapping points' with the same tag number as the corresponding instrument, to facilitate identification during installation, operation and maintenance and to avoid mistakes. Examples of such tapping points are; for drought gages on large furnace, analyzer, impulse lines, etc.

5.4 All instruments shall be weatherproof after installation. Where necessary the instruments shall be provided with protective shades.

6. FABRICATION REQUIREMENTS

6.1 Welding

Joints shall be made by welding wherever possible, unless otherwise specified. All pipework shall be suitably prepared for welding where welding is required. All welded connections, shall be of the full-penetration type. The connections shall be in accordance with ASME code for pressure piping B 31.3.

All welding shall be done by qualified welders. Qualification tests for welders and welding procedures shall comply with Section IX of the ASME Boiler and Pressure Vessel Code or any other code stated by the Purchaser.

6.2 Noise Limits

Unless otherwise specified, the maximum allowable sound pressure level shall be 90 dB (A) in the work area i.e. any position accessible to personnel not less than 1 m from equipment surfaces.

If the equipment produces impulsive and/or narrow band noise, the above limit shall be taken 5 dB (A) more stringent, thus 85 dB (A).

6.3 Painting

All support brackets, etc., shall be painted in accordance with the requirements of IPS-E-TP-100 "Paints", after the installation work has been completed. Surfaces which will be inaccessible afterwards shall be painted before installation with at least two coats of primer. Plant-Mounted instruments and stainless steel impulse lines shall not be painted.

6.4 Explosion Precautions

All electric/electronic instruments shall comply with IPS-E-EL-100.

7. GENERAL SCOPE OF SUPPLY

- The final design and performance of the flarestacks and ignitors shall be the sole responsibility of the Vendor.
- In the event of conflict between this specification and the individual data sheets, the data sheets shall govern. However, such conflicts should normally be referred to the Purchaser for clarification before proceeding with material ordering or fabrication.

7.1 Flarestacks

7.1.1 The Vendor shall supply the flarestacks complete with flare tip, molecular seal, supporting steelwork, platforms and ladders, all necessary piping and flanges, surface preparation and painting:

7.1.2 Unless otherwise specified in the Purchase Order, the following shall be excluded from the Vendor's scope of supply:

- Foundations
- Water Seal
- Knock-Out drum

7.2 Ignitors

7.2.1 The Vendor shall supply pilots, flame front generator panel, and all necessary piping, flanges, valves, strainers and instrumentation.

7.2.2 One ignitor set shall be provided for each Flarestack. For more detail, reference is to be made to Clause 7.5.3.(3) of IPS-E-PR-460.

7.2.3 Unless otherwise specified in the Purchase Order, the following shall be excluded from the Vendor's scope of supply:

- Foundations
- Interconnecting piping between flame front generator panel and pilots

8. INSPECTION

8.1 Fabrication and testing of all equipment is subject to inspection by the Purchaser or his representative. Such inspection does not relieve the Vendor of responsibility to meet the requirements of this specification and the Purchase Order.

8.2 Purchaser's inspector shall have free access to check all materials and fabrication and witness all tests.

8.3 The Vendor shall have full responsibility for inspection of materials. The Purchaser shall have the right, upon request, to inspect all materials at source.

9. PREPARATION FOR SHIPMENT

9.1 All unpainted exterior surfaces shall be coated with rust preventative grease. Interior metal surfaces shall be sprayed with a suitable rust preventative, as per IPS-C-TP-101 standard.

9.2 All openings shall be provided with substantial wooden or metal closures, securely fastened and suitable for long exposure prior to final installation. All tapped openings shall be plugged with solid steel pipe plugs.

9.3 Equipment must be suitably crated, packaged and weather protected to guard against damage while in transport. All pieces of equipment and spare parts shall be identified by item number and service, and shall be suitably marked both inside and outside the box.

10. GUARANTEES AND WARRANTIES

10.1 General

Unless exception is recorded by the Vendor in his proposal, it shall be understood that the Vendor agrees to the guarantees and warranties described in 10.1.1 and 10.1.2

10.1.1 All flare and flare stack parts shall be warranted by the Vendor against defective materials, design, and workmanship when operated under normal usage for 1 year after being placed in specified service but not exceeding 18 months (30 months for export) after date of shipment.

10.1.2 If any malperformance or defects occur during the guarantees and warranties period, the Vendor shall make available repaired, altered, or replacement parts free of charge, free on board the Purchaser's job site.

10.1.2.1 The Vendor shall make available, free of cost to the Purchaser, qualified representatives as the Vendor deems necessary to supervise the removal, repair, and replacement of defective parts in such manner that the warranty is maintained.

10.1.2.2 The warranty period for repaired or replaced parts shall be 12 months after startup of the repaired equipment but not more than 18 months after the equipment repairs are completed.

10.2 Assistance on Site

10.2.1 In the event of failure or malfunction of the equipment within the guarantee period, the Vendor shall provide the Purchaser with immediate and comprehensive assistance.

10.2.2 The temporary repair or modification of any equipment at site shall not necessarily release the Vendor from his obligation to replace defective and/or inadequate parts/equipment in accordance with the provisions of Paragraph 10.1 of this Standard.

10.3 Spare Parts

Vendor is to include with his quotations a list of recommended spare parts, and it shall be specified and provided for start up and two years of operation.

11. QUOTATIONS

The Vendor's quotation shall include the following information as a minimum:

- 1) An outline general arrangement sketch of the complete system showing all major dimensions and weights.
- 2) A complete technical description and sketch of each item of equipment.
- 3) Operating data for the main flare including velocity and pressure drop through each component.
- 4) Fuel gas consumption and required pressure for each pilot.
- 5) Fuel gas and compressed air consumption and required pressures for flame front generator.
- 6) Purge gas flowrate to maintain gas seal under following conditions:
 - a) Normal operation.
 - b) Following heavy rainfall.
 - c) Following release of hot flare gas (where specified on data sheet).
- 7) List of materials showing specification.
- 8) Tabular or graphical representation of radiation levels at varying radii from the base of the stack.
- 9) Maximum radiation level at which flame front generator can be safely and efficiently operated.
- 10) Maximum allowable distance of flame front generator panel from pilots.
- 11) Recommended diameter of ignitor lines.