
Flare Systems and Overpressure Protection: Design Review Training Course for Plant Leaders

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Rome





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Programme Summary

Flare systems and overpressure protection are the subject of this five-day training course for process safety, operations and engineering managers at applied level, ending in a flare systems design review file for one unit or facility. Relief and flare networks are the last line of defence when a process exceeds its limits, yet they are often reviewed only when equipment changes. The approach moves from relief scenarios and device selection, through headers, knock-out drums and flare types, to radiation, dispersion and flaring performance. Mars Training Centre UK delivers this programme in flare systems for plant leaders.

The Business Case

Plants add loads to relief and flare networks over decades through debottlenecking, new connections and revised operating modes. Without periodic review, a network may no longer handle the worst credible event, and routine flaring may rise unnoticed. Informed leaders ask better questions of design teams and vendors, and they connect safety, reliability and emissions decisions.

- Overpressure Incident Exposure: Falls as relief scenarios and network capacity are reviewed against current operations.
- Routine Flaring Volume: Reduces as sources are identified, measured and ranked for action.
- Review Cycle Effort: Shortens as findings are recorded in a consistent design review file.

Principles and Evidence Base

- API Standard 520: Its guidance on sizing and selecting pressure-relieving devices frames the device review in Session 2.
- API Standard 521: Its guidance on pressure-relieving and depressuring systems structures the scenario, header and flare reviews in Sessions 1, 3 and 4.
- World Bank Zero Routine Flaring Initiative: Its focus on ending routine flaring shapes the flaring performance review in Session 4.

Intended Participants

- Leaders accountable for process safety performance at an oil, gas or chemical facility.
- Operations managers who run units that discharge to a common relief and flare network.
- Engineering managers who approve plant modifications that add relief loads.
- Environment and reliability managers who report flaring and emissions performance.

The programme serves refining, gas processing, petrochemical and upstream production facilities, and the engineering and safety functions that support them.



Learning Outcomes

1. Participants will be able to identify credible overpressure scenarios for vessels, columns and pipework.
2. Participants will be able to evaluate the selection and basic sizing logic of relief valves and rupture discs.
3. Participants will be able to diagnose capacity limits in relief headers, knock-out drums and flare tips.
4. Participants will be able to assess thermal radiation and dispersion effects of a flare at a given site layout.
5. Participants will be able to prioritise measures that reduce routine flaring and associated emissions.
6. Participants will be able to justify the conclusions of a flare systems design review to a management or safety committee.

Programme Structure

Day 1: Overpressure Scenarios and Protection Principles

What can push equipment past its limits, and how is each case ranked?

- Overpressure Cause and Consequence Matrix
- Blocked Outlet, Fire and Power Failure Scenario Screening
- Pressure Relief Philosophy and Layers of Protection
- Relief Load Summary Sheet
- Case Review of Relief System Failures

Day 2: Relief Valves, Rupture Discs and Device Selection

Which device protects each item, and is it sized and installed to work?

- API 520 Device Selection Logic
- Relief Valve Sizing Basics for Gas, Liquid and Two-Phase Flow
- Rupture Disc Applications and Combination Arrangements
- Inlet and Outlet Line Loss Checks
- Device Datasheet Review Checklist

Day 3: Relief Headers, Knock-Out Drums and Flare Network Capacity

Can the network carry the worst credible release without backpressure problems?

- Header Layout and Backpressure Profile
- Simultaneous Relief Case Selection
- Knock-Out Drum Sizing Logic for Liquid Carry-Over
- Seal Drum and Purge Gas Arrangements
- Flare Network Capacity Review Template



Day 4: Flare Types, Radiation and Flaring Performance

How does the flare behave in service, and what does it release?

- Elevated, Ground and Enclosed Flare Comparison
- Thermal Radiation Contours and Allowable Exposure
- Dispersion and Noise Considerations
- Routine Flaring Source Register
- Zero Routine Flaring Reporting Approach

Day 5: Applying Flare Systems Review to a Facility

Is the design review file ready for sign-off by a safety committee?

- Applying Day 1 Scenario Screening to a Chosen Unit
- Checking Day 2 Device Data Against Relief Loads
- Testing Day 3 Network Capacity With a Combined Case
- Ranking Day 4 Flaring Reduction Options
- Completing the Flare Systems Design Review File

Methodology

The programme is built around case analysis and structured design review exercises. Participants work with simplified process flow diagrams, relief load tables and flare layouts from refining, gas processing and chemical examples, then check them against checklists derived from the cited guidance. Discussion centres on the judgement calls leaders make when data is incomplete.

- Suggested activity: Screening a unit flow diagram for credible overpressure scenarios.
- Suggested activity: Checking a relief valve datasheet against a stated relief load.
- Suggested activity: Presenting review findings to a simulated safety committee.

Capstone Output

Each participant completes a flare systems design review file for one unit or facility. It contains a scenario register, a device check summary, a network capacity assessment, a radiation and dispersion note and a ranked list of flaring reduction actions. It is used to brief a safety committee and to scope any follow-up engineering study.

Frequently Asked Questions

Is flare systems training suitable for managers who are not relief design specialists?

Yes. It is set at applied level for managers who oversee process safety, operations and engineering, and assumes familiarity with process plant rather than detailed relief calculation skills.



Which standards does the flare systems programme rest on?

It rests on API Standard 520 for pressure-relieving devices, API Standard 521 for pressure-relieving and depressuring systems, and the World Bank Zero Routine Flaring Initiative for flaring performance.

How is the flare systems design review file used at work?

You can take it to a safety or management committee as the basis for accepting a network, requesting a study or approving flaring reduction actions for one unit or facility.

How does flare systems review differ from a programme on process hazard analysis?

Flare systems review concentrates on relief scenarios, devices, headers and flares, while process hazard analysis examines wider hazards and safeguards across a process using structured team studies.