Pressure Relief and Flare System Design and Operations Training Course



01 - 05 Nov 2026

Amman

3800 € (Per Person)

Ref: #ACE1031_252454

Course Introduction / Overview:

This comprehensive training course provides an in-depth exploration of the design, operation, and maintenance of pressure relief and flare systems, which are critical safety barriers in the process industries. The curriculum is meticulously structured to cover everything from fundamental principles of overpressure protection to the advanced analysis of flare system performance. Participants will gain a robust understanding of the governing codes and standards, including API 520, 521, and 2000, ensuring that their designs are both safe and compliant. The course delves into the practical application of these standards, drawing on the authoritative work found in publications like the "Guidelines for Pressure Relief and Effluent Handling Systems" by the Center for Chemical Process Safety (CCPS). Esteemed experts such as Dr. A. K. Coker have contributed significantly to this field, and their principles are integrated into our practical sessions. At BIG BEN Training Center, we bridge the gap between theory and real-world application, equipping engineers and technical professionals with the skills to confidently size relief devices, design robust discharge systems, and manage flare operations effectively. This program is essential for anyone responsible for process safety management and asset integrity in high-hazard environments.

Target Audience / This training course is suitable for:

- Process Engineers.
- Safety and HSE Engineers.
- Mechanical and Piping Engineers.
- Operations and Production Engineers.
- Maintenance and Inspection Engineers.
- Project and Design Engineers.
- Plant and Operations Managers.
- Technical and Engineering Managers.
- Instrument and Control Engineers.

Target Sectors and Industries:

- Oil and Gas Exploration and Production.
- Petroleum Refining and Petrochemical Plants.
- Chemical and Specialty Chemical Manufacturing.
- Power Generation and Utilities.
- Liquefied Natural Gas (LNG) Facilities.
- Engineering, Procurement, and Construction (EPC) Companies.
- Governmental bodies and regulatory agencies.

Target Organizations Departments:

- Process Engineering and Design.
- Health, Safety, and Environment (HSE).
- Operations and Production.
- Maintenance and Mechanical Integrity.
- Technical Services.
- Project Management.
- Plant Engineering.
- Inspection and Reliability.

Course Offerings:

By the end of this course, the participants will have able to:

- Apply key industry standards such as API 520, 521, and 2000 to real-world scenarios.
- Identify potential overpressure scenarios and their causes within a process facility.
- Perform accurate sizing calculations for pressure relief valves for various fluid phases.
- Select the appropriate pressure relief devices based on service conditions and process requirements.
- Design and analyze relief system inlet and outlet piping for optimal performance.
- Calculate and mitigate the effects of backpressure on relief valve capacity.
- Design key components of a flare system, including knockout drums and liquid seals.
- Evaluate flare stack height, radiation, and noise levels to ensure safety and compliance.
- Develop strategies for flare gas recovery and smokeless flaring operations.
- Understand the requirements for testing, inspection, and maintenance of relief systems.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to foster a deep and practical understanding of pressure relief and flare systems. We employ a blended learning approach that combines expert-led instructional sessions with highly interactive and participatory activities. The course moves beyond theoretical lectures to immerse participants in real-world problem-solving. Through a series of detailed case studies drawn from actual industrial incidents and projects, attendees will analyze design flaws and operational errors, learning critical lessons in a controlled environment. Group workshops and collaborative exercises encourage participants to apply calculation methods and design principles to practical problems, reinforcing key concepts. Interactive discussions and Q&A sessions are integral to the program, providing a platform for attendees to share their own experiences and challenge their understanding. Our instructors facilitate a dynamic learning environment where feedback is continuous and constructive, ensuring that every participant leaves with not only the knowledge but also the confidence to apply these critical safety skills in their own workplace. The focus is on mastering practical application and developing sound engineering judgment.

Course Agenda (Course Units):

Unit One: Fundamentals of Overpressure Protection

- Introduction to process safety management and layers of protection.
- Understanding the causes and consequences of overpressure events.
- Overview of key codes, standards, and regulations (ASME, API, OSHA).
- Introduction to API Recommended Practices 520, 521, and 2000.
- Types of pressure relief devices: direct-acting, pilot-operated, and rupture disks.
- Terminology and fundamental principles of pressure relief systems.
- Defining set pressure, overpressure, accumulation, and blowdown.

Unit Two: Sizing and Selection of Pressure Relief Devices

- Methodology for determining relief requirements and loads.
- Sizing relief valves for gas or vapor relief per API 520.
- Sizing relief valves for liquid relief and thermal expansion.
- Addressing two-phase and flashing flow scenarios.
- Selection criteria for pressure relief valves versus rupture disks.
- Understanding the specifics of pilot-operated and balanced-bellows valves.
- Documentation and data requirements for relief device specification.

Unit Three: Relief System Installation and Piping Design

- Critical design considerations for inlet piping to pressure relief devices.
- API rules and limitations for inlet pressure loss.
- Design and analysis of outlet piping and discharge headers.
- Calculating and managing superimposed and built-up backpressure.
- Evaluating reaction forces and designing appropriate supports.
- Considerations for relief device location and orientation.
- Common installation errors and best practices for mitigation.

Unit Four: Flare System Design and Analysis

- Overview of flare systems and their purpose in process safety.
- Types of flares: elevated, ground, and enclosed flares.
- Design and sizing of flare knockout drums and liquid seal drums.
- Determining flare stack height based on radiation and dispersion.
- Calculating flare radiation levels at sterile zones and property lines.
- Flare tip design for efficiency and smokeless operation.
- Purge gas requirements and velocity seals for flare systems.

Unit Five: Flare Operations, Maintenance, and Advanced Topics

- Principles of smokeless flaring and assist systems (steam, air, gas).
- Introduction to flare gas recovery systems and their benefits.
- Emergency Depressurization Systems (EDS) design and philosophy.
- Inspection, testing, and maintenance requirements for relief valves.
- Troubleshooting common issues in pressure relief and flare systems.
- Managing environmental compliance and emissions reporting.
- Case studies of major incidents related to relief system failures.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

Considering the increasing pressure from environmental regulations, how might the design philosophy of flare systems shift from simple disposal to value-added recovery in the next decade?

What unique qualities does this course offer compared to other courses?

This training course distinguishes itself by offering a holistic and integrated perspective on pressure relief and flare systems, moving beyond isolated calculations to build comprehensive engineering judgment. While many courses focus narrowly on sizing equations, our curriculum emphasizes the "why" behind the "how," exploring the intricate relationship between design choices, operational reliability, and process safety. We dedicate significant time to analyzing real-world case studies of system failures, allowing participants to learn from complex industrial incidents in a structured and safe environment. The program uniquely connects the design phase with long-term operations and maintenance, covering critical topics like flare gas recovery, troubleshooting, and regulatory compliance that are often overlooked. Rather than just presenting standards, we teach how to interpret and apply them in complex, non-ideal situations. The course fosters a deep understanding of the entire system lifecycle, from initial hazard identification and relief load determination to the final design of the flare tip and ongoing mechanical integrity programs. This practical, lifecycle-based approach ensures that participants return to their roles equipped not just with formulas, but with the critical thinking skills needed to design and manage safer, more efficient, and compliant systems.