

PRINCIPLES OF FIRE & EXPLOSION (FIRE BEHAVIOUR)

“Master fire and explosion behavior to design safer systems and improve incident response.”

Schedule

Venue	Fees
In-House	ASK FOR THE QUOTATION

► **Available delivery methods:** In-House Training

Introduction

This technical training course provides in-depth knowledge of the science behind fire behavior and explosions. Participants will explore how fires start, spread, and behave under various environmental and material conditions. The course also delves into the causes and mechanics of explosions—both chemical and physical—and how these hazards can be predicted, mitigated, and responded to in industrial and structural settings.

Objectives

Participants will be able to:

- Understand the chemistry and physics of combustion
- Analyze fire development stages and influencing factors
- Differentiate between types of explosions (e.g., deflagration vs detonation)
- Assess the impact of material properties on fire and explosion behavior
- Apply fire modeling principles for fire risk assessment
- Improve design and response strategies for fire and explosion hazards

Why Attend

Whether you're an engineer, safety professional, fire officer, or risk analyst, a deep understanding of fire and explosion principles is essential for designing safe systems, predicting hazard outcomes, and reducing loss of life and assets.

Target Audience

- Fire Protection & Process Engineers
- Health, Safety & Environment (HSE) Professionals
- Emergency Response & Fire Brigade Personnel
- Chemical & Petroleum Engineers
- Safety Auditors and Risk Analysts
- Investigators and Incident Commanders

Individual Benefits

- Grasp core concepts of fire science and explosion behavior
- Strengthen your ability to assess and control fire hazards
- Enhance your skills for fire/explosion incident investigation
- Apply models and calculations for better risk prediction

Organizational Benefits

- Reduce incidents and operational downtime
- Improve compliance with fire and explosion safety codes
- Support incident investigation and root cause analysis
- Build a workforce capable of hazard anticipation and mitigation

Instructional Methodology

- Technical lectures with real-life case references
- Group activities and analytical problem-solving
- Explosion footage and fire behavior simulations
- Interactive Q&A with combustion science specialists
- Optional hands-on sessions with modeling software (if applicable)

Course Outline

DETAILED 5-DAY COURSE OUTLINE (CUSTOMIZABLE)

Training Hours: 7:30 AM – 3:30 PM

Daily Format: 3–4 Learning Modules | Coffee Breaks: 09:30 & 11:15 | Lunch Buffet: 01:00 – 02:00

Day 1: Introduction to Fire Science & Behavior

Module 1: Fundamentals of Combustion Chemistry (07:30 – 09:30)

Module 2: Fire Triangle/Tetrahedron – Ignition and Propagation (09:45 – 11:15)

Module 3: Fire Development – Growth, Flashover, Decay (11:30 – 01:00)

Module 4: Influences of Ventilation, Fuel Load, & Geometry (02:00 – 03:30)

Day 2: Fire Behavior in Enclosures & Open Areas

Module 1: Fire Spread in Confined Spaces (07:30 – 09:30)

Module 2: Radiative, Convective & Conductive Heat Transfer (09:45 – 11:15)

Module 3: Smoke Production, Movement, and Toxicity (11:30 – 01:00)

Module 4: Fire Suppression Mechanisms and Strategies (02:00 – 03:30)

Day 3: Explosion Science and Classification

Module 1: Definitions – Deflagration vs Detonation (07:30 – 09:30)

Module 2: Gas, Dust, Vapor, and BLEVE Explosions (09:45 – 11:15)

Module 3: Explosion Pressure, Shockwaves, and Flame Acceleration (11:30 – 01:00)

Module 4: Case Study: Buncefield, Texas City, Beirut, and others (02:00 – 03:30)

Day 4: Explosion Risk Control and Modeling

Module 1: LEL/UEL Concepts, Oxygen Availability, and Fuel Concentration (07:30 – 09:30)

Module 2: Venting, Suppression, and Inerting Systems (09:45 – 11:15)

Module 3: Fire and Explosion Modeling Tools (11:30 – 01:00)

Module 4: Group Exercise – Analyze an Explosion Scenario (02:00 – 03:30)

Day 5: Incident Response, Investigation & Review

Module 1: Scene Safety and Immediate Control Measures (07:30 – 09:30)

Module 2: Fire & Explosion Investigation Principles (09:45 – 11:15)

Module 3: Risk Mitigation Planning for Fire/Explosion Events (11:30 – 01:00)

Module 4: Final Assessment, Case Review, and Wrap-up (02:00 – 03:30)

Certification

Participants will be awarded a **Certificate of Completion – Principles of Fire & Explosion (Fire Behaviour)** indicating 35 contact hours of advanced fire science and explosion risk training.

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