Liquefied Natural Gas Plant Safety Training Course: Vapour Cloud, Fire and Cold Spill Risk

6 – 17 December 2026
Doha

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Programme Summary

Liquefied natural gas plant safety, or LNG plant safety, is the subject of this two-week training course for senior health and safety, process safety and operations leaders, ending in a facility hazard review pack for one LNG site. Vapour clouds, fires and cold spills can each escalate a small release into a site event, yet hazard studies are often accepted without being challenged. The programme builds a method for reading release scenarios, consequence results and safeguards critically. Mars Training Centre UK delivers this programme on LNG plant safety to mixed-organisation cohorts.

The Business Case

An LNG site holds a large inventory of cold liquid and flammable vapour, and its safety rests on assumptions made in a hazard study years earlier. Where LNG plant safety is judged from a summary table, weak release cases, crowded layouts and untested safeguards remain hidden. Leaders who can question scenarios, spacing and barrier performance direct investment to the risks that matter and answer boards, insurers and operators with evidence.

- Major Accident Exposure: Falls as release, explosion and fire scenarios are reviewed against site layout.
- Safeguard Reliability: Improves as barriers are tested for performance, not only for existence.
- Emergency Readiness: Improves as response plans are tied to credible scenarios.

Principles and Evidence Base

- ISO 16901: Guidance on risk assessment in the design of onshore LNG installations frames the scenario and siting work in Sessions 2 and 7.
- ISO 31000: Risk management guidelines structure the risk reasoning and acceptance statement in Session 7.
- Bow-tie analysis: Linking causes, top events and consequences shows where barriers act in Sessions 7 and 8.
- Layers of protection: Counting independent safeguards guides the barrier review in Session 8.

Intended Participants

- Process safety leaders who own hazard studies and risk registers.
- Operations managers who run LNG storage, loading and processing areas.
- Health and safety leaders who set emergency and control standards.
- Engineering managers who approve layout, spacing and safeguard changes.
- Assurance leaders who audit facility hazard studies.

Typical functions include process safety, operations, engineering and assurance teams in LNG terminals, gas processing plants and shipping organisations.

Learning Outcomes

1. Participants will be able to evaluate credible release scenarios for LNG storage, transfer and processing.
2. Participants will be able to construct a dispersion and consequence picture for a vapour release.
3. Participants will be able to diagnose gas explosion and fire hazards from layout and congestion.
4. Participants will be able to assess cold spill and rapid phase transition risk to people and materials.
5. Participants will be able to prioritise safeguards using bow-tie and layers of protection reasoning.
6. Participants will be able to justify the findings of a facility hazard review to senior management.

Programme Structure

Day 1: LNG Plant Safety and Hazard Properties

Which properties of LNG and its vapour decide how a release behaves?

- LNG Property and Behaviour Sheet
- Boil-Off and Flash Gas Balance
- Hazard Inventory Register
- Flammability Range Chart
- Release Scenario Catalogue

Day 2: Release Sources and Loss of Containment

Where can liquid and vapour escape, and how large can a release be?

- Equipment Leak Frequency Review
- Transfer Arm and Hose Failure Review
- Tank and Pipework Release Matrix
- Release Rate Estimation Sheet
- Isolation and Inventory Map

Day 3: Vapour Cloud Dispersion

How far and how long does a cold vapour cloud travel?

- Dense Gas Dispersion Chart
- Weather Condition Matrix
- Flammable Cloud Extent Plot
- Terrain and Obstruction Review
- Gas Detection Coverage Map

Day 4: Gas Explosion Mechanisms

What turns a flammable cloud into damaging overpressure?

- Congestion and Confinement Survey
- Overpressure Consequence Curve
- Deflagration and Detonation Comparison
- Blast Load Screening Table
- Explosion Mitigation Options List

Day 5: Pool, Jet and Flash Fire Hazards

How do thermal radiation and fire duration affect people and plant?

- Pool Fire Radiation Estimate
- Jet Fire Impingement Check
- Flash Fire Extent Sketch
- Thermal Dose Tolerance Table
- Passive Fire Protection Review

Day 6: Cryogenic Hazards and Rapid Phase Transition

What harm does a cold spill cause beyond fire?

- Brittle Fracture Screening List
- Cold Spill Containment Review
- Rapid Phase Transition Case Study
- Cold Burn Exposure Guide
- Material Suitability Matrix

Day 7: Risk Assessment and Siting

How are hazards turned into risk and used to place and space plant?

- Bow-Tie Diagram
- Layers of Protection Worksheet
- Individual and Societal Risk Plot
- Siting and Spacing Review
- Risk Acceptance Criteria Statement

Day 8: Detection, Isolation and Barrier Performance

Which safeguards work when needed, and how is that shown?

- Detector Voting Logic Review
- Emergency Shutdown Cause and Effect Chart
- Safety Instrumented Function Check
- Spill and Vapour Control Layout
- Barrier Health Dashboard

Day 9: Emergency Response and Escalation

How does the site act in the first minutes of a release?

- Emergency Scenario Playbook
- Muster and Evacuation Map
- Command and Escalation Chart
- Drill Evaluation Form
- Offsite Consequence Briefing Note

Day 10: Applying the Tools to One LNG Facility

Do the hazard, risk and safeguard tools support one defensible review?

- Applying the Session 3 Flammable Cloud Extent Plot
- Using the Session 4 Overpressure Consequence Curve
- Testing the Session 7 Bow-Tie Diagram
- Checking the Session 8 Barrier Health Dashboard
- Completing the Facility Hazard Review Pack

Methodology

The programme uses a case analysis method built on anonymised release scenarios, layout drawings, consequence results and incident reviews from LNG terminals, gas plants and shipping operations. Participants work in peer groups on a shared facility, challenge each other's assumptions and receive written facilitator feedback. Each exercise set uses a common template so conclusions can be compared across the group.

- Suggested activity: Tracing a small leak to the worst credible outcome and naming each barrier.
- Suggested activity: Marking congested areas on a layout and ranking them for explosion risk.
- Suggested activity: Reviewing a bow-tie diagram and finding a barrier that is not independent.

Capstone Output

Each participant completes a facility hazard review pack for one LNG site. It holds a release scenario catalogue, a flammable cloud extent plot, an overpressure consequence curve, a bow-tie diagram, a barrier health dashboard and a list of findings. The pack is used at work to challenge hazard studies, brief senior management and plan safeguard improvements.

Frequently Asked Questions

Is LNG plant safety suitable for leaders who are not process safety specialists?

Yes. LNG plant safety assumes some operations, engineering or safety experience and builds scenario and barrier review skills step by step, without calculation software.

Which standards does LNG plant safety rest on?

LNG plant safety rests on ISO 16901 for risk assessment of onshore installations and ISO 31000 for risk management, with bow-tie analysis and layers of protection.

How is the pack from LNG plant safety used at work?

You use the facility hazard review pack to challenge hazard studies, brief senior management and plan safeguard improvements.

How does LNG plant safety differ from general oil and gas safety training?

LNG plant safety centres on cold liquid, dense vapour clouds and cryogenic effects, while general oil and gas safety training centres on broader site rules and permits.