

# **Process Safety Management - Operations**

Training Standard & Endorsement Guidelines

**Approved Version 1.0**

March 2013



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## Document History

This document is a controlled document maintained by Cogent. Future revisions will be recorded below with revision details and date of revision.

No	Revision Details	Author	Checked	Approved
1	Approved Draft Version 18.12.2012	Phil Bather		PSMO Expert Team
2	Peer reviewed 1.3.2013		Roxana Lawton	
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# Cogent Industry Training Standard

## Introduction

Process safety is a blend of engineering and management competencies with a clear focus on preventing accidents – particularly loss of containment, explosions and fires which are potential risks associated with the use of hazardous substances if these are not properly managed.

Employers in major hazard industries need to provide a clear demonstration of competence in process safety management throughout the organisation.

Cogent Industry Training Standards have been developed with employers to identify the knowledge, understanding, skills and behaviours needed for effective training to take place. The Process Safety Management training standards themselves form part of the Gold Standard competency framework, which provides a skills benchmark for world class performance for the process industries.



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## Expert Panel Members

The content of this document has been developed by an industry working group co-ordinated by Cogent Sector Skills Council and chaired by the Chemical Industries Association (CIA). Members of the Expert Panel include;

- ABB Engineering Services Ltd
- Apex Process Safety
- Briar Chemicals
- Chemical Industries Association (CIA)
- Cogent SSC
- Croda International
- Dow Chemicals
- E.On Energy
- Health and Safety Executive (HSE)
- HFL Risk Services Ltd
- Hudson Consultancy
- Institution of Chemical Engineers
- Johnson Matthey
- Murphy Oil
- NuStar Energy
- Pentagon
- RTS Training
- Shell UK
- Solvay
- Syngenta
- UM Storage
- United Kingdom Petroleum Industry Association (UKPIA)
- Unite the Union



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## Cogent Industry Training Standard

### Process Safety Management - Operations

#### Aim and Purpose

To provide a clear understanding of the principles of process safety management within operations.

#### Audience

Process Safety Management training is aimed at all levels of staff throughout an organisation from board level to operational staff. This training standard is appropriate to all staff who operate or maintain plant and may have an impact on process safety.

#### Process Safety Management

Process safety management is a system for identifying and assessing risks relating to process hazards, and the implementation of measures for the prevention, control and mitigation of major accidents.

It requires a clear understanding of major accident risks and the safety critical equipment and operational practices designed to control them.

#### Learning Objectives

*The learner will:*

1. Understand the meaning and importance of process safety management
2. Understand the hazards, risks and consequences associated with hazardous substances and processes
3. Understand the hazards, consequences and safeguards in the specific process or plant you operate or maintain
4. Keeping the process safe - the role of operations (Operator & Maintenance) in ensuring effective process safety
5. Emergency planning and the need for effective measures to limit the consequences of process incidents



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6. Understand the role of Operations in applying learning from incidents and near misses
  7. Understand the concept of continual improvement in process safety performance, and Operations role in this

### **Assessment Methodology**

The purpose of assessment is to ensure that effective learning has taken place. Assessment of the candidates' performance will be against the stated learning objectives and will involve structured assessment. An analysis of the candidate's performance will be conducted to help identify areas for further development.

The assessment process will be defined by National Skills Academy who will carry out regular audits to ensure that it is being correctly and fairly administered by each training provider.

The assessment process will:

- Be fair and clear for those undertaking it
- Explain clearly the standards for satisfactory completion of the module
- Be consistent and transparent in its marking
- Be open to audit by the National Skills Academy or its appointed body.

Training providers are required to keep an accurate and detailed record of attendance.

### **Training Delivery Time**

There are no guided learning hours for accreditation purposes for this standard but it is recommended that the minimum delivery time will be 12 hours. This will include plant specific training on the learner's own plant/process. Overall delivery time may differ depending on the format, venue and mode of training.



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## Resources

There are no specified resources for this training standard. Providers are expected to use appropriate resources to help deliver the learning objectives. Resources may be made available through the National Skills Academy for Process Industries Approved Providers.

### *Staffing:*

Trainers/ facilitators will be required to demonstrate evidence of the following:

- Appropriate qualifications and competencies to conduct the training
- Relevant experience of working within a process safety management role
- Training in instructional/ lecturing techniques and/or have proven instructing/teaching experience
- Maintenance of professional development keeping awareness and skills up to date.

## Other Details

### *Recommended pre-reading:*

Each provider will specify appropriate pre course reading.



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## Endorsement Guidelines

### 1. Understand the meaning and importance of process safety management

- Outline the importance and key requirements of process safety management
- Explain the difference between occupational safety and process safety
- Summarise significant major accident events.
- Outline the recurring root cause failures of these accidents that highlight the key issues associated with effective process safety management.
- Overview of Process Safety Leadership including the PSLG Principles of Process Safety Leadership.
- Summarise relevant health, safety and environmental legislation and other requirements (COMAH Regulations, guidance and standards). Explain the background to legislation and key individual legal responsibilities.
- Explain the need for an integrated, complete process safety management system to be in place (e.g. CCPS Risk Based Process Safety, Energy Institute High Level Framework for Process Safety Management).
- Explain the implications of process safety management on the complete lifecycle of the plant from design to decommissioning.
- Explain the distinction between prevention, control and mitigation of process safety incidents.

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## 2. Understand the hazards, risks and consequences associated with hazardous substances and processes

- Describe the typical properties of hazardous substances – chemically reactive, flammable, explosive, toxic, dangerous for the environment etc.
- Describe the types of major accidents and consequences – runaway reaction, vessel explosion, flammable leak and fire/explosion, toxic gas leak – leading to fatalities and injuries, environmental harm, property destruction and business loss.
- Describe the main initiators/causes of major accidents including corrosion; impact; incorrect installation; incorrect maintenance and mal-operation.
- Explain the integrated nature of process safety management and how major accidents are prevented (e.g. with reference to the process safety lifecycle model). Illustrate how all the elements fit together emphasising where employees have key roles and responsibilities, using examples from;
  - Hazard identification and risk assessment, including the importance of involving frontline staff in risk assessment.
  - Design (engineering and operational measures to prevent, control and mitigate major accidents), the hierarchy of risk control, including inherent safety and an explanation of risk reduction and ALARP.
  - Construction and installation, including commissioning, control of work and handover, pre-start up safety assurance.
  - Operation, including procedures, training, process safety essentials, shift handover and safety routines.
  - Inspection and maintenance, including plant care, safety critical trips and alarms, piping and equipment integrity, and permit-to-work systems.
  - Emergency response, including the importance of tailoring training and practise to relevant scenarios to protect employees, members of the public, the environment and the business.

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- Verification, including PSPIs, supervision & monitoring, audit, employee feedback to Process Safety leaders.
  - Lessons learned and constant improvement from incident investigation.
  - Training and competency, including process safety essentials.
  - Management of change – plant, process, materials and organisation. The importance of revisiting the hazard assessment and risk controls to ensure continued safe operation.
  - Occupied buildings for example panel/control rooms.

### **3. Understand the hazards, consequences and safeguards in the specific process or plant you operate or maintain**

- The nature of the process safety hazards for the plant which may include loss of containment, fire and explosion, toxic exposure and chemical reaction hazards.
- Engineering safeguards e.g. hard wired trips, pressure relief systems, process control systems.
- Operational safeguards including adherence to operating procedures and safe systems of work, standards of isolations, elimination of sources of ignition e.g. through electrostatic earthing, manual control of safety critical tasks.
- Explain the potential impact of major accident hazards on people, environment and the business, both on and off site.

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#### 4. Keeping the process safe - the role of operations (Operator & Maintenance) in ensuring effective process safety

- Explain the concept of prevention, control and mitigation using multiple independent layers of protection provided by:
  - Plant (e.g. hard wired trips, pressure relief, bunds etc.).
  - Process (management of change, permit-to-work, safety critical procedures etc.).
  - People (e.g. competency, accountability, supervision, human factors, communications etc.).
- Explain the importance of ensuring all protective barriers/layers of protection remain effective through:
  - Carrying out routine plant checks and reporting any hazards and defects.
  - Dealing with and preventing minor defects/events from escalating.
  - Taking proper actions in the event of alarms and abnormal events.
  - Adhering to safety critical procedures e.g. permit-to-work, management of change.
  - Working within limits of responsibility e.g. when to stop the job, shutdown the plant or when to refer to your supervisor/line manager.
  - Being vigilant in identifying small leaks, vibration, visual evidence of corrosion, damage to support structures etc.
  - Providing accurate information between operations, maintenance and management etc.
- Explain where are the highest risks including start up, shut down, deviations from the safe operating envelope; non-standard operations; intrusive maintenance and plant handover.
- Explain the importance of situational awareness and communication, proactive monitoring and control, defined proper limits, managing alarms and alerts, managing abnormal situations.
- The importance of a formal and comprehensive shift handover.

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## 5. Emergency planning and the need for effective measures to limit the consequences of process incidents

- Explain the role of operations staff in responding to and dealing with incidents:
  - Provide examples of loss of containment, over pressure of vessel, toxic gas leak, flammable leak, vessel explosions, environmental discharge/abatement and preventative emergency responses.
- Explain the importance of exercises (targeted on the high risk scenarios)
- Explain the role of operational staff in regular exercises of mitigating potential incident scenarios.
- Explain the need for operations and individuals to understand their role in the on-site and off-site emergency plans.
- Explain the importance of maintaining the effectiveness of emergency response equipment.

## 6. Understand the role of Operations in applying learning from incidents and near misses

- Explain the value of capturing process safety near-misses and the key role of operations staff in reporting them. Use examples to demonstrate the difference between occupational and process safety incidents.
- Discuss the benefits of an open culture in promoting the reporting of incidents and near misses.
- Describe basic investigation and root cause techniques and the importance of involving operations staff in investigations.
- Describe the importance in operations staff receiving feedback from near miss reports or incident investigations.
- Discuss some relevant case studies of actual incidents /near-misses from within the company, across the industry, and from other sectors (e.g. Texas City, Buncefield, Herald of Free Enterprise). Use example of incidents where lessons have not been learnt.

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## 7. Understand the concept of continual improvement in process safety performance, and Operations role in this

- Explain the concept that major accidents are rare events but there are numerous less serious pre-cursor events, and measuring and learning from these provides opportunities to prevent major incidents.
- Explain the value of measuring process safety performance.
- Explain the verification methods used to assure effective process safety performance that prevent and limit major accidents, including (with examples):
  - Process Safety Performance Indicators
  - Supervision and monitoring
  - Audit
- Explain the value of communicating and providing proactive input and feedback to management and the importance of positive involvement in process safety improvement plans.

### Glossary of Abbreviations

- **PSLG** – Process Safety Leadership Group
- **COMAH** – Control of Major Accident Hazards
- **CCPS** – Center for Chemical Process Safety
- **ALARP** – As Low As Reasonably Practicable

Title	
<b>Summary of PSM – Operations Standard</b>	
<b>Course Details</b>	
<b>Aim &amp; Purpose</b>	
To provide a clear understanding of the principles of process safety management across an organisation and how the resulting measures are used in operations to maintain safe conditions of plant and equipment.	
<b>Learning outcomes</b>	
The candidate will:	Assessment Criteria
1. Understand the meaning and importance of process safety management	a)
2. Understand the hazards, risks and consequences associated with hazardous substances and processes	b)
3. Understand the hazards, consequences and safeguards in the specific process or plant you operate or maintain	c)
4. Keeping the process safe – the role of operations (operators & maintenance) in ensuring effective process safety	d)
5. Emergency planning and the need for effective measures to limit the consequences of process incidents.	e)
6. Understand the role of Operations in applying learning from incidents and near misses	f)
7. Understand the concept of continual improvement in process safety performance, and Operations role in this	g)
<b>Additional information about this unit</b>	
<b>Assessment methodology</b>	<p>The purpose of assessment is to ensure that effective learning has taken place. Assessment of the candidates' performance will be against the stated learning objectives and will involve structured assessment.</p> <p>A common criterion for success should be applied to the assessment of the standard. The agreed criterion for success applies with the following conditions:</p>

	<ul style="list-style-type: none"> <li>• Candidates achieving 100% on the assessment are considered to have met the Process Safety Management Foundations Training Standard in full.</li> <li>• Candidates achieving 80% or more are considered to have met the Process Safety Management Foundations Training Standard only after appropriate coaching or reassessment of the areas not yet achieved.</li> <li>• Candidates achieving less than 80% are considered not to have met the Process Safety Management Foundations Training Standard and may require additional continuous professional development.</li> </ul> <p>The assessment process will:</p> <ul style="list-style-type: none"> <li>• Be fair and clear for those undertaking it</li> <li>• Explain clearly the standards for satisfactory completion of the module</li> <li>• Be consistent and transparent in its marking</li> <li>• Be open to audit by the National Skills Academy or its appointed body.</li> </ul> <p>Training providers are required to keep an accurate and detailed record of attendance.</p>
Endorsement notes or Guidelines	Note describing the training delivery requirements by training provider or internal company trainer to ensure all delivery material and methods comply to the standard
Training Delivery Time	There are no guided learning hours for this standard but it is recommended that the minimum delivery time will be 12 hours over 2 days.
Resources	Videos/ DVDs of major hazard accidents: (suggested resources) There are no specified resources for this training standard. Providers are expected to use appropriate resources to help deliver the learning objectives.
Validation Period	The duration the trained person is deemed competent, typically 12, 24 or 36 months before a refresher is required. Note the refresher may in some cases be shortened version of the initial training
Other Details	<p><i>Staffing:</i></p> <p>Trainers/ facilitators will be required to demonstrate evidence of the following:</p> <ul style="list-style-type: none"> <li>- Appropriate qualifications and competencies to conduct the training</li> <li>- Relevant experience of working within a process safety management role</li> <li>- Training in instructional/ lecturing techniques and/or have proven</li> </ul>





	<p>instructing/teaching experience</p> <ul style="list-style-type: none"><li>- Maintenance of professional development keeping awareness and skills up to date.</li></ul>
Approval & Review	This document should show the approver, date of approval and when the next review of the document is planned