Param Qualifications Level7 International Diploma in Process Safety Management (PSM)

Specification (For Centres)

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About Param Qualifications

Param Qualifications provides academic and vocational qualifications that are designed to meet international professional standards and industry needs. Our commitment to the creation and awarding of respected qualifications is based on maintaining high standards, consistency, and quality across all programmes.

Param Qualifications qualifications are developed to be accessible to all learners who are capable of achieving the required standards. We promote equality and diversity across every stage of the qualification process, ensuring learners are free from barriers that may restrict access or progression.

Centres delivering our qualifications are required to implement fair and transparent policies, provide appropriate learner support, and ensure that all assessment decisions are valid, reliable, and consistent. Param Qualifications also requires centres to recognise prior learning where relevant, enabling learners' previous knowledge, skills, and experience to be taken into account when accessing our qualifications.

Param Qualifications maintains a strong duty of care towards learners, employers, and partners by implementing robust quality assurance processes. These processes safeguard the outcome of assessments, support continuous improvement, and ensure that the qualifications remain relevant, credible, and aligned with current industry practices.

Supporting Diversity

Param Qualifications and its partners value individual differences and are committed to promoting equality, diversity, and inclusion. We aim to remove barriers to learning and ensure fair access for all learners regardless of age, gender, disability, religion, cultural background, or other characteristics.

Learner Voice

Learners are at the heart of Param Qualifications's quality improvement process. We actively encourage feedback to ensure that teaching, learning, and assessment remain effective, relevant, and responsive to learner needs.

Feedback is gathered through structured surveys, evaluations, and discussions between learners, tutors, and centre staff. This enables Param Qualifications to identify areas for enhancement, celebrate good practice, and continually raise standards.

By providing opportunities for learners to express their views and experiences, we ensure that every qualification reflects the expectations of those who study it and supports a positive and engaging learning journey.

Contents

1. Introduction

1.1 Why Choose Param Qualifications Qualifications?

Param Qualifications qualifications are designed to provide learners with meaningful opportunities for professional and career development. They support learners in reaching their potential and offer clear objectives that help them progress with confidence.

The objectives of this qualification are to:

- Provide career pathway support for learners who wish to develop advanced technical, leadership, and management skills in process safety management.
- Enhance learner understanding of high-hazard industrial environments, organisational safety systems, and how they are managed and improved.
- Develop the knowledge and abilities required to ensure safety assurance, compliance, and professional recognition in process industries.

Param Qualifications programmes offer a balanced mix of theoretical knowledge and practical application. Learners will gain insight into how organisations operating in high-risk sectors manage hazards, implement safety systems, and maintain resilience in complex and changing environments.

Through this qualification, learners will develop the ability to:

- Apply advanced analytical and evaluative techniques in process safety.
- Investigate issues and opportunities within process industries and high-hazard operations.
- Build awareness and appreciation of managerial, organisational, and ethical responsibilities.
- Use process safety management practices in innovative and effective ways.
- Make effective use of information from diverse technical and organisational sources.
- Develop creativity and problem-solving skills to address complex safety challenges.
- Exercise judgement, take responsibility for decisions, and lead with accountability in high-risk environments.
- Reflect on personal learning and improve transferable skills including leadership, communication, and critical thinking.

1.2 Employer Support for the Qualification Development

The development of this qualification has been guided by consultation with a wide range of employers, industry practitioners, and training providers. Their contributions have ensured that the programme content is practical, current, and aligned with global workforce requirements.

Feedback from employers during the design process confirmed the demand for highly skilled professionals who can provide leadership in process safety, ensure compliance with regulations, and foster strong safety cultures in high-hazard industries. This qualification reflects that demand and equips learners with the skills and knowledge to address these needs effectively.

1.3 Qualification Title

This programme is titled:
Param Qualifications Level 7 International Diploma in Process Safety Management (PSM)

This qualification is positioned at Level 7, reflecting advanced knowledge, analytical ability, and strategic leadership skills in the field of process safety. It is designed to prepare learners for senior professional roles in high-risk industries as well as for further academic study.

Each unit within the qualification carries a defined credit value and is aligned with international standards for postgraduate-level study. Upon successful completion, learners will be awarded the full diploma certificate by Param Qualifications Limited. This qualification has been designed to meet **Condition A1** of Ofqual's General Conditions of Recognition. It ensures validity, reliability, comparability, manageability, and minimisations of bias in all aspects of delivery and assessment.

1.4 Awarding Organisation

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2. Qualification Purpose, Rationale, Aims and Outcomes

2.1 Qualification Purpose

The Level 7 International Diploma in Process Safety Management (PSM) is designed for professionals currently employed in, or aspiring to, leadership roles in high-hazard industries such as oil and gas, chemical processing, power generation, and manufacturing. It is intended for learners who are responsible for planning, developing, and applying advanced process safety systems and risk management practices within their organisations.

This qualification equips learners with the expertise required to pursue senior careers in process safety management and also provides a strong foundation for progression into postgraduate study.

We expect centres and learners to gain significant benefits from this programme, acquiring both advanced knowledge and practical skills. The qualification aims to promote professional and academic development so that learners can realise their own potential while contributing to safer operations, organisational resilience, and higher industry standards.

The purpose of this qualification is aligned to the RQF Level 7 descriptors. Learners will develop highly specialised, advanced knowledge with critical awareness of current problems and new insights, as well as the ability to apply originality in problem-solving and decision-making within complex and unpredictable contexts.

2.2 Rationale for the Diploma

The rationale of the programme is to provide a clear career pathway for learners who wish to develop advanced practice and leadership capabilities within the field of process safety. The expected outcome of the Diploma is that learners will develop the strategic skills and applied knowledge required by employers and industry worldwide.
This qualification will:

- Prepare learners for senior employment roles in process safety and risk management.
- Support responsibilities within high-hazard workplaces, including leadership, compliance, emergency response, and safety culture development.

The qualification is well-suited to part-time learners who are working in industry, as well as to full-time learners who may engage in work placements or part-time employment. Successful learners can progress into or within senior-level employment in process safety, reliability, and risk management fields.

2.3 Overall Aims of the Diploma

The Level 7 International Diploma in Process Safety Management requires learners to evaluate advanced safety standards, risk control strategies, regulatory frameworks, and organisational culture in high-risk sectors.

By critically analysing process safety management practices, learners will assess how technical systems, human factors, and leadership approaches influence an organisation's ability to prevent major incidents and manage hazards.

The qualification also develops a range of executive-level skills, including strategic decision-making, research, and analytical ability. It prepares learners to address complex challenges in process safety and to lead organisational change effectively.

The Param Qualifications Level 7 International Diploma in Process Safety Management aims to give learners the opportunity to:

1. Achieve a recognised qualification that demonstrates advanced competence in process safety management.
2. Study a curriculum aligned with current industry practices and global process safety needs.
3. Develop new technical and leadership skills that can be applied immediately in professional settings.
4. Prepare for senior-level management roles through personal and professional growth.
5. Gain assessments evaluated by qualified professionals with relevant practical and academic expertise.
6. Progress along pathways to higher-level qualifications or professional recognition in process safety and risk management.

2.4 Learning Outcomes

The overall learning outcomes of the Diploma are to:

1. Apply and critique advanced process safety management frameworks and models.
2. Evaluate the role of strategic leadership in fostering process safety culture across organisations.
3. Analyse the influence of organisational, cultural, and human factors on process safety performance.
4. Apply principles of hazard identification, quantitative and qualitative risk assessment, and incident prevention.

5. Investigate and assess major process safety incidents using recognised methodologies and root cause analysis.
6. Manage strategic risks in high-hazard industries at an organisational level.
7. Examine the impact of new technologies, including Artificial Intelligence (AI), data analytics, and digital monitoring tools, on process safety management.
8. Assess approaches to competence development, workforce engagement, and continuous improvement in process safety.

These outcomes reflect the expectations of a Level 7 programme. Specific learning outcomes for each unit are provided in Appendix 1 within the unit descriptors.

3. Delivering the Qualification

3.1 Quality Assurance Arrangements

All centres wishing to deliver Param Qualifications qualifications must go through an application and approval process to become recognised centres. Centres are required to have suitably qualified and experienced tutors whose expertise enables them to provide effective learner support.

Centres must also commit to working with Param Qualifications's quality team and comply with the internal and external quality assurance procedures set out by Param Qualifications. Tutors, assessors, and internal verifiers are expected to maintain ongoing professional development (CPD) to ensure their knowledge and practice remain current.

Approved centres will be subject to regular monitoring and review to ensure that learners are provided with appropriate opportunities, guidance, and support. Centres are required to maintain clear assessment plans, which will be reviewed for suitability and compliance with Param Qualifications's quality standards.

Param Qualifications also provides guidance on assessment integrity, including measures to prevent plagiarism and collusion.

Trainer Requirements

- Trainers must be appropriately qualified and occupationally competent in the areas in which they deliver.
- A minimum of 4 years' experience in process safety, chemical engineering, or related high-hazard industries is required.
- Trainers should hold a relevant degree in engineering, safety management, chemical/process disciplines, or equivalent.
- Trainers are expected to hold a recognised teaching qualification (e.g., Level 3 Award in Education and Training or equivalent).

Assessor/Examiner Requirements

- Assessors must be qualified and occupationally competent in the field they assess.
- A minimum of 5 years' experience in process safety management, risk engineering, or related professional practice is required.

- Assessors must hold a recognised teaching/assessment qualification (e.g., Level 3 Award in Education and Training or equivalent).
- Membership in a relevant professional body (e.g., IOSH, or equivalent) is desirable.

Internal Verifier/Moderator Requirements

- Internal verifiers must be qualified and occupationally competent in the areas they verify.
- A minimum of 4 years' experience in process safety or quality assurance practice in high-hazard sectors is required.
- They must hold, or be working towards, a Level 4 Award/Certificate in Internal Quality Assurance of Assessment Processes and Practice (or equivalent).
- Internal verifiers must also demonstrate evidence of recent CPD in process safety or quality assurance.

Assessors must hold a recognised assessor qualification (such as CAVA or equivalent), Internal Quality Assurers must hold (or be working towards) a Level 4 Award in the Internal Quality Assurance of Assessment Processes and Practice, and External Quality Assurers will be standardised annually with CPD logged to ensure consistency across centres.

3.2 Access to Study

Learners should be given an induction at the start of the programme to introduce them to the qualification structure, learning expectations, and assessment requirements. They should receive a handbook, timetable, and access to their assigned tutor.

Centres are responsible for carefully assessing each learner to ensure they are enrolled onto the right qualification and units that match their abilities and career goals. Learners must also be provided with accurate information about the qualification, delivery mode, and assessment requirements.

Centres must ensure learners have access to appropriate advice, guidance, and resources to support their studies effectively.

3.3 Entry Criteria

This qualification is designed to be accessible and flexible, while maintaining standards of academic and professional rigour. Learners will normally be expected to hold one of the following:

- A Bachelor's degree in process safety, chemical engineering, occupational health & safety, or a related discipline; or
- A Master's degree in a relevant discipline; or
- A Level 6 Diploma (or equivalent qualification) in a related field; or
- A minimum of 3 years' relevant work experience in process safety, engineering, manufacturing, or related high-hazard industry roles.

In exceptional circumstances, learners without formal qualifications but with significant professional experience may be admitted, subject to a successful interview and demonstration of their ability to meet the demands of the programme.

4. Structure of the Qualification

4.1 Units, Credits and Total Qualification Time (TQT)

The Param Qualifications Level 7 International Diploma in Process Safety Management (PSM) is a postgraduate-level qualification consisting of 8 mandatory units, carrying a total of 120 credits and requiring approximately 1,200 hours of Total Qualification Time (TQT).
The qualification has been designed from a learning-time perspective. TQT represents the total time that a learner is expected to spend in order to achieve the required standard for the award. This includes a combination of:

- Guided Learning Hours (GLH)
- Directed independent study
- Work-based learning
- Assessment activities

Total Qualification Time (TQT) may include activities such as:

- Guided classroom learning
- Independent research and unsupervised study
- Portfolio development or project work
- Online and blended learning activities
- Preparation for and completion of assessments
- Work-based application of knowledge and skills

Guided Learning Hours (GLH) are defined as the time when a tutor, trainer, or assessor is present to provide specific guidance towards the learning outcomes. This includes:

- Classroom-based delivery under the supervision of a tutor
- Work-based sessions supervised by a trainer or mentor
- Live webinars or tutorials delivered in real time
- E-learning sessions supervised by a tutor
- All forms of assessment conducted under direct supervision, such as examinations, observed practice, or structured assessments

The balance of TQT and GLH ensures that learners develop both theoretical knowledge and applied professional competence suitable for Level 7 study.

4.2 Qualification Structure

The Param Qualifications Level 7 International Diploma in Process Safety Management (PSM) is made up of 8 mandatory units. Each unit contributes equally to the overall qualification.

Unit Reference	Mandatory Units	Level	TQT	Credits	GLH
PSM701	Fundamentals of Process Safety Management	7	150	15	60
PSM702	Process Hazard Identification and Risk Assessment	7	150	15	60
PSM703	Safety Integrity, Reliability and Control Systems	7	150	15	60
PSM704	Emergency Response and Crisis Management	7	150	15	60
PSM705	Process Safety Leadership, Culture and Ethics	7	150	15	60
PSM706	Regulatory Compliance and Industry Standards	7	150	15	60
PSM707	Incident Investigation and Root Cause Analysis	7	150	15	60
PSM708	Advanced Process Safety Analytics and Artificial Intelligence	7	150	15	60

Total = 120 credits, 1200 TQT, 480 GLH

4.3 Progression and Links to Other Programmes

Learners completing the Param Qualifications Level 7 International Diploma in Process Safety Management (PSM) can progress to:

- Further study at postgraduate level (e.g., Master's degree, MBA, or specialised professional programmes in engineering, safety, or risk management).
- Professional recognition and membership with relevant professional bodies (where eligibility criteria are met, e.g., IChemE, IOSH, IIRSM).
- Senior-level employment in process safety management, reliability engineering, consultancy, or strategic leadership roles across high-hazard industries.

This qualification therefore acts as both a career-enhancing award and a strong academic foundation for advanced study. Successful learners may also be eligible for professional recognition routes (e.g., IOSH, IIRSM, IChemE, IEMA), and may progress to academic top-up routes such as MSc or MBA programmes.

4.4 Recognition of Prior Learning (RPL)

Recognition of Prior Learning (RPL) is a method of assessment that considers whether learners can demonstrate achievement of learning outcomes through existing knowledge, understanding, or skills they already possess. This means learners may not need to repeat learning they have already successfully achieved.

Param Qualifications encourages centres to recognise prior achievements and experiences, whether gained through employment, training, self-study, or previous formal qualifications. RPL provides an alternative pathway that values continuous learning and ensures fairness for all learners.

RPL can be applied where valid evidence demonstrates that the assessment requirements of a unit or qualification have been fully met. Accepted forms of evidence may include workplace documents, prior qualifications, project reports, reflective accounts, or direct observation.

All evidence used for RPL must be:

- Valid – directly linked to the learning outcomes.
- Authentic – produced by the learner.
- Sufficient – enough to meet the full requirements.
- Reliable – capable of being verified.

Centres must apply Param Qualifications's RPL policy consistently to ensure that learners are given fair and equal opportunity to use their previous learning towards achievement of this qualification.

5. Guidance to Teaching and Learning

To ensure consistency and quality of delivery across centres, Param Qualifications requires centres to implement a set of policies and procedures that safeguard the learning experience and maintain high standards. These include:

- Ensuring staff have the appropriate expertise and qualifications.
- Using effective and varied learning and teaching methods.
- Supporting the development of study skills at postgraduate level.
- Providing access to appropriate and up-to-date learning resources.
- Encouraging personal development planning as part of the learning process.
- Offering guidance on career opportunities and progression pathways.

All centres approved to deliver Param Qualifications qualifications must apply these standards and are expected to embed them fully into their delivery and support systems.

6. Learner Support

Centres delivering this qualification must provide continuous support to learners, ensuring they are encouraged and guided throughout their studies. To maintain consistency and quality of delivery, centres are expected to apply the following support principles:

- Making reasonable adjustments to support learners with disabilities or additional needs.
- Ensuring a safe and healthy learning environment.
- Promoting appropriate learner conduct and engagement.
- Providing progression advice to help learners plan their next steps.

Centres must ensure that these support measures are clearly communicated to learners and consistently applied.

6.1 Data Protection

All personal information collected from learners during the course of study will be held securely and used only for legitimate educational purposes. Information may be used during study and retained after learners complete their programme for purposes such as certification, verification, and quality assurance.

During enrolment, centres must explain clearly how learner data will be used, stored, and protected. Learners should also be made aware of their rights under applicable data protection laws.
Param Qualifications and its centres are committed to handling personal information responsibly, ensuring confidentiality, and complying with relevant data protection regulations.

For further clarification on data protection practices, learners should contact their centre administrator or reach out to Param Qualifications through official communication channels.

7. Assessment

This qualification is vocational in nature and is designed to support a learner's professional and career progression. To meet Param Qualifications's standards for appropriate assessment, each unit will be assessed through tasks that reflect realistic, work-related scenarios wherever possible.

Learners will be required to demonstrate:

- Knowledge and understanding of advanced process safety management principles.
- The ability to apply original thought and critical analysis.
- Practical problem-solving skills and justified recommendations for action.

Assignments will be structured to address each unit's Learning Outcomes (LOs) and Assessment Criteria (ACs). Within these assignments, learners will also be expected to engage with relevant theories and concepts that underpin process safety practice.

Learners will be encouraged to use real organisational examples in their work. Mature and part-time learners may also draw upon their own professional experiences.

Sample assessment briefs and marking guidance will be developed and shared with centres upon approval as part of this qualification specification. All assessments are designed to be fair, transparent, and accessible, with reasonable adjustments applied in line with the Equality Act 2010 and Param Qualifications' Equality & Diversity Policy.

8. Course Regulations

8.1 Course Requirements

Learners must successfully complete all eight mandatory units and achieve the required pass standard to be awarded the full diploma. Certificates will be issued to all successful learners through their approved Param Qualifications centre.

8.2 Classification of Awards

This qualification will be awarded on a Pass/Fail basis, with decisions made in accordance with Param Qualifications's academic and qualification regulations.

Decisions on overall achievement will be made by Param Qualifications in accordance with academic and qualification regulations. Judgements will be based on overall learner performance across all units, subject to meeting the minimum requirements.

8.3 Learner Voice

Learners are encouraged to contribute actively to the quality improvement process. Feedback will be collected through surveys, discussions, and evaluations to help improve the teaching, learning, and assessment experience.

8.4 Complaints

Param Qualifications recognises that there may be occasions when learners or centres have cause for complaint. A formal complaints procedure is in place to ensure that concerns are handled in a fair, accessible, and timely manner.

Learners should first raise concerns with their centre. If issues cannot be resolved at centre level, complaints can be escalated to Param Qualifications through the official communication channels provided to registered centres.

9. Equality and Diversity

Param Qualifications recognises that discrimination, harassment, and victimisation are unacceptable, and we are committed to promoting fairness, respect, and equal opportunity. It is our aim to ensure that no learner, employee, or representative of Param Qualifications receives less favourable treatment (either directly or indirectly) on the grounds of age, disability, gender, gender reassignment, marriage or civil partnership, pregnancy or maternity, race, religion or belief, sex, or sexual orientation.

Our goal is that our workforce and our learners will reflect the diversity of society and that everyone feels respected, valued, and able to achieve their full potential. Param Qualifications opposes all forms of unlawful and unfair discrimination and works actively to remove barriers that may prevent participation or progression.

Learners and centres can access the Equality and Diversity policy through official Param Qualifications communication channels. This qualification is designed to meet the requirements of the Equality Act 2010 and ensures that learners are not disadvantaged by artificial barriers to entry, delivery, or assessment.

10. Further Professional Development and Training

Param Qualifications supports centres and partners in the effective delivery of our qualifications by providing professional development and training opportunities. These options are designed to strengthen delivery, assessment, and quality assurance, ensuring that learners receive the highest standards of teaching and support.

The training and guidance offered may include:

- Planning for the delivery of new programmes.
- Designing and planning assessments.
- Developing effective and practical assignment briefs.
- Strengthening team skills and collaborative approaches.
- Implementing learner-centred teaching and learning methods.
- Establishing robust and efficient internal quality assurance systems.

Centres may request customised training directly through their Param Qualifications representative or via official Param Qualifications communication channels.

11. RQF Level 7 Alignment Statement

This qualification is aligned to the descriptors for Level 7 of the Regulated Qualifications Framework (RQF). Learners will demonstrate advanced knowledge, originality in application, critical analysis, and decision-making in unpredictable contexts. Full mapping is provided in Annex A (RQF Level 7 Mapping Table).

Appendix 1: Unit Descriptors

PARAM QUALIFICATIONS Level 7 International Diploma in Process Safety Management (PSM)

Unit PSM701: Fundamentals of Process Safety Management

Unit Code: PSM701

RQF Level: 7

Unit Aim

To build a rigorous understanding of PSM principles, systems, and regulatory frameworks in high-hazard industries. Learners will be able to critique arrangements and propose risk-based improvements.

Learning Outcomes, Assessment Criteria

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
1	Critically explain the foundations of process safety and its distinction from occupational safety.	1.1	Critically define process safety and explain the typical types of major accident hazards (MAH) and their potential consequences in high-hazard industries.
		1.2	Analyse the differences and overlaps between process safety and occupational/behavioural safety with relevant industrial examples.
		1.3	Evaluate the intent, scope and architecture of risk-based process safety (RBPS) and internationally recognised models of PSM elements.
		1.4	Critically assess the concept of lifecycle thinking in PSM, from design through to decommissioning, and evaluate the role of inherent safety principles.
		1.5	Evaluate how leadership commitment, organisational culture, and governance frameworks influence the control of MAH risks.
		1.6	Critically examine the importance of human factors and competency management in preventing loss of containment and escalation of incidents.
		1.7	Analyse the application of risk concepts such as barriers, safeguards, bowtie analysis, and ALARP in process safety decision-making.
		1.8	Evaluate the use of leading, lagging and learning indicators in PSM, discussing their relative strengths and limitations.

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
2	Analyse and apply the elements of a process safety management system.	2.1	Map recognised frameworks of PSM elements to organisational practice.
		2.2	Specify a PSM policy, objectives and roles, highlighting governance and accountability requirements.
		2.3	Design a Management of Change (MoC) process to control technical and organisational changes.
		2.4	Determine the requirements for Process Safety Information (PSI) and evaluate methods for maintaining accuracy and accessibility.
		2.5	Develop safe operating envelopes and operating procedures, integrated with permit-to-work and isolation standards.
3	Evaluate the regulatory context for high-hazard operations and compliance strategy.	3.1	Compare major international regulatory regimes (e.g., Seveso/COMAH, OSHA PSM) and their expectations for MAH control.
		3.2	Explain statutory duties relating to hazard identification, safety reports, and demonstration of risk reduction.
		3.3	Relate hazard identification and risk assessment techniques (HAZID, HAZOP, LOPA) to regulatory requirements.
		3.4	Interpret requirements for incident reporting, investigation, and liaison with regulatory authorities.

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
4	Integrate PSM with business management for assurance and continual improvement.	4.1	Design a PSM performance measurement framework with leading and lagging indicators.
		4.2	Plan assurance arrangements including self-verification, internal audits, and independent reviews.
		4.3	Apply root-cause learning from incidents and near misses to refine process safety systems.
		4.4	Develop competency and training schemes aligned with safety-critical roles.
		4.5	Specify data governance and digitalisation opportunities to strengthen PSM assurance.

Indicative Content

- Definition of process safety and distinction from occupational/behavioural safety.
- Major Accident Hazards (fires, explosions, toxic releases) and their consequences.
- Case studies: Bhopal, Piper Alpha, Texas City, Buncefield.
- Differences and overlaps between process safety and occupational safety.
- Architecture of risk-based process safety (CCPS 20 elements, OSHA PSM 14 elements, Seveso/COMAH).
- Lifecycle approach to PSM: design, operation, maintenance, decommissioning.
- Inherent safety principles: minimisation, substitution, moderation, simplification.
- Leadership commitment, safety culture, and governance frameworks.
- Human factors engineering, ergonomics, error reduction, resilience.
- Competency management and training for safety-critical roles.
- Barriers and safeguards: technical, organisational, human.
- Introduce bowtie analysis and ALARP as fundamental decision-making tools in process safety.
- Layers of Protection Analysis (LOPA).
- Differentiate between leading, lagging, and learning indicators as a foundation for safety performance measurement.
- Comparison of regulatory frameworks: Seveso III / COMAH, OSHA PSM, API/CCPS guidance.
- Statutory duties for hazard identification, risk reports, and demonstration of risk reduction.
- Hazard identification and risk assessment techniques (HAZID, HAZOP, LOPA) and regulatory expectations.
- Incident reporting, investigation, and liaison with regulatory authorities.
- Linking PSM with business management and corporate governance.
- Root cause learning from incidents and near misses.
- Continuous improvement cycles and assurance systems (audits, reviews, self-verification).
- Digitalisation and data governance in PSM assurance.

Recommended Texts

- CCPS – *Guidelines for Risk Based Process Safety* (Wiley).
- CCPS – *Guidelines for Hazard Evaluation Procedures*, 3rd Edition (Wiley).
- CCPS – *Guidelines for Inherently Safer Chemical Processes: A Life Cycle Approach*, 2nd Edition (Wiley).
- Kletz, T. – *What Went Wrong? Case Histories of Process Plant Disasters*, 6th Edition (Elsevier).
- Lees, F. P. – *Loss Prevention in the Process Industries*, 4th Edition (Elsevier).
- UK HSE – *Managing for Health and Safety (HSG65).*
- UK HSE – *Managing Competence for Safety-Related Systems (HSG250).*
- EU Seveso III Directive (2012/18/EU).
- OSHA 29 CFR 1910.119 – Process Safety Management of Highly Hazardous Chemicals.
- API RP 754 – *Process Safety Performance Indicators for the Refining and Petrochemical Industries.*
- Hopkins, A. – *Failure to Learn: The BP Texas City Refinery Disaster.*
- Hopkins, A. – *Lessons from Longford: The Esso Gas Plant Explosion.*
- AIChE/CCPS – Training modules on process safety.
- IChemE Safety Centre – Safety resources and guidance.

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Unit PSM702: Process Hazard Identification and Risk Assessment

Unit Code: PSM702

RQF Level: 7

Unit Aim:
This unit aims to develop learner knowledge and skills in advanced methods of identifying and assessing process hazards. It covers qualitative, semi-quantitative and quantitative techniques such as HAZID, HAZOP, LOPA and QRA, along with consequence modelling. Learners will understand how hazard study outputs support regulatory compliance, ALARP demonstration and integration into wider process safety management systems.

Learning Outcomes, Assessment Criteria

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
1	Critically analyse hazard identification methods in high-hazard industries.	1.1	Define the principles of hazard identification and explain its importance in process safety management.
		1.2	Critically evaluate qualitative methods of hazard identification such as checklists, What-If analysis, and HAZID workshops.
		1.3	Examine the role of structured team-based methods such as HAZOP and their application during design and operation.
		1.4	Assess human factors considerations within hazard identification, including task analysis and human error prediction techniques.
		1.5	Critically analyse the effectiveness and limitations of different hazard identification methods when applied across the asset lifecycle.
		1.6	Evaluate how hazard identification outputs are recorded, validated, and integrated into organisational risk registers.
2	Apply and evaluate risk assessment techniques for process safety.	2.1	Define and apply the principles of risk assessment, including the concepts of frequency, consequence, and risk tolerability (ALARP).
		2.2	Critically evaluate semi-quantitative methods such as risk matrices, layers of protection analysis (LOPA), and bowtie analysis.
		2.3	Apply quantitative risk assessment (QRA) methods, including fault tree analysis (FTA) and event tree analysis (ETA).
		2.4	Analyse the use of consequence modelling techniques (dispersion modelling, fire/explosion modelling, toxic release modelling) in risk evaluation.
		2.5	Evaluate the integration of qualitative, semi-quantitative, and quantitative methods in supporting decision-making for MAH control.

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
3	Evaluate regulatory and organisational requirements for hazard identification and risk assessment.	3.1	Compare regulatory expectations (e.g., COMAH/Seveso, OSHA PSM) for hazard identification and risk assessment in high-hazard industries.
		3.2	Critically evaluate organisational duties for maintaining hazard studies, updating risk assessments, and demonstrating ALARP/SoFARP in regulatory submissions.
		3.3	Assess requirements for the documentation, traceability, and periodic review of hazard identification and risk assessment outputs.
4	Integrate hazard identification and risk assessment into organisational safety management systems.	4.1	Critically evaluate how hazard identification and risk assessment inform wider PSM systems, including asset integrity, MoC, and emergency response planning.
		4.2	Develop approaches for using hazard study findings to improve operating procedures, competence frameworks, and safe operating envelopes.
		4.3	Evaluate methods for communicating hazard and risk information effectively across the organisation and supply chain.
		4.4	Design a continuous improvement strategy to ensure hazard identification and risk assessment practices remain current and effective throughout the asset lifecycle.

Indicative Content

- Principles and importance of hazard identification in process safety management.
- Qualitative methods: checklists, What-If analysis, preliminary hazard analysis, HAZID workshops.
- Structured team-based studies: Hazard and Operability Study (HAZOP) in design, operation, and modification stages.
- Human factors in hazard identification: task analysis, human reliability analysis (HRA), human error prediction.
- Effectiveness and limitations of hazard identification techniques across the asset lifecycle.
- Recording, validating, and integrating hazard identification outputs into organisational risk registers.
- Principles of risk assessment: frequency, consequence, tolerability of risk, ALARP/SoFARP.
- Semi-quantitative techniques: risk matrices, bowtie analysis, Layers of Protection Analysis (LOPA).
- Quantitative methods: Quantitative Risk Assessment (QRA), Fault Tree Analysis (FTA), Event Tree Analysis (ETA).
- Consequence modelling: dispersion modelling, fire and explosion modelling, toxic release modelling.
- Integration of qualitative, semi-quantitative, and quantitative methods to support MAH decision-making.
- Comparison of international regulatory regimes (Seveso III/COMAH, OSHA PSM, API/CCPS guidance).
- Organisational duties: maintenance, review, and updating of hazard studies; demonstration of ALARP/SoFARP.
- Documentation, traceability, and periodic review requirements for hazard and risk assessments.
- Integration of hazard identification and risk assessment into wider PSM systems: asset integrity, MoC, emergency planning.
- Using hazard study findings to develop procedures, competence frameworks, and safe operating envelopes.
- Effective communication of hazard and risk information within the organisation and supply chain.
- Continuous improvement strategies to maintain effective hazard identification and risk assessment practices.

Recommended Texts

- CCPS – *Guidelines for Hazard Evaluation Procedures*, 3rd Edition (Wiley).
- CCPS – *Guidelines for Risk Based Process Safety* (Wiley).
- CCPS – *Layer of Protection Analysis: Simplified Process Risk Assessment* (Wiley).
- CCPS – *Guidelines for Chemical Process Quantitative Risk Analysis* (Wiley).
- Lees, F. P. – *Loss Prevention in the Process Industries*, 4th Edition (Elsevier).
- Kletz, T. – *Hazop and Hazan: Identifying and Assessing Process Industry Hazards* (Elsevier).
- Mannan, S. – *Lees' Loss Prevention in the Process Industries Handbook* (Elsevier).
- UK HSE – *Successful Health and Safety Management (HSG65).*
- UK HSE – *Hazard and Operability Studies (HAZOP) – Guide to Best Practice.*
- OSHA 29 CFR 1910.119 – Process Safety Management of Highly Hazardous Chemicals.
- EU Directive 2012/18/EU (Seveso III Directive).
- API RP 754 – *Process Safety Performance Indicators for the Refining and Petrochemical Industries.*
- Hopkin, D. – *Risk Assessment: A Practical Guide to Assessing Operational Risks.*
- AIChE/CCPS training and IChemE Safety Centre guidance materials.

Unit PSM703: Safety Integrity, Reliability and Control Systems

Unit Code: PSM703

RQF Level: 7

Unit Aim:
This unit provides a deep understanding of the design, application, and evaluation of Safety Instrumented Systems (SIS) and functional safety in line with international standards (IEC 61508 / IEC 61511). Learners will analyse system architecture, reliability modelling, SIL determination, and human factors affecting safety performance. The unit also addresses lifecycle management, proof testing, and regulatory requirements for SIS. By completing this unit, learners will be able to design, validate, and improve safety and control systems to achieve demonstrable risk reduction in high-hazard industries.

Learning Outcomes, Assessment Criteria

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
1	Critically evaluate the principles of Safety Instrumented Systems (SIS) and functional safety.	1.1	Explain the concept of Safety Integrity Levels (SIL) and their role in risk reduction within process industries.
		1.2	Analyse the architecture and function of Safety Instrumented Systems, including logic solvers, sensors, and final control elements.
		1.3	Evaluate methods for SIL determination such as risk graph, LOPA, and fault tree analysis.
		1.4	Critically assess redundancy, diversity and fail-safe principles in the design of safety systems.
		1.5	Examine common failure modes and reliability challenges in SIS (e.g., FMEA, common cause failures).
		1.6	Interpret the requirements of IEC 61508 / IEC 61511 standards and the functional safety lifecycle.
2	Apply reliability engineering methods in the assessment of safety systems.	2.1	Apply reliability concepts including MTBF, failure rates, and Probability of Failure on Demand (PFDavg).
		2.2	Use fault tree and event tree analysis to model accident scenarios and quantify system reliability.
		2.3	Critically evaluate the role of human factors in the reliability of safety and control systems.
		2.4	Assess proof testing methods, intervals, and maintenance strategies for sustaining SIS performance.
		2.5	Evaluate lifecycle management of SIS from specification and design through operation and decommissioning.

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
3	Evaluate regulatory and organisational requirements for SIS and functional safety.	3.1	Critically evaluate reliability modelling techniques (Markov models, reliability block diagrams) used in demonstrating compliance.
		3.2	Assess the level of risk reduction achieved by SIS and compare with tolerable risk criteria.
		3.3	Examine requirements for separation and integration of SIS with basic process control systems, ensuring independence and compliance with standards.
4	Design, validate and improve safety integrity and control systems.	4.1	Design a SIS for a specified process hazard scenario in line with functional safety standards.
		4.2	Validate and verify SIS design against IEC 61511 lifecycle requirements.
		4.3	Critically analyse the performance of existing safety systems using audits, reviews, and compliance checks.
		4.4	Recommend improvements to SIS design, testing, and operational practices to enhance safety and reliability.

Indicative Content

- Principles of functional safety and Safety Instrumented Systems (SIS).
- Role and determination of Safety Integrity Levels (SIL) in risk reduction.
- Architecture and function of SIS: logic solvers, sensors, and final elements.
- SIL determination methods: risk graphs, LOPA, fault tree analysis.
- Design principles: redundancy, diversity, fail-safe concepts.
- Common failure modes and reliability challenges: FMEA, common cause failures, systematic vs. random failures.
- Functional safety lifecycle as per IEC 61508 and IEC 61511 standards.
- Reliability engineering concepts: MTBF, failure rate, Probability of Failure on Demand (PFDavg).
- Reliability modelling techniques: fault tree analysis, event tree analysis, reliability block diagrams, Markov modelling.
- Human factors in safety system performance and reliability.
- Proof testing: strategies, intervals, optimisation, and impact on system availability.
- Lifecycle management of SIS: specification, design, operation, maintenance, and decommissioning.
- Independence of SIS from Basic Process Control Systems (BPCS); separation and integration issues.
- Demonstration of tolerable risk and ALARP through SIS performance.
- Regulatory and industry expectations for SIS design and compliance (IEC standards, OSHA, COMAH/Seveso).
- SIS verification and validation requirements in line with IEC 61511.
- Methods for auditing, reviewing, and assessing SIS performance.
- Continuous improvement of SIS: lessons from incidents, new technology, digitalisation, cyber-security considerations.

Recommended Texts

- CCPS – *Guidelines for Safe Automation of Chemical Processes* (Wiley).
- CCPS – *Guidelines for Safety Instrumented Systems: Concept, Design, and Application* (Wiley).
- CCPS – *Guidelines for Implementing Process Safety Management* (Wiley).
- IEC 61508 – *Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems.*
- IEC 61511 – *Functional Safety – Safety Instrumented Systems for the Process Industry Sector.*
- Goble, W. M. – *Control Systems Safety Evaluation and Reliability* (ISA).
- Melchers, R. E. – *Structural Reliability Analysis and Prediction* (Wiley).
- Kletz, T. – *Safety Integrity Levels and Their Application in the Process Industry.*
- Mannan, S. – *Lees' Loss Prevention in the Process Industries Handbook* (Elsevier).
- UK HSE – *Managing Competence for Safety-Related Systems (HSG250).*
- UK HSE – *Out of Control: Why Control Systems Go Wrong and How to Prevent Failure (HSG238).*
- Smith, D. J. & Simpson, K. G. – *Functional Safety: A Straightforward Guide to IEC 61508 and Related Standards* (Elsevier).
- API standards on SIS and instrumented protection systems.
- ISA training and IChemE Safety Centre guidance on functional safety.

Unit PSM704: Emergency Response and Crisis Management

Unit Code: PSM704

RQF Level: 7

Unit Aim:
This unit develops learner competence in planning, implementing, and leading emergency response and crisis management strategies for high-hazard industries. It covers regulatory expectations, emergency preparedness, drills and simulations, crisis communication, and recovery planning. Learners will gain the ability to design and evaluate emergency response systems that protect people, assets, and reputation during major incidents.

Learning Outcomes, Assessment Criteria

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
1	Critically analyse the principles of emergency preparedness in high-hazard industries.	1.1	Explain the objectives and scope of emergency response and crisis management.
		1.2	Evaluate regulatory requirements and industry standards for emergency preparedness.
		1.3	Analyse the role of risk assessment in developing emergency response strategies.
		1.4	Assess resource allocation, roles, and responsibilities in emergency planning.
		1.5	Evaluate the importance of coordination with external agencies and stakeholders.
2	Design and apply emergency response systems and procedures.	2.1	Develop emergency response plans for credible worst-case scenarios.
		2.2	Evaluate procedures for evacuation, containment, and medical response.
		2.3	Design and implement drills, exercises, and simulations to test emergency plans.
		2.4	Assess the integration of emergency response with safety management systems.
		2.5	Evaluate the effectiveness of emergency equipment, systems, and resources.

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
3	Evaluate crisis management and recovery strategies.	3.1	Analyse the principles of crisis management and business continuity in high-hazard industries.
		3.2	Evaluate methods of crisis leadership, decision-making, and governance during emergencies.
		3.3	Assess recovery planning strategies for restoring operations, reputation, and stakeholder confidence.
4	Apply effective communication in emergency and crisis management.	4.1	Evaluate internal communication strategies during emergencies.
		4.2	Assess external communication with regulators, emergency services, media, and communities.
		4.3	Critically analyse the role of information management and decision support tools.
		4.4	Design strategies for post-incident communication, learning, and organisational improvement.

Indicative Content

- Objectives, scope, and principles of emergency response and crisis management in high-hazard industries.
- Regulatory frameworks and industry standards for emergency preparedness (OSHA, COMAH/Seveso, API, NFPA, ISO 22320).
- Role of risk assessment and hazard analysis in emergency planning.
- Resource planning: allocation, responsibilities, emergency response teams, chain of command.
- Coordination with regulators, emergency services, local authorities, contractors, and community stakeholders.
- Development of emergency response plans for credible worst-case scenarios.
- Evacuation, containment, firefighting, spill control, and medical response procedures.
- Emergency drills, table-top exercises, full-scale simulations, and evaluation of outcomes.
- Integration of emergency response with process safety and business management systems.
- Emergency equipment, facilities, alarms, PPE, and monitoring systems – testing and reliability.
- Crisis management principles: incident command systems, business continuity frameworks.
- Evaluate leadership behaviours in emergency command structures and crisis decision-making.
- Recovery planning: phased restoration of operations, supply chain resilience, reputation management.
- Internal communication strategies during emergencies (command centers, communication hierarchy, redundancy).
- External communication with regulators, emergency services, media, and communities.
- Role of social media, public relations, and stakeholder engagement.
- Information management systems, digital decision support tools, and real-time monitoring.
- Post-incident review, reporting, and organisational learning.
- Embedding continuous improvement and resilience into emergency and crisis management systems.

Recommended Texts

- CCPS – *Guidelines for Emergency Planning* (Wiley).
- CCPS – *Guidelines for Risk Based Process Safety* (Wiley).
- CCPS – *Guidelines for Managing Process Safety Risks During Organizational Change*.
- FEMA – *Emergency Management Guide for Business and Industry.*
- ISO 22320 – *Societal Security – Emergency Management – Requirements for Incident Response.*
- NFPA 1600 – *Standard on Disaster/Emergency Management and Business Continuity Programs.*
- UK HSE – *Emergency Preparedness for Major Accidents (HSG191).*
- UK HSE – *Developing a Major Accident Emergency Plan.*
- Hopkins, A. – *Learning from High Reliability Organisations.*
- Shrivastava, P. – *Bhopal: Anatomy of a Crisis.*
- Smith, D. – *Business Continuity and Crisis Management.*
- Alexander, D. – *Principles of Emergency Planning and Management.*
- IChemE Safety Centre – Guidance on Emergency and Crisis Management.
- API RP 753 – *Management of Hazards Associated with Location of Process Plant Portable Buildings.*
- Government and regulator case studies: Buncefield, Piper Alpha, Fukushima.

Unit PSM705: Process Safety Leadership, Culture and Ethics

Unit Code: PSM705
RQF Level: 7

Unit Aim:

This unit develops learner competence in leading process safety through culture, ethics, and governance. It focuses on ethical decision-making, leadership behaviours, safety culture improvement, and accountability in managing organisational responsibilities. Learners will understand how values, leadership styles, and governance frameworks directly influence safety performance and sustainability in high-hazard industries.

Learning Outcomes, Assessment Criteria

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
1	Critically evaluate the role of leadership in process safety.	1.1	Explain the characteristics of effective process safety leadership.
		1.2	Evaluate the influence of leadership commitment on safety performance.
		1.3	Analyse leadership behaviours during crisis and change situations.
		1.4	Assess the role of leaders in embedding process safety within organisational strategy.
		1.5	Critically review case studies of leadership success and failure in process safety.
2	Analyse the importance of safety culture in high-hazard organisations.	2.1	Define safety culture and its dimensions.
		2.2	Evaluate methods for assessing and measuring safety culture.
		2.3	Analyse strategies for improving safety culture through engagement and empowerment.
		2.4	Assess the impact of communication, learning, and trust on building a strong safety culture.
		2.5	Critically evaluate barriers to developing and sustaining positive safety culture.

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
3	Evaluate ethics and organisational responsibility in process safety.	3.1	Explain the ethical principles underpinning process safety decisions.
		3.2	Evaluate the responsibilities of organisations towards employees, contractors, regulators, and society.
		3.3	Critically analyse the consequences of ethical failures in high-hazard industries.
4	Apply leadership and ethics to enhance organisational governance.	4.1	Critically evaluate governance structures that support process safety responsibility.
		4.2	Assess frameworks for accountability and transparency in process safety performance.
		4.3	Apply ethical leadership principles to organisational decision-making.
		4.4	Design strategies for continuous improvement in leadership, ethics, and culture.

Indicative Content

- Characteristics of effective process safety leadership: vision, commitment, competence, credibility.
- Leadership commitment and its impact on safety performance outcomes.
- Leadership behaviours during crisis, emergencies, and organisational change.
- Embedding process safety in business strategy and corporate objectives.
- Case studies of leadership success and failures in high-hazard industries (e.g., BP Texas City, Deepwater Horizon, Bhopal, Piper Alpha).
- Critically evaluate governance frameworks and leadership accountability for sustaining a positive safety culture (e.g., HSE Safety Culture Maturity Model, Hudson model).
- Methods for assessing safety culture: surveys, focus groups, safety climate tools, behavioural observations.
- Analyse ethical dilemmas in process safety decision-making with real-world case studies: employee engagement, empowerment, visible leadership.
- Role of communication, trust, learning, and just culture in strengthening safety culture.
- Barriers to achieving and sustaining a positive safety culture: resistance to change, blame culture, weak governance.
- Ethical principles underpinning process safety decision-making (duty of care, integrity, fairness, accountability).
- Organisational responsibilities to employees, contractors, regulators, and the public.
- Consequences of ethical failures in high-hazard industries: case studies of accidents caused by neglect, cost-cutting, or governance failures.
- Governance structures supporting process safety: board oversight, safety committees, independent review.
- Frameworks for accountability and transparency in safety performance.
- Ethical leadership in organisational decision-making: balancing profit, compliance, and safety.
- Strategies for continuous improvement in leadership, ethics, and safety culture.
- Integration of ethics and governance with sustainability and corporate social responsibility.

Recommended Texts

- Hopkins, A. – *Lessons from Longford: The Esso Gas Plant Explosion.*
- Hopkins, A. – *Failure to Learn: BP Texas City Refinery Disaster.*
- Reason, J. – *Managing the Risks of Organizational Accidents.*
- Hudson, P. – *Safety Culture: Theory, Measurement and Improvement.*
- Cooper, M. – *Improving Safety Culture: A Practical Guide.*
- CCPS – *Guidelines for Risk Based Process Safety* (Wiley).
- CCPS – *Guidelines for Implementing Process Safety Management.*
- Kletz, T. – *What Went Wrong? Case Histories of Process Plant Disasters.*
- UK HSE – *Developing Process Safety Indicators (HSG254).*
- UK HSE – *Managing for Health and Safety (HSG65).*
- OECD – *Corporate Governance and the Safety of High Hazard Industries.*
- IChemE Safety Centre – leadership and culture guidance.
- International frameworks on ethics and governance: UN Global Compact, ISO 26000 (Social Responsibility).

Unit PSM706: Regulatory Compliance and Industry Standards

Unit Code: PSM706
RQF Level: 7

Unit Aim:

This unit equips learners with the knowledge and skills to interpret, apply, and evaluate key process safety regulations and industry standards. It explores the principles of regulatory compliance under COMAH/Seveso, OSHA PSM, IEC functional safety standards, and related frameworks. Learners will gain expertise in compliance auditing, documentation, inspection readiness, and demonstrating ALARP/SoFARP in high-hazard industries. The unit prepares learners to critically evaluate organisational practices against legal and international benchmarks, ensuring accountability and continuous improvement.

Learning Outcomes, Assessment Criteria

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
1	Critically evaluate international process safety regulatory frameworks.	1.1	Explain the scope and objectives of COMAH/Seveso, OSHA PSM, and IEC standards.
		1.2	Compare and contrast regulatory approaches across jurisdictions.
		1.3	Analyse the role of regulators in enforcing compliance and driving industry improvement.
		1.4	Evaluate how organisations demonstrate ALARP/SoFARP in regulatory submissions.
		1.5	Assess case studies of compliance successes and failures in high-hazard industries.
		1.6	Critically evaluate challenges in harmonising global regulatory standards.
2	Apply compliance management systems and audit practices.	2.1	Critically evaluate compliance management frameworks and policies.
		2.2	Apply audit methodologies to assess organisational compliance with regulations and standards.
		2.3	Evaluate inspection readiness and evidence requirements for demonstrating compliance.
		2.4	Assess the role of independent audits, internal verification, and regulator inspections.
		2.5	Design a compliance audit plan for a high-hazard organisation.

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
3	Evaluate organisational responsibilities for regulatory compliance.	3.1	Assess the duties of operators in preparing safety reports, risk assessments, and compliance documentation.
		3.2	Evaluate requirements for reporting incidents, near misses, and corrective actions.
		3.3	Critically analyse the consequences of regulatory non-compliance, including legal, financial, and reputational impacts.
4	Integrate regulatory compliance into continual improvement.	4.1	Analyse how compliance data informs organisational learning and performance improvement.
		4.2	Critically evaluate governance structures that ensure ongoing compliance and accountability.
		4.3	Apply industry standards to strengthen organisational resilience and safety performance.
		4.4	Recommend strategies for aligning compliance with wider process safety and business management systems.

Indicative Content

- Scope, objectives, and principles of COMAH/Seveso III Directive, OSHA PSM (29 CFR 1910.119), and IEC 61508/61511 standards.
- Comparison of regulatory approaches across jurisdictions (EU, US, Middle East, Asia).
- Role of regulators in enforcement, inspections, and industry improvement.
- Analyse ALARP and SoFARP demonstration specifically in COMAH/Seveso and OSHA submissions.
- Case studies of compliance successes and failures (Buncefield, Texas City, Deepwater Horizon, Bhopal).
- Challenges in harmonising global regulatory standards and multinational compliance.
- Compliance management systems and frameworks (ISO 45001, CCPS guidance).
- Policy frameworks for maintaining compliance across the asset lifecycle.
- Audit methodologies: internal audits, third-party audits, regulator inspections.
- Evidence gathering, inspection readiness, and documentation practices.
- Independent audits, verification, and assurance mechanisms.
- Designing compliance audit plans for high-hazard organisations.
- Organisational duties in preparing safety reports, major hazard risk assessments, and compliance documentation.
- Requirements for reporting incidents, near misses, corrective and preventive actions.
- Consequences of regulatory non-compliance: legal sanctions, financial penalties, reputational damage.
- Use of compliance data for organisational learning and continuous improvement.
- Governance structures for maintaining compliance and accountability.
- Application of industry standards to improve resilience and process safety outcomes.
- Strategies for aligning compliance with business management, sustainability, and process safety frameworks.

Recommended Texts

- CCPS – *Guidelines for Risk Based Process Safety* (Wiley).
- CCPS – *Guidelines for Implementing Process Safety Management* (Wiley).
- CCPS – *Process Safety Leading and Lagging Metrics – CCPS/UK HSE Guidance.*
- Lees, F. P. – *Loss Prevention in the Process Industries*, 4th Edition (Elsevier).
- Kletz, T. – *What Went Wrong? Case Histories of Process Plant Disasters.*
- OSHA 29 CFR 1910.119 – *Process Safety Management of Highly Hazardous Chemicals.*
- EU Directive 2012/18/EU – *Seveso III Directive.*
- IEC 61508 – *Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems.*
- IEC 61511 – *Functional Safety – Safety Instrumented Systems for the Process Industry Sector.*
- UK HSE – *Developing Process Safety Indicators (HSG254).*
- UK HSE – *Managing for Health and Safety (HSG65).*
- OECD – *Guidance on Corporate Governance for Process Safety in High Hazard Industries.*
- NFPA and API standards relevant to compliance and auditing.
- IChemE Safety Centre – compliance and governance resources.

Unit PSM707: Incident Investigation and Root Cause Analysis

Unit Code: PSM707
RQF Level: 7

Unit Aim:

This unit develops advanced competence in investigating process safety incidents and identifying root causes to prevent recurrence. Learners will study investigation frameworks, evidence collection, analysis tools, and reporting practices. The unit also covers regulatory expectations, organisational responsibilities, and the integration of investigation findings into learning and continuous improvement. By completing this unit, learners will be able to plan, conduct, and report investigations that strengthen safety culture and compliance in high-hazard industries.

Learning Outcomes, Assessment Criteria

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
1	Critically evaluate the principles and practices of incident investigation.	1.1	Explain the objectives and scope of incident investigation in process safety management.
		1.2	Evaluate regulatory and organisational requirements for reporting and investigation.
		1.3	Critically analyse investigation frameworks and methodologies (e.g., ICAM, TapRooT, Tripod Beta).
		1.4	Assess the role of evidence collection, witness interviews, and data integrity in investigations.
		1.5	Evaluate the importance of impartiality, competence, and independence in investigation teams.
		1.6	Critically review challenges and limitations in current industry investigation practices.
2	Apply root cause analysis tools and techniques.	2.1	Apply causal analysis tools such as the “5 Whys”, fishbone diagrams, and fault tree analysis.
		2.2	Evaluate human and organisational factors contributing to incidents.
		2.3	Apply barrier analysis and bowtie methods to identify failures in safety systems.
		2.4	Critically analyse how systemic weaknesses contribute to root causes.
		2.5	Recommend corrective and preventive actions based on root cause findings.

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
3	Evaluate organisational responsibilities for reporting and regulatory compliance.	3.1	Explain statutory requirements for incident reporting to regulators.
		3.2	Critically evaluate the role of transparency and accountability in incident communication.
		3.3	Assess the organisational impact of under-reporting and poor learning from incidents.
4	Integrate investigation findings into organisational learning and improvement.	4.1	Critically evaluate methods for sharing investigation findings internally and externally.
		4.2	Apply investigation outputs to strengthen safety culture and leadership accountability.
		4.3	Analyse how investigation data informs performance indicators and continual improvement systems.
		4.4	Recommend strategies for embedding lessons learned into process safety management systems.

Indicative Content

- Objectives and scope of incident investigation in process safety management.
- Regulatory and organisational requirements for incident reporting and investigation (OSHA, COMAH/Seveso, API, HSE).
- Investigation frameworks and methodologies: ICAM, TapRooT, Tripod Beta, HFACS.
- Evidence collection techniques: physical evidence, digital data, witness interviews, maintaining data integrity.
- Role of impartiality, competence, and independence in investigation teams.
- Challenges and limitations of current industry investigation practices.
- Root cause analysis tools: “5 Whys”, fishbone (Ishikawa) diagrams, barrier analysis, and bowtie analysis applied as part of incident causal mapping to identify failed barriers.
- Human and organisational factors contributing to incidents (fatigue, workload, supervision, culture).
- Systemic weaknesses and latent conditions leading to failures (management systems, governance gaps).
- Development of corrective and preventive actions from investigation findings.
- Statutory requirements for incident reporting to regulators (HSE RIDDOR, OSHA, Seveso III, API guidance).
- Organisational responsibilities: timely reporting, transparency, accountability, corrective actions.
- Impact of under-reporting, blame culture, and poor learning on organisational performance.
- Methods for sharing investigation findings internally (toolbox talks, safety alerts) and externally (industry databases, regulators).
- Strengthening safety culture and leadership accountability through learning from incidents.
- Use investigation outputs to refine leading and lagging indicators for continual improvement.
- Integration of investigation findings into continual improvement frameworks (PDCA cycle, management reviews).
- Embedding lessons learned into process safety management systems, competence frameworks, and governance.

Recommended Texts

- CCPS – *Guidelines for Investigating Chemical Process Incidents*, 3rd Edition (Wiley).
- CCPS – *Learning from Experience: An Analysis of Process Safety Incident Reports.*
- Kletz, T. – *Learning from Accidents in Industry.*
- Reason, J. – *Managing the Risks of Organizational Accidents.*
- Hollnagel, E. – *The ETTO Principle: Efficiency-Thoroughness Trade-Off.*
- Hopkins, A. – *Failure to Learn: The BP Texas City Refinery Disaster.*
- Hopkins, A. – *Lessons from Longford: The Esso Gas Plant Explosion.*
- Tripod Foundation – *Tripod Beta User Guide.*
- TapRooT® – *Root Cause Tree Handbook.*
- ICAO – *Human Factors Analysis and Classification System (HFACS).*
- UK HSE – *Investigating Accidents and Incidents (HSG245).*
- OSHA – *Accident Investigation Guide.*
- API RP 585 – *Pressure Equipment Integrity Incident Investigation.*
- IChemE Safety Centre – publications on investigation and learning.

Unit PSM708: Advanced Process Safety Analytics and Artificial Intelligence

Unit Code: PSM708
RQF Level: 7

Unit Aim:

This unit equips learners with knowledge and skills to apply artificial intelligence, machine learning, and data analytics in process safety management. It explores how predictive modelling, real-time monitoring, and digital tools can enhance risk identification, incident prevention, and decision-making. Learners will evaluate ethical and regulatory implications of AI in high-hazard environments and develop strategies for integrating emerging technologies into continuous improvement systems.

Learning Outcomes, Assessment Criteria

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
1	Analyse the role of data analytics in process safety management.	1.1	Explain the principles of data analytics and their relevance to process safety performance.
		1.2	Evaluate sources and quality of safety-related data (e.g., sensors, logs, inspection records).
		1.3	Apply data analysis techniques to identify leading and lagging indicators.
		1.4	Assess the use of dashboards and data visualisation in process safety monitoring.
		1.5	Interpret data trends to support proactive safety decisions.
2	Evaluate artificial intelligence and machine learning applications in safety systems.	2.1	Explain how AI and ML are applied in hazard prediction, anomaly detection, and risk assessment.
		2.2	Evaluate case studies of AI-driven tools in predictive maintenance and safety monitoring.
		2.3	Assess the integration of AI/ML with existing safety instrumented systems (SIS) and control systems.
		2.4	Critically analyse benefits and limitations of AI/ML in process safety environments.
		2.5	Recommend suitable AI solutions for enhancing safety assurance and performance.

LO	Learning Outcomes: When awarded credit for this unit, a learner can:		Assessment Criteria: Assessment of this learning outcome will require a learner to demonstrate that they can:
3	Address ethical, regulatory and organisational considerations.	3.1	Analyse ethical challenges associated with AI use in high-hazard industries (e.g., bias, transparency, accountability).
		3.2	Evaluate data privacy, cybersecurity, and legal compliance requirements for AI systems.
		3.3	Assess how AI aligns with functional safety standards (e.g., IEC 61511) and regulatory expectations (e.g., COMAH, OSHA).
4	Apply digital innovation to drive continuous improvement.	4.1	Evaluate how digital technologies (e.g., digital twins, IoT, cloud systems) support real-time safety insights.
		4.2	Assess how predictive analytics informs learning from incidents and improves safety KPIs.
		4.4	Recommend a digital transformation strategy to support continuous improvement in process safety.
		4.5	Design a framework for integrating AI into a process safety management system (PSMS).

Indicative Content

- Principles of data analytics and their application in process safety.
- Sources of safety-related data: process sensors, logs, inspection records, near-miss databases, maintenance reports.
- Data quality management: accuracy, completeness, integrity, and accessibility.
- Apply predictive analytics and AI to enhance leading indicator monitoring and early warning systems.
- Dashboards, data visualisation, and real-time monitoring for safety decision-making.
- AI/ML applications in hazard prediction, anomaly detection, predictive maintenance, and risk assessment.
- Case studies of AI-driven safety monitoring and predictive systems in high-hazard industries.
- Integration of AI/ML with Safety Instrumented Systems (SIS) and process control systems.
- Benefits, risks, and limitations of AI/ML approaches in safety-critical environments.
- Ethical challenges: algorithmic bias, transparency, accountability, and decision trust.
- Data privacy, cybersecurity, and governance considerations in AI deployment.
- Compliance requirements: functional safety standards (IEC 61511, IEC 61508), OSHA PSM, COMAH/Seveso.
- Digital technologies for process safety: digital twins, IoT-enabled monitoring, cloud-based analytics platforms.
- Predictive analytics for learning from incidents and enhancing safety KPIs.
- Strategies for digital transformation in process safety organisations.
- Framework design for integrating AI into process safety management systems.
- Role of AI in supporting continual improvement and organisational resilience.

Recommended Texts

- CCPS – *Guidelines for Process Safety Metrics* (Wiley).
- CCPS – *Guidelines for Process Safety in the Era of Big Data and Digitalization.*
- CCPS – *Guidelines for Digitalization of Process Safety Management Systems.*
- IEC 61508 – *Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems.*
- IEC 61511 – *Functional Safety – Safety Instrumented Systems for the Process Industry Sector.*
- ISO/IEC 27001 – *Information Security Management Systems.*
- AIChE/CCPS – technical reports on digital transformation in process safety.
- UK HSE – *Big Data, Artificial Intelligence, and Safety Management: Opportunities and Risks.*
- World Economic Forum – *AI Governance Principles in Industrial Systems.*
- Hopkins, A. – *Learning from High Reliability Organisations.*
- Marr, B. – *Big Data in Practice.*
- Russell, S. & Norvig, P. – *Artificial Intelligence: A Modern Approach.*
- Selected peer-reviewed papers on AI/ML in predictive maintenance and process safety applications.
- IChemE Safety Centre – guidance on digital safety transformation.