Department of **Local Government, Industry Regulation and Safety**

GOVERNMENT OF WESTERN AUSTRALIA

WorkSafe Western Australia Petroleum Safety

INFORMATION SHEET

Human factors: Training and competency

Introduction

Training is essential for achieving and maintaining competency and consistency. Training updates existing knowledge and equips workers with new knowledge and skills. Competence combines the skills, experience and knowledge required to undertake the responsibilities of a role and consistently perform activities to a recognised standard on a regular basis. Workers must apply and practice what they have learned to become competent.

Collectively, training and competence can reduce errors from knowledge gaps. They promote behaviours that support desired human performance for preventing and managing major accident events (MAE).

Scope and objectives

This information sheet will assist major hazard facility, petroleum and geothermal energy operations or operators to:

- recognise the critical role played by training and competency in preventing and mitigating MAEs
- understand what a training needs analysis is and why they should be conducted
- understand verification of competency
- recognise the importance of refresher training and additional human factors training for those in safety critical roles and incident investigation teams.

Definitions and abbreviations

Barrier – a physical control which, on its own, can prevent a threat from becoming an MAE in circumstances that are likely to exist when the barrier is needed. A barrier can also be a safety critical element (SCE).

Bowtie analysis – a graphical representation of the relationship of the preventative, mitigative, response and recovery controls to the hazards, hazardous events and event consequence it is controlling against, as well as its relationship to other controls, systems and processes.

Consequence – the possible outcomes from an MAE and major incident (for example multiple fatalities).

Control measure/control(s) – the measures that will eliminate or, if it is not possible to eliminate, will reduce the risk of a hazard causing an MAE so far as is reasonably practicable. Control measures are defined in:

- regulation 4 of the Work Health and Safety (Petroleum and Geothermal Energy Operations) Regulations 2022 (WHS PAGEO Regulations)
- regulation 23(2)(c) of the Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007 (DGS MHF Regulations)

Note: the DGS MHF Regulations use the term 'risk control measure'.

Degradation factors – conditions that lead to an increased risk by defeating or reducing the effectiveness of a barrier.

Major accident event (MAE) – an event, including a natural event, connected with a facility, having the potential to cause multiple fatalities at or near the facility (defined in regulation 26 of the WHS PAGEO Regulations).

Major incident – any incident involving or affecting a Schedule 1 substance that causes serious harm to people, property or the environment. Within this information sheet, MAE is used to encompass 'major incident'.

Performance standard – a standard, established by the operator, of the performance required of a system, item of equipment, person or procedure that is used as a basis for managing the risk of an MAE.

Safeguard/degradation control – a control that cannot by itself prevent an MAE from occurring but can help to minimise the degradation risk of barriers. A safeguard can also be an SCE.

Safety critical task – a task where human performance can cause or contribute to an MAE, or where the purpose of the task is to prevent or limit the effect of an MAE, including initiating events prevention and detection control and mitigation, and emergency response.

Safety critical element (SCE) – Any part of a facility (whether tangible or intangible), system, process, procedure, person or other control measure:

(a) the purpose of which is to prevent, or mitigate the effect of, an MAE, or
(b) the failure of which might cause, or substantially contribute to, an MAE.

Skill degradation – also known as skill fade, is the loss of formerly trained and acquired knowledge and skills after periods of non-use.

Training and competency and managing MAEs

To prevent and mitigate against MAEs, operators must identify the risks and implement control measures, specifically safety critical elements (SCE), along with associated performance standards. More information about performance standards is within the *Identification of major accident events, control measures and performance standards: Guide*. SCEs are often illustrated using a bowtie analysis. An example of a bowtie analysis for loss of containment is provided in Figure 1.

For each SCE, a performance standard is developed which specifies the objective, measurable performance and assurance or verification steps required. Just like any other control, performance standards can be developed for human factors controls. Refer to *Integrating human factors into bowtie analyses of major accident events: Information sheet* for further information.

Human factors can be a part of SCEs when they are critical to the safe operation of systems. Ensuring personnel are adequately trained and capable of performing tasks safely is a human factor that could be considered an SCE.

For example, training and competency can be an SCE for emergency response. This is because the purpose of trained and competent emergency responders is to prevent and mitigate the effect of an MAE. The assurance activities associated with this SCE include emergency response drills for identified MAE scenarios. This assurance activity would be identified in the relevant performance standard.

Trained and competent control room operators support an effective alarm activation and response. The alarm and associated control room operator response is a control and an SCE. The performance standard would identify assurance activities relevant to this SCE. This may include control room operator training and competency verification, and alarm functional testing.

Regular auditing against the performance standards ensures the controls remain effective. Additionally, performance standards for controls involving human performance can inform design requirements, organisational arrangements, and training and competence needs of workers.

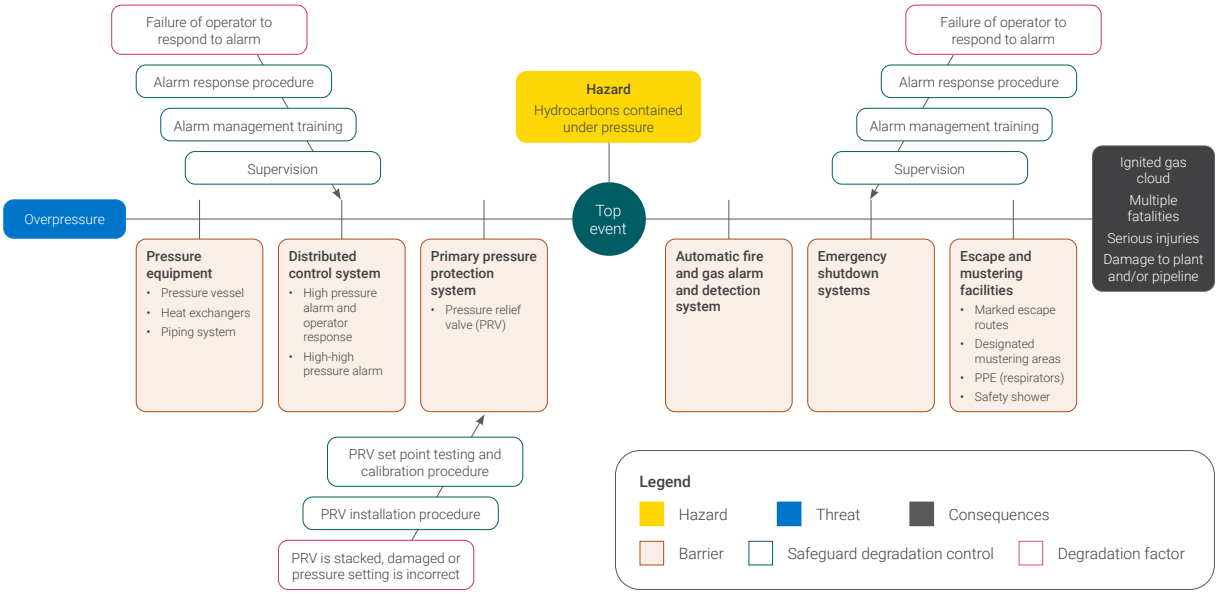

Figure 1 Example bowtie diagram

Training needs analysis

Historical MAEs have demonstrated that insufficient skills and knowledge have contributed significantly to accidents. This means that operators should not make assumptions about the competency of their workers.

Conducting a training needs analysis helps operators better address their organisation's training needs and requirements to improve operator competency. A training needs analysis involves assessing the needs of the operator, evaluating the skills and knowledge of the workers, and identifying areas in which training is needed. The aim is to identify gaps between the current competency of workers and the desired skill levels required. This allows operators to develop targeted training programs that effectively upskill workers and maintain competency. A training needs analysis should be conducted for all tasks. However, when operators begin conducting a training needs analysis, priority should be given to safety-critical tasks.

Verification of competency

Providing training does not ensure that workers possess the necessary skills and knowledge to perform tasks. This is why a verification of competency should be conducted. Verification of competency is an essential process ensuring workers are competent in their roles before they start work. Verification of competency involves a formal process of collecting evidence of the skills and knowledge workers have developed through various means. These include structured learning environments, on-the-job training, off-the-job training, and other relevant workplace experiences. Competency can be verified through recognition of prior learning, on-site recognition of current competency, and the operation's training and development program.

All verification methods must include a documented assessment. Theoretical knowledge is typically assessed in a training room but may also be conducted on-the-job through documented verbal questioning. Skills assessments are usually conducted on-the-job using practical tests or simulations. This ensures that workers are fully competent to perform their tasks safely and effectively. Operators should prioritise verifying competency for infrequent and safety critical tasks.

Managing skill degradation

Due to the infrequent nature of some tasks, workers are more likely to experience skill degradation or skill fade if they do not perform these tasks regularly. The two main factors that can lead to skill degradation are the duration of non-use and task complexity. Without practice, complex tasks involving judgements and decision-making, uncertainty, time pressures, and a higher number of steps are more vulnerable to skill degradation.

Providing regular refresher training is vital to ensure that workers retain the necessary skills and knowledge to perform their roles. The frequency of refresher training should be based on the anticipated deterioration in competence. Reducing the complexity of the task (for example, by introducing job aids, reducing judgement and decision-making) can extend the duration between refresher training.

Particular attention should be provided to maintaining competence and skills required to manage infrequent safety-critical tasks and process events. Providing refresher training ensures that workers can perform process safety tasks accurately and safely. This assists in managing the risk of MAEs.

The 'Skills Decay Analysis Tool' is an evidence-based approach to determine the frequency of refresher training. This tool can also guide the design of tasks to reduce the frequency of refresher training. More information about this tool can be found within the *Predicting skill decay: A practical application of the Skill Decay Analysis Tool* paper.

Implementing human factors training

Safety critical roles

Providing human factors training to workers who perform safety-critical roles can improve overall safety. Training helps to develop their awareness of the vital role human performance plays in preventing and mitigating MAEs. The training includes identifying performance shaping factors and recognising and knowing when to stop the job if conditions and risk controls change. This fosters a stronger safety culture by empowering workers with the skills to identify and speak up about conditions which can impact the safety of the tasks. It can also prevent major accidents.

Incident investigations

When investigating incidents, human factors are often overlooked. Investigations into historical MAEs demonstrate the critical role human factors play in preventing and contributing to these events. Identifying relevant factors can prevent similar accidents from reoccurring. Providing specific human factors training for investigation team members enhances their knowledge and application of human factors. This improves the quality of incident investigations. Examples of accredited courses are provided below for guidance purposes.

Additional information and resources

Further information is available from:

Department of Local Government, Industry Regulation and Safety

WorkSafe Western Australia

- *Human factors: Integrating human factors into bowtie analyses of major accident events: Information sheet*
- *Human factors: Integrating human factors into major accident event investigations: Human factors information sheet: Information sheet*
- *Identification of major accident events, control measures and performance standards: Guide*

Health and Safety Executive (HSE) UK

- Human factors/ergonomics: Training and competence
- Research report 086: Competence assessment for the hazardous industries
- Guidance on investigation and analysing human and organisational factors aspects of incidents and accidents

Energy Institute

- *Guidance on investigating and analysing human and organisational factors aspects of incidents and accidents*
- *Human factors briefing note no. 15 – Incident and accident analysis*

Other information and resources

- Human Performance Oil & Gas – HP in investigations
- International Association of Oil & Gas Producers – Demystifying human factors: Building confidence in human factors investigation
- Human Factors and Ergonomics Society – *Predicting skill decay: A practical application of the Skill Decay Analysis Tool*

Examples of accredited courses on human factors

- Chartered Institute of Ergonomics and Human Factors – Human Factors pathway: training courses
- Energy Institute – Full Introductory Module: Human Performance for the Energy Sector
- Human Factors and Ergonomics Society of Australia – Academic courses

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