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

GOVERNMENT OF WESTERN AUSTRALIA

WorkSafe Western Australia Petroleum Safety

INFORMATION SHEET

Human factors: Safety critical communication

Introduction

Safety critical communications are communications that could result in a major accident event if not delivered, received, and understood correctly. It includes both written and verbal communication.

Safety critical communication contributes to the effective safety performance of operations and plant by helping workers negotiate hazards in the workplace, increase reliability and perform their jobs safely.

Examples of safety critical communication scenarios include:

- shift handovers
- communicating the status of a system (e.g. live, pressurised or isolated)
- communicating during emergency response
- communication between control room and field operators
- radio communication
- plant labelling and identification
- permit to work.

Ineffective communication was identified as a key contributing factor in a number of major accident events, including incidents at Piper Alpha, Texas City and Buncefield.

Scope and objectives

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

- recognise the critical role of safety critical communication in preventing and mitigating major accident events
- proactively identify performance shaping factors and incorporate them into safety critical communication procedures
- implement procedures around receiving safety critical communications
- improve safety critical communication during shift handover and emergency response.

Definitions and abbreviations

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

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 a major accident event so far as is reasonably practicable; defined in:

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

Human failure – Human errors, mistakes and violations.

Major accident event (MAE) – An event connected with a facility, including a natural event, that has the potential to cause multiple fatalities of persons at or near the facility (as defined in r. 26 of the WHS PAGEO Regulations). For the purpose of this information sheet, 'major accident events' includes 'major incidents'.

Major incident (MI) – Any incident involving or affecting a Schedule 1 substance that causes serious harm to people, property, or the environment (as defined in r. 4 of the DGS MHF Regulations).

Performance standard (PS) – A standard, established by the operator, of the performance required of a system, item of equipment, person or procedure which is used as a basis for managing the risk of a major accident event.

Safety critical task (SCT) – A task where human performance could cause or contribute to a major accident event, or where the purpose of the task is to prevent or limit the effect of a major accident event, 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, a major accident event; or
(b) the failure of which might cause, or substantially contribute to, a major accident event.

Safety critical communication and managing major accident events

To prevent and mitigate MAEs, operators must identify the risks and implement control measures, specifically SCEs and associated performance standards. These elements are often illustrated using a bowtie analysis. Refer to the *Integrating human factors into bowtie analyses of major accident events: Information sheet* for further information.

A performance standard is developed for each SCE. Performance standards specify the objective, measurable performance criteria, and assurance or verification steps required. Controls for human factors, such as safety critical communication, can be a part of SCEs when they are critical to the safe operation of systems. Like any other SCE, performance standards can be developed for human factors controls.

For example, the permit to work system is an SCE because it is a safety critical communication system that is used to coordinate and control the safe performance of high risk work activities. The assurance activities associated with this SCE would be identified in the relevant performance standard, for example, internal audits on permits to work to ensure adherence to the procedure.

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

Proactively identifying performance shaping factors

Performance shaping factors can be proactively identified through safety critical task analysis (SCTA), learning teams, and discussing performance shaping factors in pre-starts or toolbox talks.

SCTA is a proactive, structured task analysis approach to identifying and managing factors that may impact the performance of SCTs required for preventing, mitigating and recovering from MAEs. It involves identifying SCTs, tasks that involve safety critical communication, performance shaping factors, existing controls, and additional controls to reduce the risk of MAEs so far as is reasonably practicable.

Learning teams foster effective communication between workers, and can be used to learn from successful work ('when things go right'), near misses, or incidents. Learning teams consist of workers who perform the work and workers who were involved in the incident or who may have information about it. This approach allows workers a space to discuss what works well and what doesn't, with the goal of learning from the event and improving systems of work.

Using pre-starts or toolbox talks as a time to discuss performance shaping factors can help workers proactively identify hazards in their environment and what they can do to prevent something from going wrong. For example, if workers anticipate working in a noisy environment, they may discuss the importance of adhering to communication procedures and using repeat-back communication when communicating via radio.

Factors that support effective communication

Organisational, job and individual factors that support effective safety critical communication include:

- organisational factors
  - minimum standards for effective safety critical communication are defined (e.g. use of a standardised dictionary of terms and definitions, who needs to communicate and what information needs to be communicated)
  - training in communication protocols (e.g. North Atlantic Treaty Organisation phonetic alphabet and number pronunciation, repeat-back) for safety critical situations is provided
  - adequate time is allocated for overlap in shifts to complete the shift handover
  - regular internal assurance audits are conducted to ensure controls are effective and maintained

- job factors
  - communication equipment is readily available, usable and reliable
  - standardised communication procedures for shift handovers are provided (e.g. written shift handover communication log and verbal handover)
  - known transmission blackspots are addressed
  - plant is correctly identified and labelled
- individual factors
  - verbal communication is precise and clear (note: short-term memory is generally limited to between five and nine items of information)
  - ambiguous words and words with double meanings are avoided
  - a moderate pace of speech is used
  - repeat-back communication is used (i.e. workers ask for messages to be repeated back to them).

Safety critical communication systems

Shift handover

Improving safety critical communication processes in shift handover is essential for maintaining operational safety. Ineffective shift handovers can lead to operational and safety incidents. Operators can enhance shift handovers by ensuring workers have sufficient time to complete thorough handovers. Handover of maintenance or abnormal situations poses a higher risk of miscommunication, so extra time should be allocated to ensure all relevant information can be communicated.

Developing written processes for shift handovers assists in ensuring the necessary information is communicated from shift to shift. A written shift handover communication log and verbal discussion is good industry practice for shift handover. The verbal discussion provides an opportunity for the incoming shift to clarify information contained in the written shift handover communication log.

A standardised shift handover communication log, which requires specific information to be communicated, is superior to a general form with generic headings and freehand notes. A standardised shift handover communication log establishes an expectation of what information will be exchanged at the beginning and conclusion of each shift.

Permit to work system

A permit to work system is a documented system for coordinating and controlling the safe performance of high risk work activities, particularly:

- welding and other hot work
- cold work (including physical isolation)
- electrical work (including electrical isolation)
- entry into, and working in, a confined space
- procedures for working over water, and
- diving operations.

A permit to work system is a means of communication between site management, plant supervisors, control room operators, and workers undertaking the high risk work activity. Permits to work generally communicate the following safety critical information:

- hazards and associated risks
- precautions to be taken (e.g. isolations)
- risk controls that are required to be in place during the work activity
- operations that may be occurring at the same time
- formal hand back procedures which ensure the part of the plant or area affected by the work is in a safe condition and ready for reinstatement.

The permit to work should be communicated to all workers undertaking the work. Workers should sign the permit to show they have read and understood the hazards and risk controls it outlines.

Separate permits to work may be required for different tasks within the same job or work activity, for example, hot work and confined space entry. This ensures sufficient attention is given to the hazards, precautions and controls associated with each task or activity.

Emergency response

Emergency response is another area where clear communication is vital. In emergencies, direct and clear language should be used so workers can understand instructions and respond quickly. Regular maintenance should be performed on all emergency equipment (e.g. alarm systems, speakers, radios) to ensure effective communication during emergencies. Emergency communication procedures must be up-to-date, easily accessible, and all staff must know where and how to locate them quickly.

Emergency communication protocols should be considered to ensure critical information is accurately transmitted and received during an emergency. Examples include using North Atlantic Treaty Organisation (NATO) phonetic alphabet and number pronunciation, the 24-hour clock to avoid AM/PM confusion, and repeat-back communication for safety-critical information.

Examples of safety critical communication protocols

Safety critical communication protocols can be implemented to ensure workers receive and understand safety critical communication as intended. Examples include the NATO phonetic alphabet and number pronunciation, and repeat-back communication protocols.

NATO phonetic alphabet and number pronunciation

The NATO phonetic alphabet and number pronunciation is a standardised set of phonetic pronunciations assigned to each letter of the English alphabet. Some words, numbers and letters sound similar (e.g. B, D, P) and messages can be distorted through conditions such as poor radio transmission and noisy work environments. Substituting a code word (e.g. Bravo, Delta, Papa) for each letter of the alphabet helps to prevent confusion and misinterpretation.

Repeat-back communication

Repeat-back communication (also known as three-way communication) is used when workers are communicating safety critical information in person, via radio, or by phone. First, the sender gains the receiver's attention and delivers the message clearly. The receiver then repeats back the message as heard, and the sender either confirms it is correct, or clarifies if the message has not been understood. This process ensures the information is understood as intended and reduces the likelihood of miscommunication.

Additional information and resources

WorkSafe Western Australia

- *Human factors: Information sheets*
- *Petroleum and geothermal energy operations: Guides*

Other information and resources

- Health and Safety Executive (2005). *Guidance on permit-to-work systems: A guide for the petroleum, chemical and allied industries*.
- Todd Conklin (2018). *Pre-accident Investigations: Better Questions – An Applied Approach to Operational Learning*.
- WorkSafe New Zealand. Guidelines for Successful Learning Teams

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