DP - 5

MACHINE OPERATION CONTROLS

OBJECTIVE:

The objective is to prevent harm, during machine operation and control, to ALARP, including consideration in design for foreseeable human error.

GENERAL OUTCOME:

The intended fit for purpose design outcome should:

- eliminate the risk of collision with people, mobile and fixed equipment and other objects in the vicinity of machine operation
- prevent vehicle movement when stationary without requiring operator systems activation
- automatically prevent operation outside stability limits for speed and/or load
- automatically prevent operation outside gravity limits for stability
- minimise health risks for all operators, in accordance with occupational standards
- minimise operator fatigue, including physical and mental

The intended design outcome should also consider/include:

- Integrated systems that
  - compensate for operator fatigue, slips and lapses
  - monitor situational awareness
  - warn operators and pedestrians of people in the vicinity of operating equipment
  - warn operators of any condition that threatens machine stability
  - prevent vehicle motion into objects, structures or pedestrians
- Engineered controls which are fully functional under a range of operational and environmental conditions
- Controls and displays that are appropriately located, intuitive to use, consistent and failsafe
- Warnings and alarms that are designed to be detectable, unambiguous, simple, meaningful and integrated so as not to mentally overload the operator
- Labels that are relevant, durable, clear in meaning and appropriately positioned

In addition, the intended design outcome should minimise injury in the event of a

Potential Unwanted Events (PUEs)

5.1 Musculoskeletal injury or illness due to workstation design, including seat and seatbelt design, openings and cab height, that promotes biomechanically compromised postures for the 5th percentile female to 95th percentile male body dimensions including:

a. Inappropriate or compromised head / neck posture due to restricted visibility and/or control and display positioning
b. Inappropriate or compromised hand/wrist posture due to mechanism required to manipulate/grasp control
c. Inappropriate or compromised shoulder and back posture due to extended reach to controls
d. Excessive forces required to appropriately operate buttons, triggers, hand & foot controls, levers and other devices
e. Inappropriate or compromised posture due to lack of adjustability of seat, pedals, steering wheel / controls, monitors/displays
f. Postures arising from poor seat and belt design, resulting in improper operator utilization e.g.
   i. Inadequate lumbar support and adjustability
   ii. Inadequate reduction of exposure to whole-body vibration

SURFACE



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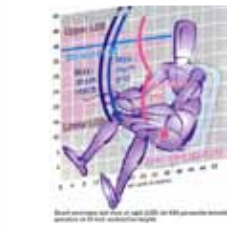

EXPLORATION DRILLING

Potential Unwanted Events (PUEs)

5.2 **Injury due to workstation design & external structures, including:**

a. Protruding structures
b. Sharp edges
c. Structures not adequately fixed to equipment
d. Roll over protection structures (ROPS)
e. Intrusion into the cab by other equipment, such as the tray of another haul truck

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EXPLORATION DRILLING

Potential Unwanted Events (PUEs)

5.3 **Injury or illness from physical and/or mental fatigue due to:**

a. Inadequate control of environmental conditions in the cab e.g. heat, cold, dust
b. Inadequate illumination of cab and displays
c. Glare from reflective sources
d. Whole-body and hand/arm vibration

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Potential Unwanted Events (PUEs)

5.4 **Harm from impaired visibility (including distorted or degraded vision) or impaired awareness of hazards in a variety of operating conditions due to:**

a. inadequate lighting for headlights, tail, reversing, turn, brake, strobe, flashing lights, etc
b. inadequately lit inspection areas
c. lack of fit for purpose receptacles for light fittings that suit standard & alternative lights
d. devices (mirrors, cameras, windscreen wipers and washers etc) that are not fit for purpose.

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Potential Unwanted Events (PUEs)

5.5 **Harm from restricted or impeded operator vision of the surrounding environment and for tool operation, due to:**

a. Cab layout, location of windows and external structures (catwalks, handrails, protective structures, line of site mirrors, etc.)
b. Poorly located or designed internal attachments, such as screens, hardware, equipment displays, sun blinds, etc

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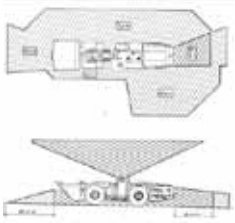

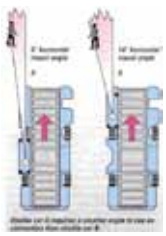

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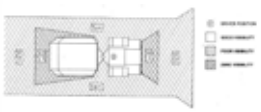

EXPLORATION DRILLING

Potential Unwanted Events (PUEs)

5.6 **Harm from collisions due to persons and small vehicles being encouraged/forced, by the equipment design, to locate on the operator's blind side.**

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Potential Unwanted Events (PUEs)

5.7 **Harm from loss of machine stability while operating, tramming, articulating or relocating due to:**

a. Inappropriate gear selection or over speed conditions on a grade
b. Working outside limits of lifting capacity and operating radius
c. Incorrect load placement or overloading, which may cause loss of steering control
d. Failure of stability devices (e.g. outriggers)
e. Failure to warn operator when design limits are being exceeded

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EXPLORATION DRILLING

Potential Unwanted Events (PUEs)

5.8 **Harm from incorrect use of equipment controls, incorrect/inaccurate calibration or ineffective maintenance due to poorly designed controls and displays, including:**

a. lack of understanding or misunderstanding about function of the control or display
b. counter-intuitive design and configuration
c. inconsistency in display or function in comparison with other controls or displays (within vehicle)
d. not appropriately considering simultaneous control operation
e. ability for unintentional operation or selection
f. unexpected operating mode (mode errors)
g. frequently used and/or safety critical controls not being located within the zone of reach
h. insufficient clearance around controls and other workstation equipment

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EXPLORATION DRILLING


Potential Unwanted Events (PUEs)

5.9 **Harm from misinterpretation of information due to displays or labels being:**

a. Illegible
b. Incomprehensible
c. Not visible
d. Inappropriately located
e. Not using universal symbols or standardized terminology
f. Not durable

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EXPLORATION DRILLING

Potential Unwanted Events (PUEs)

5.10 **Harm due to difficult access to communication systems, such as no two-way radio provision in cabin.**

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Potential Unwanted Events (PUEs)

5.11 **Harm, including mental overload, from warnings and alarms being overlooked, ignored or not heard due to these:**

a. Not being seen/heard or understood
b. Not being reliable or sufficiently sensitive
c. Being over sensitive
d. Not fully integrated or interlocked with other warning systems
e. Being over-used, tampered with or compromised in any way e.g. being turned off

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