



bhpbilliton

Fatal Risk Controls

Petroleum

Health, Safety and Environment

JULY 2010

Zero Harm

OUR COMMITMENT

Zero Harm is achievable and a core BHP Billiton Petroleum value.

We all have an obligation to identify and reduce risks, safeguard people and protect the environment and the communities where we operate. Working together in this way, we can make informed business decisions and maintain a safe work environment.

We can build on our current efforts, learn from health, safety and environment (HSE) incidents, and continually improve performance to achieve our goal of Zero Harm by focusing on three main areas:

- Our people.
- Our systems.
- Our equipment.

The implementation of effective HSE controls, visible leadership and application of HSE excellence will truly make our business a success.



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INTRODUCTION

Purpose

The Petroleum Fatal Risk Controls define requirements for managing key risks to our personnel, the environment and facilities from Petroleum operations and associated activities. The wellbeing of our employees, contractors, the environment and the communities in which we operate is integral to our business.

The Fatal Risk Controls are part of the [Petroleum HSE Management System](#) and are established using industry best practices and guidelines and standards. Effective implementation of these Fatal Risk Controls will drive our commitment to Zero Harm and support the relevant criteria noted in the Group Level Documents (GLDs).

Application and Scope

The Petroleum Fatal Risk Controls apply at Petroleum facilities, and to personnel and visitors involved in Petroleum activities. The table in Appendix A outlines the scope for each of the Fatal Risk Controls.

Partners, suppliers and contractors are encouraged to adopt the intent of the performance requirements in these Fatal Risk Controls.

Where a conflict exists between the requirements in the Fatal Risk Controls and applicable local laws, the more stringent must be applied.

Responsibility

Unless otherwise stated, managers and supervisors responsible for Petroleum activities are accountable for the implementation of the Fatal Risk Controls specified in this document.

Personnel must comply with the requirements in the document, and the expectations detailed in [Petroleum HSE Management System](#).

Fatal Risk Controls

This document defines the requirements for managing identified fatal risks within Petroleum and provides direction to related reference documentation.

The mandatory requirements of these Controls are signified by the use of the word "must". The word "should" indicates that the primary intent is to comply with the requirement however, there will be circumstances where local conditions may demonstrate that the requirement is either not applicable, compliance is not possible or an alternative approach is necessary. In cases where "should" has been used in a requirement or a risk assessment has been conducted to demonstrate that a different control ensures the risk is tolerable, variation can only be considered as compliance if the senior manager of the operation approves it based on an evaluation of the risk.

The remainder of this document describes the intent of each Fatal Risk Control and provides a set of corresponding mandatory performance requirements.

CONTROL 1

ROAD GOING AND LIGHT VEHICLES

INTENT

To eliminate or minimize the risk of fatalities, injuries and incidents arising from the use of road going and light vehicles within Petroleum operations and sites.

PERFORMANCE REQUIREMENTS

Plant and Equipment

1.1 Road going and light vehicles must have the following minimum safety features:

- Seat belts for all occupants.
- Roll-over protection for all four-wheel drive vehicles, unless the risk of roll-over has been assessed as tolerable as defined in the [Petroleum HSE Risk Matrix Procedure](#). In addition, where a journey does not have an identified and valid risk reduction gained from using a 4x4 vehicle in preference to normal passenger cars, normal passenger cars must be used.
- Cargo barriers and load restraints for all vehicles designed for carrying loads (other than passengers), or that are unable to have cargo separated from the vehicle's occupant carrying space.
- Drivers air bag and, where available as a manufacturer fitted item, passengers air bag.
- Methods for preventing uncontrolled movement of vehicles (such as chock blocks).

1.2 Light vehicles that interact with mobile equipment and/or plant must have:

- Means that enables positive communication to be made with that equipment and/or plant (such as numbering on the sides and roof).
- Flashing, revolving or strobe light.

1.3 Light vehicles must not have:

- Seating that is side mounted.
- Light vehicles must not be fitted for, or carry externally mounted fuel containers.

1.4 Light vehicles must be fitted with:

- A fire extinguisher.
- A minimum of two hi-visibility jackets.
- Signage appropriate for the location and driving conditions, allowing for easy and positive vehicle identification. In locations where this could result in a security concern, this requirement can be waived.

1.5 Road going and light vehicles should have:

- First aid kit.

- Emergency roadside triangles or beacons (three of either).
- Survival or emergency equipment suitable for the operating environment.

1.6 Consideration should be given to the inclusion of GPS devices in vehicles that operate in remote areas or areas that have unpaved or unmarked roads.

1.7 A change management process must accompany all vehicle modifications, including the attachment of any equipment. Examples of changes or modifications may include those made to the:

- Overall vehicle body structure or design.
- Original manufacturer-fitted type of tires or wheels.
- Vehicle suspension system.
- Vehicle's mechanical system.
- Vehicle's center of gravity.
- Vehicle's load-carrying capacity.
- Other areas that may affect the crash-worthiness or the effective operation of any vehicle feature e.g. the fitment of a "bull bar."

Procedures

1.8 Vehicle selection must be based on risk assessment taking account of tasks, application and environmental conditions.

1.9 A formal inspection and preventative maintenance system must be in place to ensure that vehicles are maintained in a safe and roadworthy condition and, as a minimum, serviced in line with the vehicle manufacturer's service schedule. Inspection and maintenance must be undertaken on the following critical items:

- Wheels and tires (including the spare).
- Steering, suspension and braking system.
- Seats and seat belts.
- Lamps, indicators and reflectors.
- Windscreen and windows, including windscreen wipers and washers.
- Vehicle structure itself.
- Other safety-related items on the body, chassis or engine, including instrumentation.

ROAD GOING AND LIGHT VEHICLES CONTINUED

- 1.10** Sites must develop and implement a pre-operation vehicle safety check and familiarization system that is used by the driver prior to using the vehicle.
- 1.11** Seat belts must be used in all cases by all occupants.
- 1.12** When being used within Petroleum operating sites, light vehicle running lights (low-beam headlamps) must be left on at all times when the vehicle is in operation.
- 1.13** Mobile phones, whether hands free or not, must only be used by the driver of a vehicle while the vehicle is stationary and in a safe location.
- 1.14** Systems must be in place to ensure that risks associated with vehicle journeys are managed and controlled. The systems must include, but not be limited to:
- Journey management plans in place prior to commencement of new or changed travel activities.
 - Identification and monitoring of the risks associated with the number of journeys, routes, intersections, etc. to ensure that the overall exposure is reduced to as low as reasonably practicable.
 - Assessment and communication of changed environmental and road conditions at the time of travel.
 - Outline of actions required in the event of an emergency, e.g. collision or break down.
 - Process for monitoring drivers of Petroleum vehicles for “at risk behaviors.”
 - Provision to manage driver fatigue.
- 1.15** Controls must be in place at Petroleum sites to ensure the safety of people working on roadways, including working on unexpected vehicle breakdowns.
- 1.16** A site-based review of pedestrian interaction, road design and layouts (including entrance and exit points, intersections and other potential points of interaction between light vehicles and other mobile equipment), must be conducted and updated when changes to layouts are required. Where possible, traffic segregation should be used to separate pedestrians, light vehicles and other mobile equipment.
- 1.17** A site-based traffic management plan (which can be incorporated into the plan developed for mobile equipment – (see [Fatal Risk Control 2 – Mobile Equipment](#)) that is approved by the Operations Manager (or equivalent for Projects), must be in place including, but not limited to, the following:
- Setting of appropriate speed limits for vehicle types, road surfaces and environmental conditions.
 - Overtaking protocol.
 - Procedures for light vehicles entering hazardous or restricted areas.
- The minimum safe distance to be maintained between light vehicles and mobile equipment.
 - Clear communication protocols.
 - Standards for safe following distances based on operational circumstances, environmental conditions and near sight (blind spot) limitations of other mobile equipment.
 - Installation and maintenance of road traffic control signs as appropriate to the work site.
 - Parking procedures e.g. safe parking distances/locations and required barriers from heavy mobile equipment and pedestrians.
- People**
- 1.18** All employees, contractors and visitors must be inducted in appropriate road safety and site vehicle hazards.
- 1.19** A system must be in place to ensure drivers are competent to operate the type of vehicle(s) in its intended environment, whether that is internal or external to a Petroleum site.
- 1.20** A system must be in place to verify that drivers of Petroleum vehicles have a valid and appropriate level public road driver’s license prior to being allowed to operate a Petroleum vehicle off site.
- 1.21** A system must be in place to ensure that drivers undertake adequate training to ensure that the vehicle intended to be operated or driven can be operated or driven safely. As a minimum, training should include:
- Behavioral-based defensive driving principles.
 - Vehicle familiarization, taking into account the vehicles handling dynamics and various features.
 - Loading and restraining principles where the vehicle intended to be operated is designed for carrying cargo loads.
 - Education and awareness of driving and travel risks that may be encountered within the environment where the vehicle may be operated or driven.
 - Emergency crash and breakdown procedures.
 - Basic mechanical principles, including tire changing and how to adequately perform a pre-operation check.
- 1.22** A system must be in place to ensure any person operating any equipment associated with a light vehicle (e.g. vehicle-mounted cranes and winches) is suitably trained and accredited.
- 1.23** Behavior-based observations must include the operation of light vehicles. Any need for additional specific retraining must incorporate the results of these observations.
- 1.24** A process must be in place, incorporating defined action levels for drugs (including prescribed medication) and alcohol.

CONTROL 2

MOBILE EQUIPMENT

INTENT

To eliminate or minimize the risk of fatalities, injuries and incidents arising from the use of mobile equipment.

PERFORMANCE REQUIREMENTS

Plant and Equipment

- 2.1** Mobile equipment must have the following minimum safety specifications:
- Seat belts for all occupants.
 - Adequate lighting (e.g. headlights, tail, turn, brake, strobe, flashing light).
 - Identified isolation/lockout point in accordance with the Fatal Risk Control 5 - Isolation.
 - Adequate walkways, railing, steps/grab handle combinations and boarding facilities including an alternative path of disembarking in case of emergency.
 - Reversing alarms.
 - Equipment for preventing uncontrolled movement of mobile equipment such as through the provision of chock blocks for rubber-tired mobile equipment.
 - Horn.
 - Effective windscreen wipers.
 - Effective guarding on accessible moving parts (consistent with the Equipment Safeguarding Control).
 - Signage on the equipment that allows clear and easy identification from a distance.
- 2.2** Mobile equipment must have the following minimum safety specifications, unless exempted by risk assessment:
- Approved or certified roll-over protection.
 - Two-way radio or other forms of communication.
 - Fall-on protection (protective structure for the operator cab to protect against dropped objects, overturning etc).
 - A method for transporting supplies and personal items to and from the operator cabin to enable drivers to continuously maintain three points of contact while mounting and disembarking equipment (e.g. a backpack or shoulder strap bag).
- 2.3** Layout of cabins must be taken into consideration for the purchase or hire of equipment and must consider the ergonomics of seating, operator controls and retrofitted devices.
- 2.4** Fleet and control consistency must be considered where possible to minimize operator error when changing machines.
- ### Procedures
- 2.5** A formal risk-based selection and acceptance process must be in place for all new (to site) and modified mobile equipment prior to commencement of work on site.
- 2.6** Selection of equipment, and any modification, must be subject to a rigorous change management process.
- 2.7** Design, inspection and maintenance requirements must be in place for all roadways including collision protection of hazardous and critical plant and equipment. Risk assessments must be carried out prior to any changes to traffic movements.
- 2.8** A maintenance and inspection program must be in place for mobile equipment, including critical equipment and components.
- 2.9** Procedures must be in place that detail the maintenance an operator is allowed to perform and that maintenance which personnel can carry out under testing conditions.
- 2.10** A procedure and checklist system must be in place for pre-operation inspection by the operator, including a brake functionality test. Log books must be maintained and audited, and must be located on the machine.
- 2.11** Procedures must be in place to ensure mobile equipment only operates on sufficiently stable surfaces and on gradients that are within the limits of safe operation.
- 2.12** Seat belts must be used in all cases for all occupants.
- 2.13** Mobile phones, whether hands free or not, must only be used by the driver of mobile equipment while it is stationary and in a safe location.

2.14 On-the-job risk assessments must be conducted as part of the planning process for mobile equipment operations and activities including:

- Maintenance activities.
- Risks to personnel from remote-controlled mobile equipment.
- Risks from loading, unloading, towing and recovering mobile equipment.
- Risk of fire in mobile equipment.

2.15 Procedures must be in place for the safe isolation of mobile equipment. These procedures must be consistent with [Fatal Risk Control 5 – Isolation](#).

2.16 A site-based traffic management plan (which can be incorporated into the plan developed for light vehicles - (see [Fatal Risk Control 1 – Road Going and Light Vehicles](#)) that is approved by the Operations Manager (or equivalent for Projects), must be in place including, but not limited to, the following:

- Segregation of pedestrians, light vehicles and mobile equipment where possible.
- Setting of appropriate speed limits, and installation and maintenance of road signage.
- Right-of-way rules (including overtaking restrictions).
- Access planning in areas identified as hazardous and having significant associated risk.
- Systems to control movement of mobile equipment in areas accessible to pedestrians, into and out of workshops, and for controls on pedestrian and light vehicle movement around mobile equipment.
- The minimum safe distance to be maintained between light vehicles and mobile equipment.
- Designated parking areas for heavy vehicles and light vehicles, including parking around maintenance areas.
- Systems to control approaching, refueling, parking, boarding, disembarking and isolation by production and maintenance crews. Equipment operators or drivers must be out of the cabin and dismounted onto ground level when their direct involvement with maintenance or servicing is not required.
- Guidelines for abnormal road conditions (e.g. rain, high winds) giving “go/no go” criteria and stating the responsible person for this decision.

- Clear communication procedures for interactions between all vehicles.
- Truck loading/unloading procedures - to avoid material or objects falling from the vehicle.
- Guidelines for wide or abnormal loads including offsite transport.
- Systems to control equipment use within the vicinity of overhead power lines.

2.17 Risk assessments must be carried out prior to any changes to traffic movements or road systems.

2.18 Where conditions require, a dust control and water management plan for road and site operations must be in place. Consideration must be given to extreme wet weather and the issue of over-watering roads.

2.19 Parking standards must include requirements for the immobilization of mobile equipment (e.g. chocking) and consideration for breakdown maintenance activities.

2.20 A tire management system must be in place to address issues including fire, heating, explosion, electrical contact, separations, maintenance, tire changes, etc.

People

2.21 Recruitment and induction processes for mobile equipment operators must encompass past work history, site testing and comprehensive medical examinations that confirm fitness for work.

2.22 Site and area induction of operators must be performed prior to starting work in a new area.

2.23 A permit or certification system must be in place to ensure drivers are competent to drive on site. In addition, a system must be in place to verify that operators of Petroleum vehicles have a valid driver’s license prior to operating Petroleum vehicles off-site.

2.24 A fit-for-work policy must be in place, incorporating defined action levels for drugs and alcohol.

2.25 A system must be in place to manage driver fatigue.

2.26 Behavior-based observations must include the operation of mobile equipment. Any need for additional specific retraining must incorporate the results of these observations.

CONTROL 3

EXPLOSIVES

INTENT

To eliminate or minimize the risk of fatalities, injuries and incidents arising from the storage, handling, use, initiation and disposal of explosive materials and associated equipment.

PERFORMANCE REQUIREMENTS

Plant and Equipment

- 3.1** The following types of explosives may be used during drilling and well operations:
- Primary High Explosives (detonating explosives), e.g. detonators and blasting caps.
 - Secondary High Explosives: used in perforating charges, primer/detonating cord and cutters and which require a primary explosive to initiate them.
 - Secondary Low Explosives (deflagrating explosives): powders used mainly for CST.
 - Flammable Solids: not explosives as such - these generally include packer setting charges.

Procedures

- 3.2** Explosive management procedures must ensure the safety of all well-site and off site personnel throughout all stages of operations involving the use of explosives, i.e. during transportation, storage, handling and disposal of such materials.
- 3.3** Procedures must include processes for:
- Identifying and managing of clearance zones for all blasts.
 - Controlling access to areas of blasting activity, including potentially affected areas.
 - Mitigating the risks of equipment operating (e.g. Simops) in the vicinity of loaded holes or explosives remnants.
 - Managing the risks of misfires and the destruction of old explosives.
 - Identifying and managing the risks of blasting in hot (temperatures greater than 55° Celsius or 131° Fahrenheit) or reactive ground.
- 3.4** The specialist explosive contractor's procedures must apply throughout operations involving the use of explosives.
- 3.5** All local regulations regarding the handling and use of explosives must be complied with at all times.
- 3.6** All explosive operations must be conducted under a Hot Work Permit.
- 3.7** Prior to commencing operations in a new area of operations, the service contractor must check all applicable law and ensure that all procedures for the handling and use of explosives comply with such local laws and regulations.
- ### Transportation
- 3.8** Explosives must only be transported in accordance with applicable local regulations and international agreements. The latter includes:
- The IMO/IMDG Code (International Maritime Dangerous Goods Code).
 - The CSC (International Convention for Safe Containers, 1982): ISBN 92 801 11310.
 - IATA/ICAO Regulations Covering the International Transport of Dangerous Goods.
- 3.9** Explosives must at all times be transported in accordance with the relevant service contractors approved procedures, with particular regard to any restrictions on the transport of loaded perforating guns or other explosive devices.
- 3.10** All transport containers and boxes must display proper warning labels.
- 3.11** Vehicles used for transportation must display the appropriate local or UN labels for the type of explosives being transported.
- 3.12** A manifest or bill of lading (as appropriate) must accompany all shipments of explosives, which must include the following information:
- Weight of each transportation container.
 - Detailed contents list of each transportation container, including the numbers and types of each charge and their individual weights.
 - Classification of explosives within each transportation container.
 - Number of transportation containers in the shipment.

CONTROL 3 EXPLOSIVES CONTINUED

- 3.13** Explosives must only be transported as packaged by the supplier or service contractor.
- 3.14** Explosives must not be transported in any vehicle that is carrying passengers for hire (e.g. bus).
- 3.15** Explosives being transported by land must only be carried in a vehicle approved by the relevant contractor or by a licensed common carrier.
- 3.16** Where transport of explosives by land cannot be carried out, preference must be given to transport by boat rather than by air.
- 3.17** If the explosives are to be transported by air, Petroleum Principal Aviation Specialist must be consulted prior to the transportation operation to ensure that [Petroleum Aviation Operations Controls](#) and applicable law are complied with.
- 3.18** Explosives to be destroyed must be stocked separately from explosives still in use or still required.
- 3.19** An up-to-date inventory of the quantities and types of explosives must be maintained on site by the appropriate service contractor(s), with an up-to-date copy of such inventories given to the Petroleum person in charge of managing explosives.
- 3.20** The location of explosive storage areas must be agreed before any explosives are brought onto site. This location must be agreed upon by Petroleum, the installation or drilling rig/site contractor and the specialist contractor.

Handling

- 3.21** Explosives must only be handled by approved personnel.
- 3.22** As soon as practicable after explosives are brought on site and prior to any explosion operations commencing, a meeting must be held, attended by the Petroleum Supervisor, the installation or drilling rig/site contractor, the Petroleum person in charge or managing explosives and the specialist contractor. During the meeting the following issues must be addressed:
- General safety and any existing hazardous conditions.
 - Locations of designated smoking areas.
 - Location for perforating gun/explosive charge make up.
 - Location of site radio antennas and any large off site antennas.
 - Numbers, locations and users of two-way radios and radio phones used on site.
 - Procedures for establishing and ending radio silence including, for offshore operations, standby vessels and other vessels which might approach the installation or drilling rig.

- Site Hot Work Permit system.
 - Personnel to be involved in operations, which must be restricted to the minimum practicable.
 - Organization and responsibilities during operations.
 - Contingency plans.
- 3.23** All affected site personnel must be made aware of the upcoming explosive operations. This may be achieved during regular site safety meetings or tool box meetings for current site personnel, also during site inductions for new site personnel.
- 3.24** When explosives charges are to be loaded, the make-up area must be marked by signs and warning tape. Access to this area must be restricted to authorized personnel only.
- 3.25** Prior to explosives being removed from the magazine for use:
- All other hot work must be suspended and permits returned to the control point.
 - Hand-held radios must be returned to the control room, well-site radio room or equivalent.
 - All site radio transmitters must be turned off and placed into such a mode of operation that an incoming call does not activate the transmitter.
 - For offshore facilities, standby/support vessels must be alerted and instructed to maintain radio silence when in the vicinity of the facility and to stand-off 6 miles (1 km) from the facility to warn off other vessels, until operations have been completed. The method by which radio silence is ended must be agreed in advance with the standby/support vessels.
 - If any large transmitters (e.g. radio or television) are located within 2½ miles (4 km) of the site, their operators must be contacted to request the synchronization of transmitters shut down with the planned explosion operations.
 - Where radio silence cannot be achieved, detonators which do not require Primary explosives must be used.
- 3.26** For wireline operations, the wireline cable must be rigged such that it does not contact any facility wiring. If necessary, facility wiring may be removed to avoid contact.
- 3.27** For drilling rig operations, checks must be made to ensure that no voltage exists between the facility, casing or wellhead, wireline cable armor and the logging unit. This must be constantly verified (by a continuous voltage monitoring) during operations.

CONTROL 3 EXPLOSIVES CONTINUED

- 3.28** Prior to explosive operations, the logging unit must be prepared by isolating electrical circuits and removing the electrical isolation/safety key.
- 3.29** All personnel must be clear of the line of fire prior to arming any explosive device.
- 3.30** Only the specialist contractor's engineer may arm an explosive device.
- 3.31** Explosive devices must not be armed if a thunder/electrical storm is expected imminently at the site.
- 3.32** Once the explosive has been lowered into the hole to a depth of at least 500 feet (153 meters) below ground level, electrical power may be restored to the instrument cab.
- 3.33** After firing, the tool/explosive may be brought out of the hole. At 100 feet (31 meters) (minimum) below ground level, the instrument cab must be prepared for explosive operation.
- 3.34** Only specialist contractor's engineer must disarm an explosive device.
- 3.35** If an armed gun or explosive device, including a mis-fired explosive device, is to be brought to the surface, all explosives contractors' appropriate rules and regulations must be strictly observed.
- Storage**
- 3.36** Only the minimum stock necessary for operations must be stored on site.
- 3.37** Explosives must only be stored on site if absolutely necessary for operations. Once they are no longer required they must be removed from the well-site unless specifically sanctioned by the Drilling Manager for a specific reason (e.g. planned future operations or hand-over to another Operator).
- 3.38** Primary High Explosives must be stored separately from Secondary High, Secondary Low Explosives and Flammable Solids.
- 3.39** Secondary High, Secondary Low and Flammable Solids may be stored together.
- 3.40** Explosive storage containers must be equipped with:
- No electrical wiring or, alternatively, explosion proof electrical (EXP) wiring.
 - Proper ventilation.
 - Proper external warning labels and markings attached.
- 3.41** Explosive storage containers must be:
- Designed and constructed specifically for the purpose of storing explosives.
 - Kept locked at all times, without the possibility of unauthorized access to keys.
 - Kept clean inside, free of empty packaging and foreign materials.
 - Kept clean outside in order to maintain a clear firefighting area.
 - In the case of containers stored on mobile offshore drilling units, capable of being jettisoned and with facilities for ease of location and recovery and with separate storage provided for Primary High Explosives.
- 3.42** Inside the containers, explosives must be:
- Separated by type, size, etc.
 - Stacked so that the oldest stock is used first.
 - Stored in such a way to facilitate easy inventory taking.
- Disposal**
- 3.43** No explosive remnants, including detonators, must be left at the site after operations have ceased other than for a specific reason (e.g. planned future operations or hand-over to another Operator) and unless sanctioned by the Petroleum Manager.
- 3.44** An inventory of all materials to be taken off site must be made prior to demobilizing explosives and the area checked for residual detonating cord scraps, loose charges, trash, etc.
- 3.45** All waste explosives (detonating cord, charges, etc.) must be transported off site in designated waste explosive containers, which must comply with applicable law and the other requirements of these Controls.
- 3.46** The end destination of all explosives wastes must conform to local regulations and the specialist service contractors own waste disposal plans.
- People**
- 3.47** The Petroleum site manager must oversee all activities performed by specialist service contractors.
- 3.48** All personnel involved in explosives operation must be properly qualified for the planned work.
- 3.49** The minimum practical number of site personnel must be involved in any explosive operation.

CONTROL 4

HAZARDOUS MATERIALS

INTENT

To eliminate or minimize the risk of fatalities, illnesses, injuries and incidents including loss of containment arising from the processing, storage, handling, production, transport, recycling and disposal of hazardous materials.

PERFORMANCE REQUIREMENTS

Plant and Equipment

- 4.1** The basis of design of a facility or process, permanent or temporary, which transports, produces, stores, uses or disposes of hazardous materials must be reviewed, amended as necessary and assessments of change must be documented utilizing a process risk assessment tool such as HAZOP (hazard and operability), HAZID (hazard identification), etc. As-built design drawings (e.g. process and instrumentation diagrams, process flow diagrams, layout drawings, isometrics, etc.) must be updated as a result of these reviews.
- 4.2** All specifications for the design and/or modification of hazardous materials facilities must be subject to risk assessment that includes hazardous materials selection, transport, production, storage, handling, use and disposal. Previous incidents should be reviewed to ensure risk is as low as reasonably practicable (ALARP).
- 4.3** All facilities which have a recognized risk from hazardous substances must provide an emergency response plan which includes:
- Means of escape in an emergency situation.
 - Emergency response teams appropriate to the risk.
 - Appropriate provision of safe refuge and assembly areas for people.
 - Emergency response equipment for spillage containment, fires, explosions, burns, etc.
 - Appropriate response arrangements with external medical providers, e.g. ambulance, hospitals, fire brigade, etc.
 - Emergency response procedures appropriate to the hazardous materials and the risk.
 - Recovery procedure and disposal of the hazardous material.
- 4.4** Provisions for safe venting, drainage and containment, where required by normal operations or emergency situations, must be based on a process risk-assessment tool such as HAZOP and HAZID, and be conducted in accordance with the [Petroleum HSE Risk Matrix Procedure](#).
- 4.5** Labeling must be in place on all storage vessels, containers and tanks, as per appropriate national or international standards. As a minimum, this labeling must clearly identify the carried or stored material.
- 4.6** Piping containing hazardous material must be marked such that the contents and direction of flow of the piping can be identified.
- 4.7** Temporary, powered equipment (combustion or electrically powered) must be examined for protective devices and conformity with Petroleum and regulatory requirements, and must not be used or sited within areas that have been identified as having a "Zone 1 (IP/MODU codes) or Division 1 (API Recommended practice RP500) Hazardous Area Classification."
- 4.8** Where temporary powered equipment (combustion or electrically powered) is to be used within a "Zone 2 (IP/MODU codes) or Division 2 (API Recommended practice RP500) Hazardous Area Classification," the equipment must, as a minimum, be subject to formal risk assessment for its use in that area and include the following equipment:
- Automatic air intake shutdown devices.
 - Overspeed protection devices.
 - Exhaust spark arrestors.
 - Protected/cooled exhaust manifolds and ducting.
 - Non-flammable fuel lines.
 - Pneumatic starter motors.
- 4.9** Where temporary process lines are required within production/plant process areas, these should be hard piped. Where there is a requirement, by design, for flexible lines, these must meet acceptable international codes and standards (i.e. Coflexip process piping). The use of flexible lines must be risk assessed and approved by the relevant authority.
- 4.10** Glass devices must not be designed into process facilities.
- 4.11** Hazardous materials must be segregated from and not come into contact with incompatible materials.

CONTROL 4

HAZARDOUS MATERIALS CONTINUED

- 4.12** Security, access control systems and hardware must be in place, appropriate to the risk, to manage access to areas where hazardous materials are stored and used.
- 4.13** Process control systems must ensure that the potential for personnel to be exposed to hazardous materials is eliminated wherever possible or reduced to ALARP.
- 4.14** Automatic process control systems must be in place in hazardous material facilities to eliminate the need for operator intervention and maintain operation within the safe operating envelope. Such systems must incorporate fail to safe systems in the event of emergencies. Where automatic control is not practicable, risk assessment must be used to identify and implement operational options that reduce HSE risk to ALARP.
- 4.15** Equipment must be designed and operated to fail in a safe condition during events of interruption to electric, hydraulic or pneumatic power supply.
- 4.16** Fixed and personal detection devices appropriate to the hazard must be considered as options in the selection of potential risk reduction measures.
- Procedures**
- 4.17** A risk assessment process must be in place for all hazardous materials to identify:
- The selection criteria and life-cycle analysis for all hazardous materials
 - The level of risk associated with the hazardous materials
 - Controls required to manage the risk to levels that are ALARP
 - The performance requirements (reliabilities and capacities) of specific equipment and systems included in these controls.
- 4.18** The risk assessment must include an assessment of the processes containing hazardous materials where the volumes/quantities meet or exceed the thresholds in Annex I of the Seveso II Directive - (<http://mahbsrv.jrc.it/framework-seveso2-leg-en.html>). Copies of all relevant design input and output records from the process hazard analysis must be kept throughout the life of the plant.
- 4.19** All hazardous material risk assessments must be reviewed at a minimum of every three years or when:
- There is reason to believe the assessment is no longer valid.
 - There has been significant change in the work procedure or the chemical product used.
 - Any results of monitoring employee's exposure show it to be necessary.
- 4.20** A system must be in place to ensure that all risk assessments are up to date, controlled and available to all personnel. Where an electronic system is used, the risk assessments must be attached to the chemical product record.
- 4.21** A site register must be in place for all hazardous materials, and include the following:
- Name of product and manufacturer details.
 - HAZCHEM/United Nations code.
 - Material Safety Data Sheet (MSDS).
 - Summary of maximum inventory.
 - Storage requirements and precautions.
 - Specific storage location(s).
 - Physical properties of the chemical product.
 - Approved disposal methods.
- 4.22** A system must be in place to ensure that the site register and MSDSs are available to affected personnel (including first-aiders and medical personnel) involved in the transportation, storage, handling, use and disposal of hazardous materials on site.
- 4.23** A system must be in place to identify and document maintenance, inspection, testing schedules and procedures for critical equipment associated with hazardous materials.
- 4.24** A system must be in place whereby the introduction and disposal of hazardous materials, including containers, must be approved by the site hazardous materials co-coordinator prior to introduction or disposal.
- 4.25** A system must be in place for the management of change of equipment and/or processes for transportation, storage handling, use and disposal, and must include specific steps to assess the impact of changes on the risk associated with hazardous materials.
- 4.26** A system must be in place to ensure that all relevant design documents and drawings associated with this Control are up to date, controlled and available.
- 4.27** Critical activities involving hazardous material, which have the potential for immediate or long-term harm, must be identified and safe operating procedures documented, including transportation, storage handling, use and disposal of incompatible hazardous substances.

- 4.28** Systems for monitoring hazardous material activities must be in place to ensure that the status of operation is understood and shown clearly at all times. Where these systems include human interface, they must include a procedure for the documented hand-over between shifts that records any relevant information/changes in operating status.
- 4.29** Safe operating limits for plant and equipment handling hazardous materials that have the potential for immediate or long-term harm, must be clearly defined, documented and up to date to reflect current plant arrangements and available to operations and maintenance personnel.
- 4.30** A system must be in place to ensure proper decontamination of plant and equipment, isolation, use of the correct personal protective equipment and any special requirements or precautions (e.g. requirements for venting, clearing of piping or when using naked flames) to ensure that the occupational exposure limit of a hazardous substance is not exceeded.
- 4.31** A system must be in place to control simultaneous operations involving hazardous materials to avoid mixing of incompatible materials.
- 4.32** Emergency response plans for hazardous materials incidents must be in place and tested, reviewed and documented annually. This must include external support services such as local ambulance and hospitals as appropriate to the risk.
- 4.33** A system must be in place to control and monitor access to areas where hazardous materials are stored and handled. This must also identify process areas where hazardous materials may be released under certain operational circumstances (e.g. vent opening during process upset, infrequent discharge points) and what restrictions are placed on access to those areas.
- 4.34** A system must be in place to monitor short and long-term exposure of personnel to hazardous materials, which have the potential for immediate or long-term harm. This system must ensure that fatality potential is also addressed.
- 4.35** Procedures must be in place for transporting hazardous materials. A hazardous material manifest and supporting documentation must be completed and shipped with the hazardous material. This documentation must comply with local applicable law.

People

- 4.36** A site hazardous materials coordinator must be appointed by the site manager, at sites where hazardous materials are processed stored and handled. This person must have training and be competent to understand and evaluate the risks associated with a wide variety of substances, and be able to identify where additional expert advice can be sourced. The individual must be responsible for assessing the hazardous properties and disposal requirements of materials used, monitoring the consumption and management of inventory, and also provide an "as needed" service to supply, warehousing, operational and HSE personnel.
- 4.37** The risk assessment process must include people with relevant subject knowledge expertise. Consideration should be given regarding the use of external people (e.g. supplier technical officers).
- 4.38** Sites with hazardous materials must provide personnel with information and training on the nature of the hazards to which they may be exposed and the means of assessing and controlling their exposure.
- 4.39** A system must be in place to authorize and control the training of appropriate personnel in normal transportation, storage handling, use and disposal of, and emergency response procedures for hazardous materials.
- 4.40** A competency-based training system must be in place for operations, maintenance and emergency response roles involving hazardous materials. Use should be made of supplier expertise to supply this training with annual refresher courses, if required.
- 4.41** Behavior-based observations must include the operation of equipment and systems handling hazardous materials. Any need for additional specific retraining must incorporate the results of these observations.

CONTROL 5

ISOLATION

INTENT

To eliminate or minimize the risk of fatalities, injuries and incidents arising from the uncontrolled release of energy or hazardous materials.

PERFORMANCE REQUIREMENTS

Plant and Equipment

- 5.1** Purchase and design of equipment (including hired and contracted equipment) must give due consideration to meeting the requirements of this Control.
- 5.2** Isolation must provide positive protection and be achieved by the use of locking devices or the establishment of a physical barrier or separation. In addition, where separation or a physical barrier is used for the isolation, these must be provided with either a permanent or temporarily fitted locking device.
- 5.3** Locking devices must:
- Be uniquely keyed.
 - Not be combination locks.
 - Not have an unauthorized second-party master override key.
 - Be kept under the exclusive control of the site permit authorities and those individuals forming part of the formal isolation process.
 - Not be transferred to another person for lock removal.
- 5.4** Designated isolation points must be clearly labeled at all times to identify the circuit or system over which they have direct control. These labels must be applied following a process of pre-isolation identification using isolation lists, marked drawings, etc. (where permanently applied, these labels must be physically verified prior to the isolation).
- 5.5** Lockout boxes, stations or equivalent must be provided where required and must be controlled by the site permit authority.
- 5.6** All designated isolation points fitted with locking devices must be tagged. The isolation tagging system must ensure that:
- Isolation points are positively identified, including the name of the person locking out.
 - The reason for the isolation is clearly identified, including relevant unique permit to work and isolation identification numbers).
 - Isolation tags are highly visible to prevent inadvertent operation.
- 5.7** The isolation of wells must conform to the barriers policy detailed within [Worldwide Drilling \(WWD\) Well Integrity Standards – WWD007](#).
- ### Procedures
- 5.8** All Petroleum sites must comply with the following Petroleum procedures:
- [Lock Out Tag Out](#)
 - [Permit to Work](#)
- 5.9** The isolation system must be applied to all activities on site, including contractor activities (e.g. construction, commissioning, operation, maintenance, return to service, sanction to test, emergency, modification or demolition of equipment).
- 5.10** A risk-based process must be used to determine the appropriate isolation method for any activity (either by way of a full description for specific cases, or by demonstrating the process that must be followed to achieve the appropriate level of isolation in new activities). This must include, but not be limited to:
- The role of work instructions, checklists, tagging requirements and the permit to work system.
 - A positive registration process for people working on isolated equipment (personal tag, log sheet, etc.).
 - Changed requirements associated with the duration of the isolation and task(s), or when tasks take longer than planned to complete.
 - Energy sources to be isolated (hazardous materials, mechanical, electrical, etc.).
 - The physical state of the energy sources such as their phase (liquid, solid, vapor, etc.) and other characteristics (e.g. pressure, temperature, voltage, etc.).
 - Controls required for the duration of the activity (temporary engineering and operating changes, emergency procedures, personal protective equipment, etc.).
 - The requirements for formal contact with representatives in charge of each facility area affected, and the process for granting written authorization to proceed.
 - Special precautions when isolations cover one or more shift changeovers.

CONTROL 5 ISOLATION CONTINUED

- 5.11** Documented system-specific isolation procedures must be in place for critical operations and critical equipment (such as simultaneous operations, critical alarms, emergency shutdown devices, relief and blow-down valves, fire and gas detection and protection devices, and other items as designated in the critical equipment register).
- 5.12** Documented test procedures must be provided to verify isolation integrity including, but not limited to, the following principles:
- Identification of all energy sources or hazardous materials directly and indirectly associated with the work to be performed.
 - Confirmation of those systems requiring isolation.
 - Isolation of the confirmed energy or hazardous material sources.
 - Application of lock/tag.
 - Application of isolation tag.
 - Trying/testing of all systems and non-redundant isolations when reasonably or feasibly possible (to verify the integrity of the isolation and ensure a zero energy state exists).
- 5.13** A formal procedure must be in place for controlling clearances to work for the:
- Isolation and de-isolation of plant and equipment.
 - Handover and hand back of plant and equipment between operation and maintenance.
 - Transfer of isolations between shifts or different workgroups.
- 5.14** Specific procedures must be developed and implemented to address software overrides.
- 5.15** A procedure must be in place to mitigate hazards in special cases where any one of the following is not achievable:
- A zero energy state,
 - A test/try of isolation is not possible, or
 - Use of a locking device is not feasible.
- 5.16** Formal isolation procedures must include requirements for investigation, reporting and removal of personal locks/tags by an authorized person other than the originator.
- 5.17** The isolation and de-isolation of wells during simultaneous drilling and production operations must take place under a permit to work.
- 5.18** Regular audits of the permit-to-work and isolation processes must be conducted.
- People**
- 5.19** A competency-based training system that includes the requirements of this Control must be in place for relevant personnel involved in the operation and maintenance of plant and equipment.
- 5.20** Behavior-based observations must include work activities associated with isolation processes. Any need for additional specific retraining must incorporate the results of these observations.

CONTROL 6

EQUIPMENT SAFEGUARDING

INTENT

To eliminate the risk of fatalities and injuries where and when there is the potential for human interaction with moving parts or potential moving parts of plant and equipment.

PERFORMANCE REQUIREMENTS

Plant and Equipment

- 6.1** New plant and equipment must consider all energy sources and be designed to eliminate the need for guarding where practicable. Safeguarding must be selected where other potential mitigation measures do not adequately protect personnel.
- 6.2** Plant and equipment safeguards must be designed and constructed to comply with applicable law, standards, codes of practice and relevant recognized leading industry practices and considering maintainability and operability.
- 6.3** A formal system must be in place to ensure the integrity of plant and equipment safeguarding.
- 6.4** Where safeguarding and interlock systems are insufficient to protect people, access to plant and equipment must be controlled and monitored.
- 6.5** Fail-to-safe switches or devices must be installed on all manually operated rotating plant and equipment and power hand tools (e.g. saws, lathes, drill presses, etc.).
- 6.6** Guards must only be removed for maintenance and repair after plant and equipment has been isolated, locked out and tested in line with the relevant Isolation Control. Where the temporary removal of safeguards is necessary on operating plant and equipment, for the purposes of fault finding, testing and commissioning, a risk-based procedure must be in place. Guards must be replaced prior to plant and equipment being put back into operation.

Procedures

- 6.7** A risk-based process must be used to identify where safeguarding and interlocks are required on plant and equipment.
- 6.8** A risk-based process must be used to identify safeguarding hazards that require interlock systems as an additional control.
- 6.9** All documentation related to the risk-based process for the selection and modification of safeguarding requirements must be retained and controlled.
- 6.10** A change management system must be used to ensure the integrity of safeguarding is optimal when change occurs.
- 6.11** Guarding must not be modified or altered except through the application of a risk-based change management process.

People

- 6.12** A competency-based training system that includes the requirements of this Control must be in place for relevant personnel involved in the operation and maintenance of plant and equipment.
- 6.13** Behavior-based observations must include work activities associated with plant and equipment safeguarding. Any need for additional specific retraining must incorporate the results of these observations.

CONTROL 7

WORKING AT HEIGHT

INTENT

To eliminate or minimize the risk of fatalities, injuries and incidents arising from working at height (two meters or more, or where a fall could result in a significant incident).

PERFORMANCE REQUIREMENTS

Plant and Equipment

- 7.1** New builds, including new plant and equipment, must be designed to minimize the need to work at height.
- 7.2** All working at height equipment must comply and be used in accordance with relevant approved design standards and manufacturers specifications. This includes a secure working area which includes:
- Flooring securely fastened in place so it cannot be accidentally dislodged.
 - Mesh, railings or solid barriers to prevent a person falling.
- 7.3** Single person anchor points must be capable of withstanding 15kN (approximately 3,372lbf). Where it is not practical to install dedicated anchor points (i.e. ad hoc work), anchor points capable of withstanding 15kN must be identified through a risk assessment process and must be approved by a competent person prior to commencement of work.
- 7.4** When working within 2 meters of an opening where the provision of a secure working area is not practicable, personnel must use fall restraint equipment, such as a fixed lanyard and harness as a minimum, to prevent them from falling over the edge.
- 7.5** When working at height and the provision of a secure working area is not practicable, personnel must wear appropriate fall restraint or fall arrest equipment. In such circumstances a full body harness, including shock-absorbing lanyard or inertia reel, is mandatory.
- 7.6** The use of body belts for fall arrest is prohibited.
- 7.7** Fall-restraint and fall-arrest equipment must have lanyards and snap hooks with secondary locking mechanisms.
- 7.8** Where work methods require persons to detach and re-attach at height, a dual lanyard system must be utilized to ensure that at least one connection point is maintained at all times.
- 7.9** Where fall-arrest equipment has been identified as a requirement through a risk assessment (see Performance Requirement 7.21), fixed ladders used to access or exit from places at height must:
- Have fall-arrest equipment such as "ladsafe" or the use of dual lanyard systems for detaching and re-attaching to ensure at least one connection point at all times, installed and used.
 - Have access and egress points fitted with high visibility markings and signage indicating the need for fall-arrest equipment to be used.
 - Be fitted with cages that meet relevant approved design standards.
- 7.10** Fixed ladders:
- Should be replaced with stairs where it is practicable to do so.
 - Should be fitted with high-visibility markings and signage where they are used for emergency access/egress only.
- 7.11** All forms of portable and movable elevated work platforms and suspended work baskets must conform to relevant approved design standards. People in the work platform basket must wear a correctly fitted harness attached by a lanyard to a suitable certified anchor point in the basket. This does not apply to people working from a properly constructed and certificated scaffold with the requisite handrails and toe boards.
- 7.12** Where operators need to gain access to places at height on plant and equipment, access ways or dedicated fixed ladders should be provided. Ideally access ways should have handrails and fixed ladders should have ladder cage/back-scratchers.
- 7.13** Portable ladders must not be used:
- Unless the provision of a secure working area is not practicable.
 - For work above 2 meters unless a formal risk assessment has been conducted and suitable controls that mitigate that are signed off by the site senior manager.
 - Under any circumstances for work above 9 meters.
- 7.14** Persons working at height must ensure that their safety helmets are secured to prevent them from falling when working at height.

Procedures

- 7.15** The risk of fall must be eliminated where reasonably practicable utilizing the Hierarchy of Controls. Works tasks must be planned to minimize the need to work at height.
- 7.16** Standard work procedures must be in place for the correct wearing and use of personal fall-arrest and fall-restraint equipment.
- 7.17** Where there is potential to fall from working at height in unprotected areas, access must be restricted and controlled through risk assessment.
- 7.18** Working-at-height activity must be conducted under a permit to work.
- 7.19** A documented risk assessment must be conducted before the commencement of work and at any time the scope of work changes or the risk of a fall increases. The risk assessments must include:
- Consideration for the potential of objects, as well as personnel, to fall.
 - Selection of appropriate control measures using the hierarchy of controls.
 - The possibility for weather and other environmental conditions to influence the working conditions (e.g. wind, rain, snow, dust, gases, poor lighting, temperature, etc.).
 - Selection of appropriate equipment.
 - Selection of anchor and tie-off points.
 - Condition of supporting structures such as roofs.
 - Selection of appropriate barricading and/or demarcation.
 - Fall clearances i.e. length of lanyard + tear-out distance + height of user + safety margin.
 - A formal written rescue plan that minimizes time to prevent suspension trauma.
- 7.20** Equipment must be fit-for-purpose and undergo pre-use checks and a minimum of six monthly documented inspections by a competent authorized person. An equipment register and tagging system must be in place to indicate compliance with this inspection. Testing must be done in accordance with recognized standards. Where deemed appropriate, a program for the renewal of equipment at a pre-determined frequency must be implemented.
- 7.21** Sites must develop and maintain a fixed ladder register. The register must identify, through formal risk assessment, those fixed ladders deemed of sufficient height or fall risk to warrant the use of fall-arrest equipment. The risk assessment must be approved by the site manager and endorsed by the senior HSE person responsible for the site, and must consider:
- Frequency of use of the ladder and potential removal of the ladder where there is a low frequency of usage.
 - Practicality of replacing the ladder with stairs.
 - Whether it is used only for emergency access/egress.
 - Whether access is isolated, limited or controlled under a permit system.
- 7.22** Personnel working at height must not work alone and there must be other personnel in the vicinity that can raise the alarm immediately should a person fall.
- 7.23** Processes compliant with the Fatal Risk Control 9 – Dropped Objects, must be in place to prevent tools, materials and other objects from falling from height.
- 7.24** Where working at height is required, barricading and warning signage must be placed on all lower levels where personnel or objects may fall.
- 7.25** The site emergency response plan(s) must include plans for the rapid retrieval of personnel in the event of a fall from height, including a fall into the sea, i.e. response time is critical if a person is to avoid suspension trauma, drowning or hypothermia. These plans must include the training requirements for the rescue team and training requirements for the use of specialized rescue equipment, including fast rescue craft and other rapid response arrangements for the recovery of personnel from the water.
- People**
- 7.26** Sites must implement a process to ensure selected personnel and, where appropriate, contractor personnel are fit to work from heights. Specific consideration must be given to personnel who suffer medical conditions, such as vertigo and epilepsy, as well as considering the weight of the person using the harness. (Note: many harness systems have a maximum weight limit of 136kg/300lbs.)
- 7.27** Personnel operating elevated work platforms and baskets must be trained and certified for the specific equipment they are using.
- 7.28** A competency-based training program for employees, applicable contractors and supervisors must be in place, which includes provisions for maintaining competence. All persons engaged in work covered by this Control must be adequately trained and assessed for competency.
- 7.29** Behavior-based observations must include activities and tasks associated with working from heights. Any need for additional specific retraining must incorporate the results of these observations.

CONTROL 8

LIFTING OPERATIONS

INTENT

To eliminate or minimize the risk of fatalities, injuries and incidents arising from the performance of lifting operations.

PERFORMANCE REQUIREMENTS

Plant and Equipment

- 8.1 All electrical cranes must have power supply isolation points capable of being positively locked.
- 8.2 Cranes must be formally approved and accepted by the site and, where identified as a hazard, have fall protection systems provided for their operation, maintenance and inspection.
- 8.3 Cranes without a physical locking system that disables and isolates its free-fall capability must not be used.
- 8.4 Offshore pedestal, portal and mobile cranes must have overload protection fitted; Electric overhead traveling cranes should have overload protection fitted where possible.
- 8.5 Crane cabins should be air-conditioned or heated in accordance with environmental conditions.
- 8.6 Cranes must be risk assessed for the requirements of a secondary means of escape in case of emergency and self rescue equipment such as smoke-hood, fire extinguisher and life jacket.
- 8.7 All crane cabins must have signs to warn against interruption of the operator.
- 8.8 Vehicles fitted with loading/unloading cranes (e.g. truck mounted cranes) must have sufficient physically engineered controls to prevent the operator from being crushed during lifting operations.
- 8.9 All crane hooks must be fitted with a positive locking safety catch.
- 8.10 The safe working load (SWL) or working load limit (WLL) must be clearly identified and marked on all cranes and relevant lifting equipment and must not be exceeded.
- 8.11 Load cells, load moment indicators and external rated capacity limiters must be available in accordance with the requirements of the Petroleum [Lifting Operations Procedure](#).
- 8.12 All cranes and lifting equipment must comply with the requirements of the relevant approved design standard. The minimum acceptable design standard must be the relevant ISO standard. In countries where the requirements of the relevant national standard exceed the requirements of the ISO standard, the national standard must apply.

- 8.13 All cranes and lifting equipment must be identifiable with a unique identity code or number.
- 8.14 Drilling Rigs should be designed to eliminate the use of man-riding systems for access. Where the existing design of a drilling rig includes man-riding systems, they must be used solely for lifting and holding personnel, and must not be used to lift any other loads.
- 8.15 Items of lifting equipment that are subject to wear and frequent replacement (e.g. slings, shackles, pad-eyes, shipping and handling baskets) or used to transport equipment to and from sites, must be color coded to confirm compliance with certification and inspection requirements, and to identify expiration of equipment certification to prevent usage.

Procedures

- 8.16 A formal selection and acceptance process based on risk assessment must be in place for all new (to site) and modified lifting equipment, in compliance with the Petroleum [Lifting Operations Procedure](#), taking into account the crane's various safety features and cabin ergonomics, prior to commencement of work.
- 8.17 Cranes must be subject to daily visual inspections of wire ropes, sheaves, hoses and general condition. Daily inspections must include tests to be conducted to confirm the correct operation of all limit switches, shutdowns, load indicators, alarms and other safety devices.
- 8.18 Manufacturer's crane and lifting equipment operating manuals and load charts must be available to the crane and lifting equipment operator. These should be in the language of the country in which the lifting equipment is being used.
- 8.19 Where the crane and lifting equipment operator is not conversant with the language of the country, provisions must be made to ensure that the operators can understand the operating manuals and load charts.
- 8.20 A procedure must be in place to address:
 - Lifting operations when the arcs of operation of two or more cranes can overlap*.
 - Multiple crane lifting operations*.
 - The danger to lifting operations when adverse weather conditions are present or imminent e.g. electrical storm, high winds and sea state.

- Personnel safety when cranes and lifting equipment are operating in the proximity of live electrical conductors*.
 - Lifting operations when lifting near or over unprotected plant, equipment or services, including live process or hydrocarbon processes*.
 - The effective hand-over from one operator to another for cranes with complex boom, jib or tower configurations.
- 8.21** Detailed lifting plans must be established and implemented for the points marked with a "*" in the previous performance requirement. The plans must be approved by a competent supervisor. Toolbox meetings must be held prior to such lifts to ensure all personnel understand how it is to be executed.
- 8.22** Availability and use of check-lists for pre and post-operational inspections.
- 8.23** Cranes must not be used for lifting operations until crane operators have been given sufficient time to familiarize themselves with relevant aspects of the crane.
- 8.24** Risks associated with all lifting, crane maintenance, assembly activities and environmental conditions must be assessed as part of the planning process. Barricading, warning signs or other means of ensuring personnel protection must be in place during lifting operations and for those cranes left unattended in wind vane mode.
- 8.25** There must be no side loading of crane booms.
- 8.26** With the exception of pick and carry operations, no lifting must be carried out without outriggers being deployed and locked.
- 8.27** Controls compliant with the Fatal Risk Control 9 – Dropped Objects must be in place to prevent objects from lifting equipment and loads falling.
- 8.28** The lifting of personnel with cranes must only be carried out in exceptional circumstances, after an appropriate risk assessment, and must only use approved workbaskets in accordance with the [Lifting Operations Procedure](#). Cranes used for this purpose must be approved as suitable for man-riding operations. A recovery plan must be in place before personnel are lifted.
- 8.29** The elimination of the need to work under suspended loads must be pursued. Where working under suspended loads is unavoidable, controls must be in place to eliminate or minimize the risks to personnel.
- 8.30** Any modification to cranes and lifting equipment must be subject to the original equipment manufacturer's approval and to a rigorous change management process.
- 8.31** A preventative maintenance system must be in place to ensure that all cranes and lifting equipment is maintained and in a serviceable condition.
- 8.32** All cranes and lifting equipment must be inspected and tested (including non-destructive testing as required by the relevant standard) prior to being operated or put into service. After any repair and/or modification, cranes and lifting equipment must be inspected (and non-destructively tested as required by the relevant standard) prior to being returned to service.
- 8.33** A system of periodic inspection must be in place for all cranes and lifting equipment. Lifting equipment must be visually inspected and confirmed fit for purpose prior to being put into service. Visual inspection of lifting equipment by approved competent person should be performed on a regular basis (e.g. monthly or every six months) unless regulations in the local area require examination more frequently.
- People**
- 8.34** A register of all lifting equipment must be maintained and include:
- Equipment unique identification numbers.
 - Documented evidence of all inspections.
 - Certifications.
 - Maintenance.
 - Modifications and Tests.
- 8.35** Suitably qualified, certified and competent person(s) must be involved in the planning, supervision and implementation of the lifting operations.
- 8.36** The roles and responsibilities for lifting operations must be clearly defined and communicated.
- 8.37** A competency-based training program for contractors, employees and supervisors must be in place. An approved examiner must assess the competency for trainers performing such training.
- 8.38** A competent person must determine the maximum environmental conditions under which cranes and lifting equipment can be safely used. Except in the event of an emergency, cranes and lifting equipment must not be put into service if the maximum environmental conditions are exceeded. Risks must be assessed in emergency situations.
- 8.39** A competent inspector must perform lifting equipment inspections. An approved examiner must assess the competency of the lifting and handling equipment inspector.
- 8.40** Crane operators and crew must be able to communicate in a common language and to use the correct crane signals.
- 8.41** A fit-for-work policy must be in place, incorporating defined action levels for drugs and alcohol and a fatigue management plan.
- 8.42** Behavior-based observations must be performed and any need for additional specific training must incorporate the results of these observations.

CONTROL 9

DROPPED OBJECTS

INTENT

To eliminate or minimize the risk of fatalities, injuries and incidents arising from dropped and falling objects.

PERFORMANCE REQUIREMENTS

Plant and Equipment

- 9.1** All permanently installed equipment suspended more than 2 meters above ground must be reviewed for applicability of primary and secondary securing mechanism. Where a secondary securing mechanism is deemed unnecessary or impractical, primary securing devices must have in-built secondary securing devices (e.g. nuts with split pin or securing wire).
- 9.2** Where safety wires are used as a secondary securing mechanism for an object that may become detached, they must be as short as reasonably possible. This is to prevent high kinetic energy build-up after failure of the primary attachment (e.g. minimize shock loads). This is particularly important where safety wires are used on heavy equipment. Designs must take into consideration both the weight of the load and the distance it drops before the restraint takes effect.
- 9.3** Safety wires must be routed to a secure location independent of and remote from all parts of the object (or its attachments) that may become detached. For example, a floodlight might be secured to an adjacent section of structural steel, not to a sub-component or any other supporting part of that floodlight that may also fail.
- 9.4** Permanently installed shackles must be safety type, i.e. nut and bolt type with nut retaining mechanism, rather than a screw-pin type.
- 9.5** Hand tools that are to be used for working at height must have a secondary securing mechanism such as a lanyard, which must be attached either to the workman or to a fixed point adjacent to the work site.
- 9.6** Tools must be carried aloft and returned to ground level using a tool belt or other effective means of preventing them from falling.

- 9.7** All permanent and temporary structures, plant and equipment, including forms of portable and movable elevated work platforms, suspended work baskets and properly constructed and certified scaffold with the requisite handrails and toe boards, must conform to relevant approved design standards and manufacturers specifications.
- 9.8** All contractor-owned-and-operated equipment, third-party equipment, and equipment hired or contracted directly by Petroleum for controlled operations must be reviewed before it is used to ensure compliance with this Fatal Risk Control.

Procedures

- 9.9** All facilities must have a dedicated dropped object management system in place. The system must include the following provisions:
- An inspection of the facility must be conducted to identify all objects that have the potential to drop; a register must be developed and maintained.
 - The potential negative effect of a dropped object must be eliminated utilizing the Hierarchy of Controls.
 - The possibility for weather and other environmental impacts to influence the working conditions (e.g. wind, rain, snow, dust, gases, poor lighting, temperature etc.) must be assessed.
 - Primary prevention of falling objects must rely on an adequate and effective maintenance system so that secondary restraints provide redundancy only.
 - All high-level equipment and workspaces must be inspected periodically to ensure that no loose or redundant equipment or material is present at any elevated location.

- All loose and redundant tools and equipment must be removed on completion of work tasks.
 - All hand and power tools used for working at heights must be tracked and documented up and down using a "Tools Aloft Procedure."
 - The selection of appropriate warning signage, barricading and/or demarcation must be placed on all lower levels where personnel or objects may fall.
 - Risk assessments must include interactions between work groups.
 - Documented handling procedures and safe work practices for all operations must be carried out where there is a risk for equipment to fall from height.
- 9.10** Planned maintenance systems must include a requirement to ensure that all elevated areas and equipment at high level are regularly inspected for loose or redundant equipment and that permanent equipment supports and attachments are properly maintained. The amount and frequency of inspection must be determined by:
- Documented risk assessment.
 - The current condition of the equipment, with particular reference to historic maintenance and inspection records.
 - Local and environmental conditions and an assessment of the probable future rate of deterioration.
 - Usage and redundancy.
 - Reference to equipment manufacturers recommendations.
- 9.11** The dropped object management system must be included in the facility Management of Change system, for additions or modification to existing high-level equipment and other equipment that is considered high risk.
- 9.12** The dropped object management system must be included in both start-up and periodic HSE audits and facility inspections.
- People**
- 9.13** Dropped object management systems must define the person/position responsible for each individual workspace, work area and high-level equipment included in the system.
- 9.14** All personnel working aloft must, during and on completion of work tasks, routinely inspect the immediate work area for loose tools and equipment. Adjacent equipment must be checked for its condition (e.g. to identify loose attachments, bolts, and fittings, etc.).
- 9.15** A competency-based training program for employees and supervisors must be in place, which includes provisions for maintaining competence regarding dropped objects and with consideration to training in risk and hazard identification.

CONTROL 10

WORKING WITH PRESSURE

INTENT

To eliminate or minimize the risk of fatalities, injuries and incidents arising from the uncontrolled release of energy associated with pressurized equipment.

PERFORMANCE REQUIREMENTS

Plant and Equipment

- 10.1** All pressure equipment, regardless of its pressure rating, must be designed, constructed, tested, inspected, placed into service and maintained in accordance with appropriate internationally recognized industry standards.
- 10.2** Piping systems must follow appropriate internationally recognized industry standards.
- 10.3** All pressure containing equipment must be included in the facility or equipment providers' planned maintenance system and include detailed inspection procedures and intervals.
- 10.4** Where pressure equipment is, or forms a part of a system that is, classed as "Critical" equipment, it must be subject to verification of its performance standard and certification as required by applicable law and/or the facility Safety Case.
- 10.5** All new and refurbished/repared pressure vessels as defined by API codes must be clearly marked with a unique identifier and maximum working pressure as verified by an independent competent person. The documentation to be verified must include:
- Unique identifier (all components should have a unique serial number, equipment code or local ID number).
 - Date first placed into service, with a description of the equipment or component.
 - Maximum Allowable Working Pressure (MAWP) and Maximum Test Pressure.
 - Copies of the initial inspection and most recent pressure test records.
 - Most recent weld qualification records.
 - Manufacturer's certification and traceability records.
 - Certification renewals (as issued by the certifying authority).
 - Documentation of major repairs and re-certification (issued by the NDE contactor or by the repair contractor).
- 10.6** All pressure systems must be fitted with an effective relief device (e.g. relief valve or burst disc) to prevent over-pressuring. The relief device must be sized/designed for the most appropriate duty (full-flow or fire case). Wellheads and Christmas Tree systems are an exception, where Wellheads and Christmas Tree systems must be rated to full Shut-in Wellhead Pressure (SIWHP) and must not use any type of pressure relief system (PSV's or Bursting Discs).
- 10.7** For drilling rigs, fixed, permanent and temporary flexible piping must comply with the requirements of [WWD002 Drilling Audit and Inspection Standards, Appendix 8 – Technical Inspection and Audit Management Guideline – Rig Piping and Hose Systems](#).
- 10.8** Relief devices must have a set-pressure below the maximum working pressure of the equipment being protected and must vent to an appropriately designed system [flare, drain] or, alternatively, to a safe area [risk assessment required].
- 10.9** All pressure systems must be fitted with effective means of de-pressurizing (e.g. bleed valves, blowdown valves, etc).
- 10.10** Check Valves must be designed to impede flow and must not be used to control or isolate pressure.
- 10.11** All instrument connections on pressure containing systems must be provided with a means of safe isolation.
- 10.12** Flexible hoses and temporary piping must be clamped or restrained so as to prevent whipping in the event of a connection failure. Such restraints must be designed so as to avoid exceeding design stress due to thermal (expansion/contraction) effects.
- 10.13** Pressure vessels and pressure containing pipe systems must be checked for fixtures and fittings/attachments that may become projectiles in the event of connection or component failure; and, wherever possible, equipment should be oriented that in the event of any such failure, projectiles do not affect areas where personnel could be reasonably expected.
- 10.14** Positioning of pressure containing equipment must be risk assessed, with consideration given to adjacent personnel traffic and escape routes.
- 10.15** Pressure containing equipment must be labeled to identify contents and pressure. This must include all buried pipelines/flowlines and associated rights-of-ways.

Permanent Equipment

- 10.16** Permanent piping systems must be provided with properly engineered and installed piping clamps and restraints; consideration must be made for vibration and thermal effects on the piping and restraints.

WORKING WITH PRESSURE CONTINUED

- 10.17 All storage and racking systems must be designed and installed with positive latching retaining bars that prevent bottles/containers from tilting out of the rack.
- 10.18 All pressure and temperature gauges must be calibrated in accordance with their planned maintenance system requirements.
- 10.19 Current calibration certificates must be available at the facility.
- 10.20 Flange bolts must be of a tensile strength, diameter and length appropriate to the flanges being connected.
- 10.21 Flange bolts must be tightened to the correct torque using a torque wrench or a hydraulic bolt tensioner. Torque wrenches must have current test calibration certificates.

Temporary or Portable Equipment

- 10.22 The use of flexible hoses must be risk-assessed. The risk assessment must consider pressure rating, position, motion, restraint, handling, bend radius, duration of service and service fluids.
- 10.23 Hammer union compatibility must be verified by the senior site representative.
- 10.24 Temporary piping (for example Chiksans) must be of all-welded type and must not be used where pipe movement is expected.
- 10.25 Flexible hoses must be restrained in accordance with the hose manufacturer's recommendations.
- 10.26 Fixed pipework (temporary or permanent) must be considered over the use of flexible type steel piping (for example Coflexip) and/or pipes connected with swivel joints (for example 'Chiksan'). Where flexible piping or piping with swivel joints is to be used, flexible piping must be the preferred type.
- 10.27 All temporary and portable equipment must be inspected prior to use.

Procedures**Routine Operation of Pressure Equipment**

- 10.28 All operations conducted on pressure equipment must be subject to written procedures, including responses to emergency conditions.

Acceptance of Pressure Equipment Prior to Pressure Testing

- 10.29 The following checks must be made on pressure equipment prior to pressure testing:
 - Verification of equipment certificates for ratings and currency.
 - Visual inspection for transit and other damage.
 - Inspection of threads, to ensure that they run freely without binding.
 - Inspection of sealing surfaces for serviceability.

- Flanges and bolts, to ensure that the clearance of the boltholes in the flanges are correct, i.e. that the correct bolts have been supplied.
- Dimensional check, to confirm compliance with construction drawings.

- 10.30 A documented "handover procedure" must be used to transfer responsibility to the testing authority. This procedure must include verification of torque requirements/ methodology and system isolation points/methods.

Pressure Testing

- 10.31 All pressure testing must be subject to a job risk assessment. Refer to the [Petroleum HSE Job Risk Assessment Procedure](#) for more information.
- 10.32 All pressure tests must be conducted in accordance with a written procedure. Procedure must include provisions for pressure relief and specify the "ramp-up" schedule for the test.
- 10.33 A risk assessment must be conducted to establish an exclusion zone around the equipment being pressure tested. Considerations must include final pressure, size of the system under test and test fluid.
- 10.34 The exclusion zone must be marked with physical barriers and signs and, where possible, the test should be preceded by a site-wide announcement.
- 10.35 Pressure testing onshore (i.e. in a test facility) must use either a blast wall or a dedicated containment area.
- 10.36 Pressure testing with gases must be avoided wherever possible. If pressure testing with a gas is required, senior management must approve the work.
- 10.37 Pressure testing with volatile/flammable fluids must not be permitted.

People

- 10.38 Personnel must not tamper with, tighten, strike or stand/sit on pressurized equipment when under pressure.
- 10.39 Only competent personnel must be permitted to work with, or on, pressure equipment.
- 10.40 Personnel involved in pressure testing of equipment at a Petroleum site must be specifically trained in:
 - Job risk assessment, permit to work and emergency response procedures.
 - Effective isolations.
 - Lock out/tag out procedures.
 - Safe pressure testing practices.
 - All personnel must wear appropriate PPE during pressure tests.

CONTROL 11

PRESENCE OF HYDROGEN SULPHIDE (H₂S)

INTENT

To eliminate or minimize the risk of fatalities, injuries and incidents arising from the presence of Hydrogen Sulphide (H₂S) gas.

PERFORMANCE REQUIREMENTS

Well and Process Equipment

- 11.1** Equipment that may come into contact with reservoir fluids or drilling mud that has been, or is intended to be, circulated through a reservoir that may be hydrogen sulphide bearing must be designed, constructed, placed in service and maintained using materials suitable for H₂S service (e.g. NACE Standard MR 0175-96, Standard Material Requirements: Sulphide Stress Cracking Resistant - Metallic Materials for Oilfield Equipment).
- 11.2** Systems and piping that contain H₂S must be suitably marked for identification purposes.

Minimum 'Make-Safe' Equipment Requirements

- 11.3** Operations conducted in areas where there is a known potential for H₂S to be present must have the following minimum emergency contingency equipment:
- A sufficient number of 30-minute Self Contained Breathing Apparatus (SCBA) sets available to all emergency personnel who have the potential for exposure to H₂S in the event of loss of containment or the failure of flare systems that combust fluids that contain H₂S.
 - All face mask assemblies used with either SCBA or Airline Breathing Apparatus must be positive pressure-type design.
 - A risk assessment must be conducted to determine the need for personal Breathing Air (BA) escape packs [15-minute escape packs].
 - Where a BA compressor is used to change BA cylinders on site, it must be sited in a non-zone rated area per the Hazardous Area Classification drawings. BA cylinder sets must only be changed in this area and appropriate means must be used to verify quality of charge air.
 - Sufficient spare SCBA sets and/or bottles must be available to enable re-supply of breathing air until the source of H₂S can be made safe (but not necessarily to allow for long-term working).

- A dedicated Emergency Shutdown (ESD) system must be installed for all hydrocarbon processing plants, to activate automatically to shut in the plant (and subsurface if determined to be necessary) on confirmation of an H₂S alarm.

Airline Breathing Apparatus

- 11.4** Where Airline Breathing Apparatus is required, whether by regulation or as a result of a risk assessment, it must comply with the following performance standards:
- Airline Breathing Apparatus manifold locations must be determined by assessment of potential sources and locations of H₂S, including permanent and temporary refuges, helideck and lifeboat locations.
 - Maximum allowed length of airlines on Airline Breathing Apparatus is 100 feet (31 meters).
 - All Airline Breathing Apparatus face mask assemblies must include 5-minute escape provision.
 - Two BA compressors should be installed at opposite ends of the accommodation, located giving regard to prevailing winds; one should be electrically powered and a second diesel-powered.

Procedures

- 11.5** All operations must assess the possibility of encountering H₂S and ensure appropriate controls and mitigations are defined and implemented.
- 11.6** Potential exposure points must be secured from public access through the use of fences, locked gates and warning signs.
- 11.7** Where H₂S is determined to be a risk in an operation, muster areas must be determined based on a consideration of the potential sources of H₂S and prevailing wind directions.
- 11.8** A wind sock (or other unambiguous method of indicating wind direction) must be installed in a highly visible location(s) for all operations where H₂S is determined to be a risk.

- 11.9** Permit to work issued for confined space entry must consider the possibility that the space contains H₂S, and a job risk assessment performed which specifically addresses the risks and procedures to be followed for entry and rescue.
- 11.10** Written procedures must be in place for any task that may result in personnel being exposed to H₂S. Such procedures must, wherever possible, direct gases and fluids that may contain H₂S to safe disposal, e.g. sump, flare or safe vent.
- 11.11** For operations that present H₂S risk, H₂S specific drills must be included in the emergency response drill program.
- 11.12** Alarms must be triggered at H₂S limits set by regulations in the area of operations, or 10 ppm in air whichever is lower.
- 11.13** All sites with H₂S risk must have escalation alarm levels, whereby, at 15 ppm in air, affected personnel must muster in a safe area.
- 11.14** All facilities with H₂S risk must develop and implement an H₂S exposure monitoring plan.
- H₂S Detector System Procedures**
- 11.15** Fixed H₂S detectors must be fitted in locations determined by assessment as potential sources and locations of H₂S on the site. Calibration of these detectors must be formalized within the site planned maintenance program and form part of the overall fire and gas maintenance process.
- 11.16** Personal H₂S detectors must be provided for all staff who work in areas where H₂S could be present. Personal H₂S detectors must be serviced and calibrated in accordance with manufacturer's recommendations.
- 11.17** Portable H₂S detectors must be available for use on site (in addition to personal H₂S detectors) and must, in addition to routine maintenance and calibration testing, be overhauled and calibrated to manufacturer's specifications at least annually.
- 11.18** An H₂S alarm should be fitted to portable H₂S detectors, to give both audible and visual alarms to crews working in all areas of the site and at least an audible alarm in any site accommodation. The H₂S alarm must trigger at 10ppm H₂S in air.
- 11.19** All likely sources and locations of exposure to H₂S must be determined, including vents, blow-downs, burst discs and relief valves on all piping, manifolds, separators and tanks, bleeds such as on pressure gauges, etc.
- 11.20** At any time fluids with the potential to contain H₂S are introduced into process equipment, checks must be conducted to detect the presence of H₂S to verify the integrity of the plant.
- People**
- 11.21** All personnel at sites with the potential for exposure to H₂S must receive H₂S training using an approved training organization providing a certificate of competency. Personnel must be made aware of the risks involved in working in a toxic atmosphere and the safety precautions they must take to prevent exposure. Refresher training must be provided at least annually.
- 11.22** All persons that routinely visit drilling rigs (contractors, rig managers, line managers, supervisors and WWD personnel) must undertake H₂S competency training.
- 11.23** Any personnel required to wear a SCBA or supplied air Breathing Apparatus must be subjected to a pulmonary function test performed by a qualified person and examination by a medical physician, who must determine whether or not the individual is able to wear a respirator; such assessment must include testing to confirm that the individual does not have a perforated ear-drum. Such assessment must be conducted on a frequency not to exceed two years.
- 11.24** Where operations are to be conducted under H₂S conditions, personnel must be clean-shaven to allow for proper mask fit. Other issues that may adversely affect "mask fit" should also be taken into consideration. Personnel who cannot affect an adequate air-tight mask seal must not be permitted to work where they may be exposed to H₂S in air.
- 11.25** "Fit-testing" of SCBA or supplied air BA face masks must be conducted on all crews that may be required to use them, prior to commencing use of Breathing Apparatus.
- 11.26** Medics supporting operations where exposure to H₂S is possible must be trained in the physiological effects of H₂S toxicity and its treatment.

CONTROL 12

CONFINED SPACE ENTRY (CSE)

INTENT

To eliminate or minimize the risk of fatalities, injuries and incidents arising from entry into confined spaces.

PERFORMANCE REQUIREMENTS

Plant and Equipment

- 12.1** All piping, equipment and spaces connected with or adjacent to the confined space must be isolated/locked-out and comply in all respects with Fatal Risk Control 5 – Isolation.
- 12.2** Adequate ventilation must be provided to ensure a safe atmosphere at all times, from initial entry until the work is completed and the space is evacuated.
- 12.3** Adequate monitoring devices must be provided for any confined space likely to contain a hazardous atmosphere:
 - Oxygen content must be between the limits of 19.5% and 23.5%, to ensure that the level of oxygen is neither deficient (risk of asphyxiation) nor oxygen-rich (risk of explosion or spontaneous combustion of contents).
 - Lower Explosive Limit/Lower Flammable Limit (LEL/LFL) must be less than 10%, to prevent potentially explosive atmosphere.
 - Toxicity of atmosphere must be determined and limits for exposure identified and implemented; for example, hydrogen sulphide content must be less than 10ppm.
 - Carbon monoxide must be less than 35ppm.
- 12.4** Consideration must be given to the possibility that any normally sealed and unventilated confined space that has never contained any hazardous material and might otherwise be considered “safe”, may be oxygen-deficient as a result of internal rust or anode deterioration, or become oxygen deficient as a result of introducing inert gases or waste gases during the work.
- 12.5** Combustion engine driven or nitrogen driven mobile tools and equipment must not be used in confined spaces.

Procedures

- 12.6** Sites must identify all confined spaces and maintain a confined space register. The register must:
 - Be used to control all work planned on such confined spaces.
 - Include both site permanent equipment and any permanent or temporary third-party service contractor equipment used at the site.
 - Identify and suitably mark/label all potential confined spaces to prevent inadvertent or unauthorized access to those spaces by site personnel. Examples include fuel tank and other flammable or toxic materials storage tanks.
- 12.7** Equipment and spaces that are not deemed confined spaces that undergo a modification (permanent or temporary) must be assessed to determine whether the modification has created a confined space. Modifications include temporary enclosure such as with plastic sheet coverings. All new confined spaces must be recorded in the confined space register.
- 12.8** Confined space entry must only be conducted after alternatives, which avoid CSE, have been considered and evaluated. Alternatives include:
 - Accomplishing the work from outside the space (e.g. cleaning tanks without entering them; using remote inspection equipment such as remote cameras).
 - Delaying the work until the equipment can be returned to a specialized workshop or maintenance facility.
- 12.9** All planned confined space entries must be subject to a formal risk assessment to allow safe means of carrying out the work to be prepared. The risk assessment must include:
 - The reasons and justification for why the work cannot be avoided.
 - Assessment of the risks associated with both the entry and the work tasks including (but not limited to) the following:
 - » Atmospheric hazards: oxygen deficiency; oxygen enrichment; flammable materials; toxic gases/ substances; the means by which the hazardous atmosphere is prevented or removed (isolations; ventilation).

- » Determining the means of verifying that the atmosphere is, and remains, safe to breathe by defining the type(s) of atmosphere-monitoring equipment and procedures required and providing mechanical ventilation or breathing apparatus as appropriate: measure for oxygen, flammable gases and toxic gases.
 - » Engulfment/drowning hazards: free-flowing solid materials, e.g. bulk materials such as cement, barite, bentonite; potential for liquid entry, e.g., oil, fuel, water.
 - » Ensuring that isolation of the confined space is effective and is maintained for the duration of the work.
 - » Particular hazards arising from the planned work, e.g. fall hazards, electrical hazards (including static electricity), use of hazardous materials (e.g. review MSDS for all materials to be introduced into the space) or possible increase in temperature that may lead to loss of consciousness for those working inside the space. Review adjacent spaces for impact on the planned work (contents, condition, including other work in progress).
 - » Ensuring that the confined space is maintained in a safe condition.
 - » Access and egress: review the means of entering and leaving the confined space, in particular where access ways are of a restricted size or configuration and where this might complicate recovery of an injured or unconscious person. Determine any specialized recovery equipment needs, for example rescue tripod/winch, special (strap-on) stretchers, etc.
 - » Ensuring that appropriate emergency recovery equipment and resuscitation equipment, is available "at hand" and can be immediately put into use by trained recovery personnel.
 - A review of all systems (electrical, mechanical, fluid, software, etc.) that might impact or otherwise present a hazard in performing the required work.
 - Whether or not equipment or materials introduced into the confined space may themselves make an otherwise "safe" space hazardous, e.g. by introducing welding/cutting gases; oxygen; inert gases; paints, cleaning materials or other toxic solvents; electrical power and lighting (particularly into steel tanks or vessels).
 - Identify appropriate PPE required by those entering the confined space and conducting the work. As a minimum, all persons that enter the confined space must wear a harness and lifeline. The lifeline must be attached to the harness and a point located outside the confined space.
 - Communication system must be in place and tested to ensure clear communication between the persons inside the confined space and assigned persons outside the confined space.
 - A "standby" person must be in place at all times that persons are inside the confined space. The standby person must be equipped with a radio or other form of communication device
 - Identify rescue requirements and procedures, and conduct emergency response training and exercising prior to implementation of a confined space entry:
 - » Manning levels for rescue teams covering entrants and watch/standby personnel.
 - » Consider that rescuers may face the same hazards as those already taking effect inside the space - ensure that the rescue plans reduce the risks to the rescuers to As Low as Reasonably Practicable (ALARP).
 - » Ensure that, in the event of an emergency, rescue plans can be immediately implemented by trained site-based personnel.
 - » Consider what other off-site based rescue provisions may be required, notify them of the planned operations and put them on "stand by" if appropriate.
 - » Ensure that resuscitation equipment and persons trained in their use are sufficiently close at hand to be effective should they become necessary.
- 12.10** All work undertaken in a confined space must take place under the permit to work system. The Permit to Work must:
- Comply with the [Petroleum Permit to Work Procedure](#).
 - Define the location of the work, the work to be carried out and identify those responsible for it, including supervision of the work.
 - Identify the hazards arising from both the space entry and the planned work within that space.
 - Define any time limits imposed on the work.
 - Cross-reference any other open permits in the vicinity that may impact upon the confined space entry or the planned work.
 - List the precautions required for the work (making safe; monitoring; isolations; fire-fighting provisions; watchmen; communications; PPE) and attach to all copies of the permit to work documentation.
 - Ensure that all isolations required, and the responsibilities for affecting, verifying and approving isolations, comply with Fatal Risk Control 5 – Isolation.
 - Describe the fire plans, rescue plans and responsibilities (local and remote).

- 12.11** The work and activities planned during a confined space entry must be subject to both job risk assessment (prior to issuing the permit to work) and a pre-task toolbox meeting or safety meeting with the crew conducting the work and the work supervisors.
- 12.12** Where confined space entry work continues between shifts, there must be a formal procedure in place for cancellation of any open permit to work and issue of a new permit, to ensure that the on-coming crews are subject to a similar full review of all of the issues involved. Consideration should be given to “staggering” the shift hours of supervisors and work teams, to ensure a smooth handover of the work.
- 12.13** An oxygen-deficient atmosphere must not be “sweetened” by introducing oxygen, since this may of itself render the space hazardous (risk of spontaneous combustion or explosion).
- 12.14** Where gases are introduced into a confined space (e.g. for the purposes of cutting or welding):
- The gas cylinders must remain outside the space.
 - The atmosphere inside the space must be continuously monitored, to confirm it remains safe at all times.
 - Procedures must be put in place to isolate the gases at all times when the cutting or welding work is not actually taking place, preferably by removing the hoses and welding/cutting gear from the confined space when they are not in immediate use.
 - Effective communications must be put in place between those conducting the work and those controlling the gas shut-off outside the space.
 - Placement of hoses must consider safe egress from the space and rescue plans.
 - Procedures must be put in place to prevent damage to the gas hoses inside the space and at the entry to the space.
 - Fire precautions must identify the numbers and type of fire hoses, fire extinguishers and other identified fire prevention/response equipment that must be provided inside the space.

People

- 12.15** Work in confined spaces must be limited to personnel who have received suitable training and are competent in confined space work and its supervision. Training should include:
- Identification of confined spaces and their potential hazards.
 - Firefighting and rescue techniques in confined spaces.
 - Making and maintaining the workplace safe, including:
 - » Isolating and de-isolating electrical systems, control systems and piping.
 - » Ventilating enclosed spaces.
 - » Use of different types of gas monitoring equipment and their service duties.
 - Duties and responsibilities of supervisors and those carrying out work in confined spaces.
 - Requirements and procedures for rescue personnel and rescue services.
- 12.16** A system must be in place to ensure personnel who work in confined spaces are assessed to confirm their fitness to work in confined spaces.
- 12.17** Training in permit to work and isolation procedures must be provided for all personnel required to work in confined spaces or who supervise work in confined spaces.
- 12.18** The roles and responsibilities for all personnel working in and supervising work in confined spaces must be defined and documented in the work procedures.

CONTROL 13

DIVING

INTENT

To eliminate or minimize the risk of fatalities, injuries and incidents that can arise from all aspects of diving operations and personnel working subsea.

PERFORMANCE REQUIREMENTS

Plant and Equipment

13.1 Equipment and vessels used for diving operations, including support vessels, must comply with the specifications in the [Petroleum Diving Operations Procedure](#).

Procedures

13.2 All diving activities conducted by, or on behalf of, Petroleum must comply with the [Petroleum Diving Operations Procedure](#) which also references relevant Industry codes and standards including:

- IMCA (International Marine Contractors Association) Standards for Diving Operations.
- Association of Diving Contractors International (ADCI) Consensus Standards.
- Norway/UK Regulatory Guidance for Offshore Diving.

13.3 The following diving and subsea activities are prohibited:

- Diving operations of any type at working depth in excess of 1,000 feet sea water (or 304 meters sea water) must not be conducted.
- Activities requiring the use of SCUBA equipment (self-contained underwater breathing apparatus).
- Activities using re-breather apparatus, other than where used in rescue or emergency operations.
- Diving in heavily contaminated environments.
- Use of uncertified or recreationally certified diving personnel.
- Use of open circuit self-contained underwater breathing apparatus (i.e. Scuba) at any water depth.
- Use of "band-masks" (only the use of hard-shelled diving helmets is permitted for Petroleum diving activities).

13.4 Contractors and suppliers of equipment and diving services must be selected and contracted to meet the requirements in the [Petroleum Marine Operations Controls](#) and the [Petroleum Diving Operations Procedure](#).

13.5 All diving operations must be conducted in accordance with a written program (typically referred to as a Dive Plan) that is approved by the senior Petroleum site or project manager. Written programs must include specific emergency action plans, developed based upon the diving risk assessment conducted.

13.6 Diving operations must only be conducted where the use of remotely operated vessels (ROV) is not practicable, particularly from dynamically positioned (DP) drilling rigs.

People

13.7 Diving personnel, including superintendents, diver supervisors, diver's life support staff and other personnel involved in diving operations including personnel inspecting and maintaining equipment used for diving operations must be trained, qualified, have appropriate levels of experience and have competency in those skills required for their positions, in accordance with requirements outlined in the [Petroleum Diving Operations Procedure](#).

APPENDIX A:

APPLICATION OF FATAL RISK CONTROLS

Control	Application
1 Road Going and Light Vehicles	<p>This Control applies to Petroleum owned, contracted (lease or hire) or operated road going and light vehicles used for work-related activity. It also applies to all Petroleum personnel using road going and light vehicles used for work-related activities. Light vehicles are passenger cars, four-wheel drives (including all wheel drives), sports utility vehicles (SUVs), pickups (utilities) and mini buses. Road going vehicles are light vehicles that are registered for use on public roads.</p> <p>The requirements of this Control do not apply in the following situations:</p> <ul style="list-style-type: none"> • Vehicles being driven "on site" to the employee or visitor car park area, or for delivery drop off in "non-hazardous" areas (eg: warehouse deliveries). • Private vehicles being used on an occasional basis to undertake a low-risk work related trip, such as visits to Contractor offices, etc, where approved by the Line Manager or equivalent. • Employees traveling between their fixed or temporary residence and their fixed or temporary work place in either Company provided transport, public transport or personal transport. • Situations where the employee departs from a reasonably direct route of work related travel for personal reasons, e.g. a side trip to visit a place of interest.
2 Mobile Equipment	<p>This Control applies to the use of all mobile equipment over and above those vehicles covered under Fatal Risk Control 1 – Road Going and Light Vehicles.</p>
3 Explosives	<p>This Control must be used in conjunction with the World-Wide Drilling (WWD) Explosives Management Guidelines contained within the Drilling Safety Guidelines Document No WWD015.</p>
4 Hazardous Materials	<p>This Control applies to activities related to hazardous materials management. It includes management of hydrocarbon processing facilities and operations and includes hazards associated with the extraction, production, processing and transport of hydrocarbons and associated products. These controls must be used in conjunction with the process safety provisions in the Hazard and Risk Management Controls.</p> <p>This Control does not cover handling of explosives (covered in Fatal Risk Control 3 – Explosives).</p>
5 Isolation	<p>This Control applies to the isolation of all sources of energy (electrical, mechanical, hydraulic, chemical, gravitational, pneumatic, kinetic, stored energy, etc.). The requirements detailed in this Control must be used in conjunction with the Petroleum Permit to Work Procedure and the Petroleum Lock Out Tag Out Procedure.</p>
6 Equipment Safeguarding	<p>This Control applies to safeguarding of people from moving parts of plant, mobile machines, equipment and power tools, including moving equipment, high pressure equipment and applications, electrical, and other energy sources with the potential to move, and objects falling or projected from moving parts.</p>
7 Working At Height	<p>This Control applies wherever there is potential for any person to fall 2 meters or more, or to gain access to within 2 meters of an open edge from where there is the potential to fall 2 meters or more, including working from various forms of portable and moveable elevated work platforms, baskets, ladders, scaffolding, or where a risk assessment has identified high potential fall hazards when working at heights of less than 2 meters. It also applies where a significant injury could result from a fall. (Note: if local applicable law requires more stringent controls, then those controls must be implemented.) This Control does not apply to rope rescue situations and abseiling that are regarded as specialist functions.</p>
8 Lifting Operations	<p>This Control applies wherever lifting operations are undertaken. These controls must be used in conjunction with the Petroleum Lifting Operations Procedure.</p>

APPENDIX A:
APPLICATION OF FATAL RISK CONTROLS CONTINUED

Control	Application
9 Dropped Objects	<p>This Control applies to all work conducted on Petroleum sites and to facility equipment, third-party equipment, and all equipment hired or contracted direct by Petroleum. It includes:</p> <ul style="list-style-type: none"> • Objects falling or dropped from plant/equipment or a rig/derrick. • Objects falling or dropped from crane booms, flare booms and other permanently or temporarily installed structures and buildings. • Objects falling or dropped from elevated decks, platforms, scaffolding and any other workspace where equipment is mounted or secured overhead. • Tools, equipment and other objects falling or dropped while working from portable and moveable elevated work platforms and while persons are working at heights using a work harness or working in baskets. <p>This Control should be used in conjunction with the requirements of Fatal Risk Control 7 – Working at Height and Fatal Risk Control 8 – Lifting Operations.</p> <p>This Control excludes:</p> <ul style="list-style-type: none"> • Loads falling from cranes during lifting procedures. • Tubulars (drill strings, BHA's, test strings, casing and tubing, etc.) suspended from or in the rotary table that drop down the well.
10 Pressure	<p>This Control applies to all activities and operations where pressure-containing equipment is used. These controls must be used in conjunction with Fatal Risk Control 5 – Isolation, Petroleum Permit to Work Procedure and the Petroleum Lock Out Tag Out Procedure.</p>
11 Hydrogen Sulphide	<p>This Control applies to all Petroleum activities where H₂S may be encountered.</p>
12 Confined Space Entry	<p>This Control applies to all Petroleum activities involving confined space entry. These controls must be used in conjunction with Fatal Risk Control 5 – Isolation and the Petroleum Permit to Work Procedure and the Petroleum Lock Out Tag Out Procedure. The definition of a confined space must reflect local applicable law. The Australian Standard AS2865 defines confined space as, any space which:</p> <ul style="list-style-type: none"> • Is at atmospheric pressure during occupancy; • Is not intended or designed primarily as a place of work; • May have restricted means for entry and exit; and may: <ol style="list-style-type: none"> i. Have an atmosphere which contains potentially harmful levels of contaminants; ii. Not have a safe oxygen level; or iii. Cause engulfment.
13 Diving	<p>This Control applies to all diving activities including:</p> <ul style="list-style-type: none"> • Surface-supplied air diving. • Surface supplied mixed gas diving. • Saturation diving. • Remotely Operated Vessels (ROV) interventions during diving operations. <p>This Control does not apply to the use of non-diving related ROVs or manned submersibles.</p>

DEFINITIONS AND REFERENCES

Definitions

For general terms and definitions, refer to Glossary of BHP Billiton Terms and the Petroleum Glossary.

References

For a complete and up-to-date list of the most current version of supporting references, refer to the electronic version of this document located on the Petroleum Portal.

Supporting reference documentation may include:

- Petroleum HSE Controls.
- Petroleum HSE Management System documentation (via the Petroleum HSE Portal).
- Other Petroleum Documents (via the Petroleum Portal).

BHP Billiton Petroleum supporting documentation will be made available to relevant external stakeholders such as suppliers, contractors and visitors as required and on a case-by-case basis.



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