

# Workplace Safety and Health Guidelines

## Implementation of WSH Management System for the Marine Industries



Tripartite Alliance for  
Workplace Safety and Health



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# 1. Introduction

Under the Workplace Safety and Health (Safety and Health Management System and Auditing) Regulations, shipyards are required to establish a Workplace Safety and Health Management System, which includes conducting audits and reviews.

A Workplace Safety and Health Management System (WSHMS) is a systematic process for management of safety and health at workplaces. It is important to establish a WSHMS for continual improvement of workplace environments.

For companies to have a better understanding of the WSHMS requirements, the Association of Singapore Marine Industries (ASMI), Ministry of Manpower (MOM) and Workplace Safety and Health (WSH) Council jointly published the Workplace Safety and Health Manual for Marine Industries in 2009 termed as ‘Guideline (2009)’. The document was based on the 14 elements for Process Safety Management System.

With the release of the *International Organisation for Standardisation (ISO) 45001:2018 (Occupational health and safety management systems – Requirements with guidance for use)*, the WSH Council together with ASMI and MOM have reviewed to integrate all 14 elements and content of the Guideline (2009) using a systematic approach with alignment to the ISO 45001:2018.

This Guidelines provide guidance to companies in developing an effective and comprehensive WSHMS. It also highlights the importance of WSH and good industry practices.

## 1.1 Terms and Definitions

The following terms and its definitions are used in this Guidelines:

Term	Definition
Accident	An unplanned event resulting in actual ill-health or injury, damage to property, plant, ships or environment, production losses or increased liabilities.
Administrative Control	Implementation of any administrative requirement which includes a permit-to-work system, safe work procedures (including during emergencies), warnings and signs, work-rest regime etc.

Competent Person	A person who has sufficient experience and training to perform the work required.
Confined Space	<p>An area where:</p> <ul style="list-style-type: none"> <li>• Dangerous gases, vapour or fumes are liable to be present to an extent where it may involve the risk of fire or explosion, or persons being overcome;</li> <li>• Supply of air is inadequate, or is likely to be reduced to be inadequate for sustaining life; or</li> <li>• There is a risk of engulfment by material as defined in the WSH (Confined Space) Regulations.</li> </ul>
Contractor	Any company or individual engaged by the shipyard to perform work in the shipyard or to provide labour, equipment, facilities or material to be used in the shipyard.
Designated Person	<p>A competent person appointed in writing by:</p> <ul style="list-style-type: none"> <li>• An occupier of a shipyard;</li> <li>• An employer of persons carrying out work in a shipyard or on board a ship in a harbour; or</li> <li>• A principal who gives direction to persons on the work carried out by those persons in a shipyard or on board a ship in a harbour, to perform any task or duty prescribed under these Regulations.</li> </ul>

Element	<p>An aspect of safety to be taken into account in the comprehensive management of safety within the enterprise. In particular, the 14 elements listed below:</p> <ol style="list-style-type: none"> <li>1. Safety Policy</li> <li>2. Safe Work Procedures</li> <li>3. Safety Training</li> <li>4. Group Meetings</li> <li>5. Incident Investigations &amp; Analysis</li> <li>6. In-house Rules</li> <li>7. Safety Promotion</li> <li>8. Contractors Selection, Evaluation &amp; Control</li> <li>9. Safety Inspection</li> <li>10. Maintenance Regime</li> <li>11. Hazard Analysis</li> <li>12. Hazardous Substances</li> <li>13. Occupational Health</li> <li>14. Emergency Preparedness</li> </ol>
Engineering Control	<ul style="list-style-type: none"> <li>• The application of any scientific principle for the control of any workplace hazard; and</li> <li>• Includes the application of physical means or measures to any work process, equipment or the work environment such as the installation of any barrier, enclosure, guarding, interlock or ventilation system.</li> </ul>
Environmental Aspect	Element of an organisation's activities or products or services that can interact with the environment.
Environmental Impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects.
Hazard	<p>A source, situation or act with the potential for harm in terms of:</p> <ul style="list-style-type: none"> <li>• Ill-health or injury, or both;</li> <li>• Damage to property, plant or ships;</li> <li>• Pollution of environment; and</li> <li>• Production losses or increased liabilities.</li> </ul>
Hazardous Substance	Any hazardous substance specified in Part II of the Fifth Schedule to the WSH Act.

Hazardous Work	Any work that is likely to endanger the life of any person in a shipyard or on board a ship in a harbour and includes any type of work which is specified by the Commissioner in writing as hazardous work.
Hot Work	Riveting, welding, flame cutting or burning and includes any other work involving the use or generation of heat or the production of sparks.
Incident	An unplanned event which results in or has the potential to result in: <ul style="list-style-type: none"> <li>• Ill-health or injury;</li> <li>• Damage to property, plant, ships or environment; and</li> <li>• Production losses or increased liabilities.</li> </ul>
In-house Rules	Instructions and prohibitions relating to behaviour, discipline and administration within the shipyard. Organisation, company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration.
Principal	A person who, in connection with any trade, business, profession or undertaking carried out by him, engages any other person otherwise than under a contract of service: <ul style="list-style-type: none"> <li>• To supply any labour for gain or reward; or</li> <li>• To do any work for gain or reward.</li> </ul>
Procedure	The step-by-step method for carrying out a task safely and to the quality level required.
Regulation	A statutory requirement issued in association with an Act passed by the Singapore Government, unless otherwise stated Regulation means any regulation made under the WSH Act.

Responsible Person	<p>In relation to any work carried out at the company.</p> <ul style="list-style-type: none"> <li>• In the case of a shipyard, refers to the occupier of the shipyard.</li> <li>• In the case of a ship in a harbour, refers to: <ul style="list-style-type: none"> <li>- The employer of any person who carries out the work; or</li> <li>- The principal under whose direction any person carries out the work.</li> </ul> </li> </ul>
Shipyard	Shipyard includes any dry or wet dock, wharf, jetty and quay, and their precincts.
Risk	The likelihood that a hazard will cause a specific bodily injury to any person. All WSH risk must be reduced by either making an incident less likely to happen or/and the consequences less serious to a level that is as low as reasonably practicable.
Risk Assessment	The process of evaluating the probability and consequences of injury or illness arising from exposure to an identified hazard, and determining the appropriate measures for risk control.
Safe Work Procedures	Any procedure for carrying out work safely, and includes any procedure which is to be taken to protect the safety and health of persons in the event of an emergency. Safe work procedure may take the form of an instruction, whether written, pictorial, or conveyed by training and supervision for safe performance of tasks such as welding, operation of machines, access to work locations. Safe work procedure should also include procedures to be taken in the case of emergency.
Safety	<p>Freedom from unacceptable risk of harm including:</p> <ul style="list-style-type: none"> <li>• The protection of people from physical or health hazards;</li> <li>• The protection of assets; and</li> <li>• The maintenance of production capability.</li> </ul>

System

The organisation, responsibilities, procedures, resources and processes by which an enterprise plans to achieve its policy and objectives. In this Guidelines, unless otherwise stated, “system” refers to Safety and Health Management System, which is the means by which the organisation implements its safety and health policy and objectives.

## 2. Demonstration of Leadership

Top management's leadership and visible commitment plays a key role in ensuring an effective WSHMS implementation and are essential for the continual improvement of safety and health in the company. Top management should provide the vision, establish the framework, set expectations and provide the resources for responsible management of the company's operations. Top management should demonstrate strong commitment to the success of WSHMS through:

### a) Strong leadership

- Responsible and accountable for workplace injury and ill-health as well as setting up preventive measures;
- Establish WSH goals and targets to drive continual WSH improvement;
- Develop, lead and promote WSH culture;
- Allocate human and financial resources and/or adoption of technology to implement and improve the WSHMS;
- Provide guidance and support to personnel who is leading the WSHMS implementation; and
- Support other relevant management roles to demonstrate their leadership.

### b) Effective implementation of the WSHMS

- Incorporate the WSHMS into the organisation's process;
- Establish WSH policy and objectives; and
- Ensure the WSHMS achieves its projected outcomes and promote continual improvements.

### c) Engaging workers

- Communicate to all workers the importance of an effective WSHMS and their conformance to the requirements;
- Establish workers' consultation and participation processes;
- Ensure the identity of workers are protected when there is a report on any hazards, risks, incidents and near-misses or when suggestions are provided for improvements;
- Support the formation of the WSH Committee and its functions; and
- Ensure workers are well represented in the WSH Committee.

## 2.1 WSH Policy

The WSH policy shall:

- Be applicable to the nature and scale of the WSH risks;
- Comply with legal and other requirements applicable to the organisation.
- Improve the protection of the health, safety and general well-being of every worker in the company;
- Eliminate WSH hazards and reduce the risks;
- Ensure continual improvement to the WSHMS;

- Consult and involve workers' participation in organisation's activities;
- Be documented, implemented and maintained;
- Be communicated to all workers and all persons working in the company;
- Be endorsed by senior management;
- Be available to interested parties; and
- Be reviewed periodically to ensure that it remains relevant and appropriate to the organisation.

## 2.2 Organisational Roles, Responsibilities and Authorities

The organisation shall ensure that persons in the workplace take responsibility for aspects of WSH over which they have control, including adherence to the organisation's applicable WSH requirements.

Top management shall take ultimate responsibility in the WSHMS by ensuring that:

- Staff roles, responsibilities and accountabilities on WSH are defined including reporting on the performance of the WSHMS to top management; and
- Authorities are delegated for effective implementation of the system.

These roles, responsibilities, accountabilities, and authorities shall be communicated to relevant persons and documented in the system. The general duties of persons at workplaces are as defined in WSH Act.



### 3. Consultation and Participation of Workers

The key to the success of the WSHMS implementation involves workers' participation and consultation. Their involvement supports a collaborative WSH culture based on mutual trust and joint effort in improving safety and health at work. Workers can be involved in the implementation of the WSHMS through the following ways:

- Draft and review WSH policies, goals and objectives;
- Develop or make changes to in-house WSH rules;
- Conduct risk assessments and risk management processes;
- Conduct safety and health inspections, document the outcomes and implement corrective actions;
- Conduct incident investigations and develop preventive actions;
- Conduct WSHMS audits and document the outcomes;
- Implement changes in materials, work processes, equipment and chemicals;
- Implement a feedback mechanism for WSH issues and suggestions for improvement, e.g. safety suggestion box, incentives for suggestions or annual WSH climate survey;
- Be a representative in the Vessel Safety Coordination Committee (VSCC), WSH Committee and toolbox meeting;
- Organise WSH promotional activities for the organisations;
- Give regular updates and discussions via in-house newsletters and notice boards;
- Be updated on requirements, e.g. legislation, standards and code of practice.

## 4. Planning

### 4.1 WSH Hazard Identification, Risk Assessment and Risk Control

Under the WSH (Risk Management) Regulations, employers, self-employed persons, and principals (including contractors and sub-contractors) are responsible for identifying safety and health hazards at workplaces, and taking measures to eliminate or reduce the risks. These stakeholders shall conduct risk assessments in relation to WSH risks posed to any person who may be affected by his undertakings, and take reasonably practicable measures to eliminate the risks. In areas where elimination is not applicable, they should implement reasonably practicable measures to minimise the risk and safe work procedures to control the risk.

The organisation should establish and document procedures for ongoing identification of hazards, assessment of risks and implementation of control measures. A holistic risk management approach should be established and include the following (refer to the Code of Practice on WSH Risk Management):

- Formation of risk management or risk assessment teams;
- Hazard identification;
- Risk assessment and evaluation;
- Prevention and control measures with effective on-site implementation;
- Documentation and record-keeping;
- Communication and provision of information; and
- Review.

### 4.2 Risk Register

Organisations are to conduct WSH risk assessments for routine and non-routine operating conditions, shutdown and start-up conditions, as well as reasonably foreseeable emergency situations.

Organisations should establish records of the WSH risk assessments and identify environmental aspects that list all its WSH risks. This may take the form of a "WSH Risk Register".

### 4.3 Legislation, Standards and Codes of Practice

Organisations involved in shipyard activities and ship repair must commit to compliance with all legal and other requirements that are applicable to the activities, products and services. These requirements include the relevant Primary Legislative Status (Acts) passed by the Parliament, the Subsidiary Legislations (Regulations, Notification and Orders) issued by the relevant government agencies, and the applicable Singapore Standards and Codes of Practice. Organisations should also comply with the relevant industrial standards and codes.

Organisations must identify all the legal and other requirements, applicable to their activities, products or services for compliance. A procedure should be established, implemented and maintained for identifying and accessing the legal and other WSH requirements that are applicable to it. Organisations should ensure that these applicable legal requirements and other requirements are taken into account and kept up-to-date when establishing, implementing and maintaining the WSHMS.

These relevant information on legal and other requirements should be communicated to persons working under the control of the organisation, and other relevant interested parties.

The relevant legislation, approved Code of Practices and Singapore Standards are included in the Annex A.

## 4.4 Objectives and Programmes

The organisation should establish, implement and maintain documented objectives to continually reduce the WSH risks identified. The objectives should:

- Be measurable and updated;
- Be consistent with the WSH policy; and
- Take into account the legal and other requirements, WSH risks and opportunities as well as worker's consultation.

The organisation should establish, implement and maintain appropriate programme(s) for achieving its WSH objectives. These programmes should define clearly:

- A list of objectives and evaluation criteria for monitoring, and the time frame for the objectives to be achieved;
- A list of the persons with their designation of responsibility and authority, and their accountability at all relevant functions and levels of the organisation;
- Allocation of resources to meet the objectives; and
- Communication of the objectives to all workers and relevant parties involved.

The programme(s) should be reviewed at planned regular intervals to monitor progress and ensure objectives are achieved.

## 5. Support

Top management should take ultimate responsibility in providing the necessary support in leading the organisation and promoting a WSH culture towards the strategic objectives of the WSH policy.

### 5.1 Resources

Top management should ensure the following in the WSHMS:

- Adequate resources are made available to establish, implement, maintain and improve the systems. Such resources may include financial, human resources, specialised skill, infrastructure and technology; and
- Allocate resources in additional areas such as workers' mental well-being, reporting of near misses and harnessing of technology in work processes.

### 5.2 Competence and Awareness

A person must be competent in performing works that can impact their safety and health. The company should establish procedures to identify the training needs of managers, supervisory staff and workers to provide them with comprehensive training on in-house safety rules and regulations, statutory requirements, safe work procedures, and other relevant occupational safety and health-related training. Sufficient instructions and information on the measures taken to minimise risks carried out at the workplace should also be provided

Management staff should be trained with the knowledge and skills to develop, implement and manage WSH programmes: first-line supervisors and team leaders should be trained in leadership skills and provided with the knowledge to lead, implement and apply WSH activities; and workers need to be trained with the knowledge and skills to perform their work safely, and coached on the right attitudes to enable them to work safely. Training should also include personal communication techniques of shaping human behaviour and promoting safe and responsible behaviour.

Training should be based on the logical sequence of:

- Conduct a training needs analysis to compare worker's skills level with the demands of his/her job;
- Ensure workers plan and attend the courses before they commence their work;
- Maintain record of workers' completed training;
- Evaluate training programmes to ensure relevancy;
- Document all training records, e.g. date, type of training, training provider and results achieved; and
- Review the need for refresher training to ensure workers' competency.

## 5.3 Types of WSH training

### a) Mandatory training

WSH training should cover the mandatory requirements for Ship Repair Manager, Safety Supervisor, Safety Assessor, Safety Auditor, Scaffolding Supervisor, Scaffolding Erector, Fire Safety Manager and other occupations. See below for a list of course(s) required for various appointments. A list of WSH courses is provided on MOM's website (<https://www.mom.gov.sg/workplace-safety-and-health/wsh-service-providers/find-approved-service-providers/find-a-wsh-training-provider>).

Appointment	Courses
Confined Space Safety Assessor	WSQ Assess Confined Space for Safety Entry and Work
Lifting Supervisor	WSQ Supervise Safe Lifting Operations
Marine Scaffold Erector	Marine Metal Scaffolding Course for Scaffolders/WSQ Erect Metal Scaffold in Marine Industry
Marine Scaffold Supervisor	Marine Metal Scaffolding Course for Supervisors/WSQ Supervise Metal Scaffold in Marine Industry
Noise Control Officer	WSQ Control Noise and Vibration
Noise Monitoring Officer	WSQ Monitor Noise and Vibration
Rigger and Signaller	WSQ Perform Rigger and Signaller tasks
Shipyards Supervisor	Shipyards Supervisors Safety Course/WSQ Supervise Marine Work for Workplace Safety and Health
Ship Repair Manager	Safety Instruction Course for Ship Repair Managers/WSQ Manage Workplace Safety and Health in Shipbuilding and Ship Repair
Shipyards Hot Work Safety Assessor	Shipyards Safety Assessor (Hot Works Certification) Course/WSQ Assess Shipyards Safety for Hot-Work Certification
Shipyards Worker (Painter Trade)	Shipyards Safety Instruction Course for Workers (Hot Work Trade)
WSH Officer	WSQ Specialist Diploma in Workplace Safety and Health (Level C)
Tower Crane Operator	<ul style="list-style-type: none"> <li>i) BCA – Luffing jib Tower Crane Operation Course</li> <li>ii) Workshop to Enhance Safety of Crane Operation (License Renewal)</li> </ul>

Mobile Crane Operator	i) BCA – Mobile Crane (Truck Mounted) Operation Course ii) Workshop to Enhance Safety of Crane Operation (License Renewal)
WAH Supervisor/ Assessor/ Manager	WSQ Manage Work-At-Height
WAH Worker	WSQ Perform Work-At-Height

Table 1: List of WSH training for various appointments

## b) WSH orientation and awareness

Safety and health orientation courses must be conducted for all workers. They should cover:

- WSH policy and WSH objectives of the company;
- Workers' contribution to the effectiveness and benefits of organisation's WSHMS as well as the consequences of not following the system;
- WSH hazards and risks associated with operation and workplace;
- Control measure taken to eliminate or minimise WSH risks which includes:
  - Availability of engineering control;
  - Safe working systems and procedures;
  - Use of personal protective equipment (PPE);
  - Actions to be carried out during emergency; and
  - Emergency response procedures such as firefighting and evacuation procedures.
- Relevant incidents or accidents and investigation findings; and
- Empowering workers to raise WSH issues to protect themselves from possible harms and injuries.

## c) Skills training

New workers are to be given training in the skills appropriate to their trades so that they can improve their individual performance. There should be sufficient focus given to WSH during skills training. For example, skills training in welding will develop the ability to weld safely as well as reach a required skill standard. The trainee should also be taught the safety precautions and hazards involved.

## d) In-house training

There should be an in-house WSH training programme. Topics could cover:

- General WSH issues, rules, policy and regulations;
- Hazard identification and risk assessment, and their preventive measures;
- Safe work procedures, including those during emergency situations;
- Permit-to-work, isolations, gas-freeing, confined space entry and emergency response;
- Company-specific methods and procedures such as the safe use of new workshop machinery;
- Relevant topics that may relate to work activities, such as eye protection, scaffolding, slips, trips and falls, etc;
- Toolbox or pre-task briefings, highlighting hazards and the methods of dealing with them;
- Supervisory demonstrations of particular tasks;
- Development of supervisory skills; and
- Drills and exercises.

## **e) Training for personnel at various organisational levels**

### **i. Courses for:**

- Management
  - All relevant management staff are to undergo safety training and be equipped with the proper understanding of the WSHMS, WSH policy and organisation, WSH statutory requirements, and their duties and responsibilities in safety and health; and
  - Relevant management staff are to be equipped with tools and techniques to manage safety and health effectively at the workplace.
- Supervisors
  - All supervisors are to undergo the necessary training to better understand the safety aspects of work operations to ensure that tasks are carried out safely; and
  - All supervisors are required to be trained in the skills and methods necessary for them to perform their tasks competently and safely, and lead workers to carry out their work safely.
- Workers
  - All new workers are to attend in-house safety orientation training programmes before they are allowed to start work. The training should cover relevant safe work procedures, in-house WSH rules and regulations, hazard identification in work areas and responses to emergency;
  - Workers are to undergo the necessary training before he/she is assigned to any high-risk or hazardous work activities;
  - Conduct WSH talks to workers on a regular basis to inculcate WSH awareness;
  - All WSH training programmes should be conducted in a manner that is easily understood by workers; and
  - All new and inexperienced workers should be identified with identification labels during their provisional period.

### **ii. Administration of training programmes**

Training programmes for workers should be properly arranged and maintained, and regularly evaluated for relevancy:

- Training schedule
  - Plan training courses in advance with information such as course date, duration, training and assessment methods to be made available to stakeholders; and
  - Provide information to include both in-house and external trainings.
- Competency of trainers
  - Engage external training providers if internal resources are insufficient, or where staff are not competent to conduct the specific or required training; and
  - Engage only approved and competent trainers.
- Training records
  - Document and maintain records of WSH training received by all workers; and
  - Training records should include the date of training, topics covered, who were the trainers, and the examination results of the training.
- Training programme review

- Conduct periodic reviews to measure the effectiveness of the WSH training and determine the extent to which the identified training needs are being met; and
- The review should be properly documented for future references.

## 5.4 Consultation and Communication

Participation and contribution to WSH practices from all those affected by shipbuilding and repair operations should be encouraged. This can be achieved through consultation and communication processes including WSH hazards, control measures, safe work procedures, and requirements of the WSHMS. During the consultation and communication process, the organisation shall consider the best method to reach out to the workers taking into consideration workers' profile, e.g. worker's native language.

The organisation should establish, implement and maintain a procedure(s) for:

- Internal communication among various levels and functions of the organization;
- Communication with contractors and other visitors to the workplace; and
- Receiving, documenting and responding to relevant communications from external interested parties.

Consultation and communication with stakeholders include WSH matters such as changes in material, processes, and procedures; decision on implementation of processes and procedures to manage risks; and hazard identification, review of risk assessment, control and legal requirements. These processes shall be documented as evidence of organisation's communication with internal and external stakeholders. Consultation and communication processes may include:

### a) WSH promotion

Promotional programmes provide an ideal opportunity for the involvement of the workforce in safety, health and well-being. This is a vital part of a company's WSH agenda, where the company communicates its intentions to its workforce.

The main principles to be considered in the promotion programme include:

- Reinforcing WSH messages;
- Keeping the initiatives relevant; and
- Encouraging a deliberate change of workers' behaviour by allowing them to examine their actions to ensure compliance.

### b) Small group meetings

Small groups meetings should be established to promote communication and co-operation between management, workers, contractors and all who are affected by operations at the workplace to address issues and ensure appropriate actions are taken. This is to achieve and maintain the company's WSH objectives. These groups include:

#### i. WSH Committee

The WSH Committee comprises representatives from various departments and functions, as well as contractors, to manage safety, health and well-being matters. The WSH (WSH Committee) Regulations require an establishment of WSH Committees in all factories with 50 workers or more



(excluding persons who carry out any work which is of a temporary nature and is not ordinarily carried out in the factory).

The WSH Committee plays a critical role in improving, promoting and reviewing all matters relating to the safety and health of workers. The WSH committee also acts as a channel for communicating and imparting knowledge and best practices to build a strong WSH culture at the workplace. For instance, inspection findings and opportunities for improvement are incorporated into the agenda of the WSH Committee meeting for discussion.

## **ii. Vessel Safety Coordination Committee**

The WSH (Shipbuilding and Ship-repairing) Regulations require a Vessel Safety Coordination Committee (VSCC) to be established for a ship where any hazardous work is carried out on board or on the structural part of the ship under construction by:

- The shipyard when the ship is in the shipyard; or
- The master, owner or agent of the ship, when the ship is in the harbour.

The VSCC is to meet daily including Sundays and public holidays when any hazardous work is being carried out on the ship and at such time the VSCC Chairman may decide.

The function and composition of the WSH Committee and VSCC and the duties of its members, including Chairman, Secretary, are stipulated in the Regulations and listed below:

- Review and discuss regularly all matters relating to the safety, health and welfare of workers involved in the work;
- Draw up plans for the co-ordination of work to ensure that when there are different types of work are being carried out at the same time, the types of work are compatible;
- Ensure that all relevant first-line supervisors and the master, owner and agent of the ship or their representatives are informed of the plan;
- Review daily of all work in progress on the ship;
- Plan and co-ordinate the movement and storage of hazardous materials;
- Review the validity of all permits issued daily;
- Monitor all the hot works carried out on the ship to ensure that all safety measures are maintained throughout the period of such work;
- Ensure that every confined space is checked for concentrations of oxygen, dangerous gases and flammable vapours
  - Before any worker enters the area; and
  - Regularly while work is being carried out for concentrations of oxygen, dangerous gases and flammable vapours and review the results of such checks.
- Ensure that every worker is provided with and uses the appropriate PPE for his work; and
- Make arrangements and determine the locations for the display of safety signs and permits on board the ship.

## **iii. Toolbox meetings**

Toolbox meetings are to be carried out daily involving supervisors and workers to consult, communicate and coordinate WSH related work activities. This should be done before work starts.

## **c) Safety information**

### **i. Risk assessment**

The employer, self-employed and principal should provide information to all workers at the workplace who may be at risk in the course of their work. The information includes:

- The nature of the risk involved; and
- Any measure or safe work procedure implemented.

### **ii. Safety signs and labels**

Safety signs should be provided by the occupier of a shipyard or the master, owner or agent of a ship in a harbour. The safety signs should conform to the Singapore Standard 508: Parts 1, 2, 3, 4 and 5.

### **iii. WSH handbook**

The occupier should provide a handbook on common WSH tasks and behaviour in the workplace. Although the regulation does not specify the contents, it can contain:

- Safety rules for behaviour in the workplace;
- Safe work procedures;
- Company's policy statement on safety, health and environmental protection;
- Hazard identification and WSH risks involved; and
- Risk control measures.

A sample of a WSH handbook is included in Annex B.

The rules and general practices can be illustrated in the form of cartoons, drawings or photographs to better convey the messages and their meaning.

The handbook can be presented as one composite document (taking care that it does not become too large for convenience) or as separate documents for different groups of workers. It is important to note the following:

- The handbook should specify who it is for;
- It should be small enough to handle and use;
- It should be written from the workers' point of view and easy for him or her to understand and put into practice;
- It should be written in a language understood by workers; and
- It should contain only information which is essential for the worker.

## **d) Other forms of consultation and communication**

- WSH briefings for workers, and other interested parties;
- Internal magazines;
- Notice boards;
- Hazard communication programmes; and
- Safety Data Sheet (SDS) and its management system.

## 5.5 Documented Information

The organisation should establish and keep information up-to-date whether it is in hardcopy or softcopy. This is so that there is adequate documentation to ensure effective operation of the WSHMS e.g. description of the elements of the WSHMS and their interactions, and provide direction to related documents.

## 5.6 Document and data control

The organisation should establish and maintain procedures for controlling all relevant WSH documents and data. Such documents can include (but not limited to):

- WSH policy
- Hazard identification records
- Risk register
- Legal register
- Licenses, certificates, permits from government agency
- Control methods which include process control and machine design, safe work procedures, in-house safety rules and regulations
- Design drawings
- WSH programme records
- Organisation structure
- Job descriptions and records of WSH responsibilities, accountability and authorities
- Records on communication and consultation with workers and stakeholders
- Contractor's records
- Safety Data Sheets
- Maintenance of records
- Training records
- Drill reports
- Inspection and audit records
- Incident records
- Operation records such as permit-to-work
- WSH performance records
- Industrial hygiene monitoring reports
- Medical and health surveillance records
- Management review

The control of safety-related procedural documents is essential to ensure that they are reliable, valid, and an authentic source of information. This involves the following principles:

- A document should carry information showing:
  - Its identity comprising the document name and number;
  - The issuing and approving authority;
  - The scope and application; and
  - The revision history with revision number, date of revision and its effective date.
- A circulation list for controlled copies should be maintained so that updates and revisions can be circulated to all copy holders.
- The document should be withdrawn promptly when it has been superseded or becomes obsolete.
- Controlled documents should be clearly identified and kept updated at all times.

- Uncontrolled documents should also be clearly identified as being “uncontrolled” and destroyed once their intended purposes have been fulfilled.
- Documents should be legible and easy to access.

## 5.7 Records and Records Management

Companies should ensure that WSH records are properly identified, maintained reviewed, stored and disposed appropriately. WSH records should be legible, identifiable and traceable to the activities involved. They should be kept in a systematic manner that enable easy retrieval and protected against damage, deterioration or loss.

Examples of records and their retention periods:

Records	Valid Period
Risk Assessment Records	3 years
Incident Report	3 years
Medical Examination Report of Persons Involved in Hazardous Occupation	5 years
Noise Monitoring Reports	10 years

Table 2: [Examples of records and retention periods](#)

The WSH (Shipbuilding and Ship-repairing) Regulations requires the secretary of VSCC to:

- Make and keep record of all matters discussed and decisions made at VSCC;
- Keep a copy of all relevant permit-to-work issued; and
- Update the permit-to-work coordination notice board.

## 6. Operation

In general, all operations must be preceded by an identification of the hazards and assessment of the associated risks. Organisations must establish, implement and maintain documented procedure(s) to eliminate or control these WSH risks. Such procedures must fulfil the following:

- Stipulate the operating criteria clearly and rationale for carrying out such steps to prevent incidents;
- Address the identified WSH risks of goods, equipment and services purchased and/or used;
- Establish the engineering standards for the design of workplace, process, installations, machinery, equipment maintenance operating procedures and work organisation, in order to eliminate or reduce operational risks; and
- Communicate to the relevant parties including suppliers and contractors. Such control measures should be properly communicated before commencing work to ensure that parties involved understand the hazards, methods of working, equipment to be used, precautions and procedures to be taken.

### 6.1 Operational Control

Operational control should be developed based on the risk assessment findings to eliminate hazards and reduce risks using the following hierarchy of control:

- Elimination (most preferred)
- Substitution
- Engineering control
- Administrative control
- Use of PPE (least preferred)

It is the duty of the employers or principals to provide and maintain PPE listed in the WSH (Shipbuilding and Ship-repairing) Regulations to the persons.

The following sections (a) to (x) provide guides on the typical types of operational controls for WSH at the shipyards (not exhaustive).

#### a) Safe work procedures

Risks can be identified through risk assessment techniques such as job safety analysis, activity-based risk assessment and trade-based risk assessment.

Shipyards should implement a system of safe work procedures to ensure that these risks are reduced and controlled so that all works are carried out safely and incidents eliminated or minimised.

As a guide, safe work procedures for works include but are not limited to the following:

- On any machinery where the fencing has been removed for the purpose of examination, lubrication or other operations;

- At a place where a person is liable to fall into any substance likely to cause drowning, poisoning, chemical burns or asphyxiation;
- In any confined space;
- Involving the application of heat or the potential generation of any source of ignition where explosive or flammable substances is liable to be present;
- On process, plant, vessel or machinery that is liable to produce or give off corrosive, toxic or flammable substances;
- In a compressed air environment or underwater;
- Functional testing of pipelines and valves (mechanical, electrical, pneumatic or hydraulic);
- Hydrostatic or pneumatic pressure testing of pipelines and equipment;
- Pressurised testing of any pressure vessel or pipe;
- Spray painting;
- Dismantling of any pipe or equipment containing steam or substances that are flammable, toxic or corrosive;
- Carrying out any repair or maintenance work on a pressurised hydraulic system;
- Radiography work;
- Grit blasting work;
- High pressure jetting;
- Erection and dismantling of scaffolds;
- Installation of equipment;
- Chemical cleaning;
- Electrical works;
- Explosive powered tools; and
- Crane and lifting operations.

## **b) Permit-to-work system**

Shipyards should adopt the permit-to-work system for all hazardous operations. It should address the following:

- Ensure that due diligence has been performed to ensure the safety and health of workers;
- Prevent incompatible works from being carried out at the same time in the shipyard or at any locations on board the ship. Ensure necessary WSH precautions are taken and enforced when such works are being carried out;
- Permit-to-work procedures must be rigorously applied in all its stages to contribute effectively to safety. Samples on permit-to-work are included in Annex G.

The stages of a permit-to-work system are described in the WSH (Shipbuilding and Ship-Repairing) Regulations. A summary is provided below.

	Stage	Responsibility		Action
		Shipyard	Ship in a harbour	
1.	Implementation of Permit-to-Work	Occupier	Master, Owner, or Agent of Ship	<ul style="list-style-type: none"> <li>• Implement a permit-to-work system.</li> <li>• Appoint a safety assessor (a WSHO or competent person).</li> </ul>
2.	Prohibition of high-risk works without a permit	Occupier, Employer, or Principal	Employer or Principal	<ul style="list-style-type: none"> <li>• Ensure that no high-risk works is carried out without a permit.</li> </ul>
3.	Application of Permit-to-Work	Supervisor or Foreman of Person Who Carry out the High-risk Work		<ul style="list-style-type: none"> <li>• Apply permit-to-work in such form and manner required by ship repair manager.</li> <li>• State measures which will be taken to ensure the safety and health of the person who carries out the high-risk work.</li> <li>• Address the permit to the ship repair manager and submit to safety assessor.</li> </ul>
4.	Evaluation of Permit-to-Work	Safety Assessor		<ul style="list-style-type: none"> <li>• Assess whether all reasonably practicable measures have been taken to ensure the safety and health of the persons who will be carrying out the high-risk work.</li> <li>• Inspect the site (including its surroundings) where the high-risk work is to be carried out together with the supervisor or foreman of the person who is to carry out the work to ensure that the high-risk work can be carried out with due regard to the safety and health of the person or any other person at work in the shipyard or on board the ship in the harbour who may be affected.</li> <li>• Endorse the permit-to-work if satisfied that the high-risk work can be carried out with due regard to the safety and health of the person at work.</li> <li>• Exercise due diligence when performing evaluation and endorsement of permit-to-work.</li> </ul>

	Stage	Responsibility		Action
		Shipyard	Ship in a harbour	
5.	Issue of Permit-to-Work	Ship Repair Manager		<p>Issue a permit-to-work in relation to the high-risk work if he is satisfied that:</p> <ul style="list-style-type: none"> <li>• There has been a proper evaluation of the risks and hazards;</li> <li>• No incompatible work which may pose a risk to the safety and health of the person who is to carry out the high-risk work and other persons at work in the shipyard or on board the ship in the harbour will be carried out at the same time and in the same vicinity as the high-risk work;</li> <li>• All reasonably practicable measures will or have been taken to ensure the safety and health of the persons who carry out or are to carry out the high-risk work; and</li> <li>• All persons who are to carry out the high-risk work are informed of the hazards associated with it.</li> </ul>
6.	Posting of Permit-to-Work	Supervisor or Foreman of Person Who Carry out the High-risk Work		<ul style="list-style-type: none"> <li>• Clearly post a copy of the permit-to-work, including where possible a sketch of any area where the high-risk work is permitted, at the work area.</li> <li>• Ensure that the copy is not removed until the date of expiry or date of revocation of the permit-to-work or on completion of the high-risk work.</li> </ul>
7.	Monitoring of High-risk Work	Ship Repair Manager		<ul style="list-style-type: none"> <li>• Continually review the progress of all high-risk work carried out pursuant to any permit-to-work issued.</li> </ul>
		Supervisor or Foreman of Person Who Carry out the High-risk Work		<ul style="list-style-type: none"> <li>• Ensure that the measures necessary to ensure the safety and health of the person at work are taken and are in place at all times during the validity period of the permit-to-work; and</li> <li>• Inform the SRM of the completion of the work.</li> </ul>

Table 3: Stages of permit-to-work system



### **i. Electronic permit-to-work system**

An electronic permit-to-work system could be implemented for day-to-day operations to manage WSH. Some of the key benefits include:

- Improves tracking of data for any project, for any type of permit and at any period of time;
- Eliminates waiting time in the approval process as each stage are time stamped;
- Increases transparency as the qualifications and certification of the supervisor, safety assessor and ship repair manager can be pre-screened during registration process into the system; and
- Provides better data protection security as all data are controlled by a third party.

### **ii. Safety checklists**

A ready-to-use guide in the form of checklists on the safety measures to be taken by the relevant trade workers would be very useful.

## **c) Design and engineering**

Major contracts will typically contain the basis of design and engineering standards needed. As an added measure, the company should additionally define the standards to include the provision for systematic WSH risk assessment, such as:

- Identification of the hazards, both in shipyard operations and the ship crew in operation of the ship.
- Assessment of the risk associated with these hazards.
- Management of the risk by avoidance of the hazard altogether, reduction by mitigation measures or by the provision of PPE.
- The design for the construction, reconstruction, repair, refitting, finishing or breaking up of vessels must be:
  - Capable of safety implementation;
  - Capable of safe testing, including shell tests and other high-pressure tests to be safe for ship's crew to operate; and
  - Safe to maintain, whether in a shipyard or at sea.
- The work of designers and engineers should be consistent and in accordance with the company's practice and standard procedures for design work. Checking and risk assessments are to be followed closely by designers and engineers.

## **d) Work at height**

Under the Workplace Safety and Health (Work at Heights) Regulations, it is the duty of the occupier of the workplace to ensure safe means of access to and egress from any area in the workplace when carrying out any works at height (WAH).

WAH is defined as work:

- In or on an elevated workplace from which a person could fall;
- In the vicinity of an opening through which a person could fall;
- In the vicinity of an edge over which a person could fall;
- On a surface through which a person could fall; or
- In any other place (whether above or below ground) from which a person could fall.

From one level to another and it is reasonably likely that the person or any other person would be injured due to the distance of the fall.

The Code of Practice for Working Safely at Heights can be read in conjunction with the relevant WSH regulations, standards, and guidelines.

### **i. Scaffolding and staging**

The WSH (Scaffolds) Regulations detail the requirements to be met by scaffolding and staging. It also includes the requirements for materials and construction of scaffolds, and for scaffold erectors, supervisors and professional engineers. The Approved Code of Practice for Scaffolds and Code of Practice for Suspended Scaffolds provide requirements relating to scaffolds.

- Hazards arising from scaffolding and staging may include the following:

#### **Falls**

The scaffolding or staging which provides access to workplaces at height must incorporate protection against falling.

#### **Falling objects**

When working at height, care must be taken to prevent objects from falling and causing injury or damage.

#### **Collapse**

Scaffolding or staging may collapse, for example through inadequate construction, failure of the ground or the structure to which it is anchored, or overloading. This is likely to cause injury, not only to persons using the scaffold but also to persons on or around the work site.

- Procedures

The company must ensure that the legal requirements are met, including the design, construction, supervision, certification, and registration of the scaffold.

The company's procedures must include provision for the training of scaffold supervisors and erectors and take into account the use of the scaffold, for example, to avoid overloading with equipment or accumulations of blasting grit.

### **ii. Mobile tower scaffolding**

Companies should set in place procedures covering the erection, use and dismantling of mobile tower scaffolding. These procedures should conform to Regulation 51 of the WSH (Scaffolds) Regulations.

- Hazards arising from mobile tower scaffolding may include the following:

#### **Falls**

The scaffolding or staging which provides access to workplaces at height must incorporate protection against falling.

#### **Falling objects**

When working at height, care must be taken to prevent objects from falling and causing injury or damage.

## **Collapse**

Scaffolding or staging may collapse, for example through inadequate construction, failure of the ground or the structure to which it is anchored, or overloading. This is likely to cause injury, not only to persons using the scaffold but also to persons on or around the work site.

## **Movement**

The tower scaffold may move if it is erected on uneven ground or not properly secured by brakes.

- Procedures

### **Construction**

- The height of the scaffold must not exceed eight times the lesser of the base dimensions of the scaffold.
- The scaffold must be effectively tied to the building or a rigid structure to prevent toppling when the height of the scaffold, excluding the handrails and their supports at the uppermost lift, exceed three times the lesser of the base dimensions of the scaffold.
- No more than two work platforms are to be used on the scaffold at any time.

### **Stability**

- The scaffold should only be used on level ground.
- The scaffold should be adequately weighted at the base when necessary.
- The scaffold should be used on a firm and even surface.

### **Locking**

- Wheels are to be securely braked.
- Casters are to be provided, with a positive locking device to hold the scaffold in position.

### **Movement**

- The scaffold must not be moved when someone is on the work platform.
- The scaffold should only be moved by applying force at or near the base.

## **iii. Aerial work platform**

Aerial work platforms, also known as 'cherry pickers', are used to carry out works at height with less extensive preparation than scaffolding and staging.

Typical work includes spray painting, blasting, job inspections and steel-work repairs.

- Hazards arising from aerial work platform may include the following:
  - Risk of falling objects;
  - Failure in service; and
  - Risk of personnel falling from height, being stranded, or of equipment falling during failure of the equipment.

- Procedures

### **Preparation**

- The ground surface is firm and level.
- All safety devices are operating correctly.
- The lifting systems and directional controls are operating correctly.
- There are no visual defects in the equipment falling during failure of the equipment.

## **Operation**

- Only authorised and trained personnel should operate the aerial work platform.
- Safety harness must be worn and anchored to the basket guard rails.
- The Safe Working Load (SWL) must not be exceeded at any time.
- The boom should be used only for lifting personnel and their immediate tools, and not for carrying materials or equipment.
- The platform should not be operated on a slope.
- Stop operations immediately and report to the maintenance authority in the event of leaks, damage and malfunctions.

## **iv. Dock arm**

The company should set in place procedures on the safe use of a dock arm as a means of access to a ship in a dry-dock.

- Hazards arising from dock arm may include the following:

### **Mechanical failure**

Inadequate maintenance may result in collapse of the dock arm causing injury to workers.

### **Unauthorised use**

Operation by personnel who are not trained in its use may cause serious injury.

- Procedures

### **Pre-operation**

- Grease moving parts regularly.
- Check hydraulic leads.
- Check for corrosion of the dock arm rails.
- Check for damaged or missing handrails.
- Check for mechanical or electrical malfunction of the controls.

### **During operation**

- Only trained personnel should operate the dock arm.
- Operator must be at the station to be in-charge of the controls whenever the dock arm is in use.
- Check that there are no obstructions along the travelling path of the dock arm.
- Maintain communication between the operator and the personnel on the working platform before raising or lowering the arm.
- Personnel on the working platform must anchor their safety belts to the handrail.
- Only two personnel may be on the working platform at any one time.
- Ensure sufficient clearance between the working platform and shipside to avoid a collision.

### **After operation**

- Dock arm must be anchored at the designated location.
- Power to the dock arm must be switched off and the control key removed.
- Any damage or malfunction of the dock arm must be reported to the maintenance authority.

## **e) Hot Work**

The company must have procedures and resources to carry out its obligations under the WSH (Shipbuilding and Ship-Repairing) Regulations. Hot work permit is required for cutting, burning and welding operations, or any operations involving the use or generation of flame, heat and/or sparks.

### **i. Cutting, burning and welding**

This includes hand-held electric arc and gas operations, automatic profile-cutting machines and others using high temperatures to cut, burn or weld metal, whether on board a vessel or in a workshop.

- Hazards arising from cutting, burning and welding may include the following:

#### **Ignition source**

These operations are an ignition source. The permit-to-work must demonstrate that appropriate precautions have been taken to ensure the area is free of gas, flammable sludge or film adhering to surfaces, and that no other structure or operation is at risk from the cutting, burning or welding. There should be a fire watchman available to raise the alarm in the event of a fire and apply immediate firefighting measures.

#### **Hazardous substances**

Hazardous substances may be entrained in the metal surfaces of tanks and vessels or may be present on the other side of a metal plate from the hot work location. These may be released as gases or liquids and cause fire or toxic atmospheres.

#### **Tripping hazards**

Hoses and leads should be arranged to avoid trip hazards.

#### **High temperature**

Workers are susceptible to burns due to exposure to heat e.g. from welding sparks.

#### **Fumes**

Some metals generate toxic fumes when being welded. The procedure should take into account ventilation requirements, even in open air.

#### **Confined space**

Cutting, burning and welding often take place in confined spaces such as at tanks, lockers, engine space and steering flat. The permit-to-work must take into account the need for gas freeing and regular checking.

#### **Equipment hazards to worker**

Workers may be exposed to electric shock, gas escape, explosion or fire. Equipment used onsite, whether owned by the shipyard or by contractors, must be inspected to ensure that it is safe and capable of the standard of workmanship required. A procedure should be set up for the checking of equipment on arrival with regular safety and maintenance checks thereafter, in accordance with legislation and company policy. There must be a record of checks of equipment, hoses, leads and electrode holders.

- **Procedures**

During the VSCC meeting, any proposed hot work to be carried out should be discussed and included into the permit-to-work. The VSCC must ensure that all persons involved are aware of the work being done and that no incompatible work is carried out. The procedures for any such work should include:

**Protection against fire and explosion**

- Check that there is no flammable material, gas or dry woodwork which can catch fire, and that surfaces which have been in contact with hydrocarbons or toxic substances are completely clean;
- Hot work areas should be isolated from flammable and combustible materials; and
- If any pipes are still in service, ensure that they are de-pressurised, gas-freed and free from flammable substances or residues before they are subjected to any heat which could cause a rise in pressure and possible rupture.

**Personal protective equipment**

Personal protective equipment (PPE) required must be specified in the procedures, in the permit-to-work or both. This includes:

- Eye protection by helmet, mask or goggles;
- Provision of appropriate breathing apparatus or adequate ventilation if there is a risk of dangerous fumes, particularly if working in a confined space; and
- Other protective clothing according to the actual work environment.

**Other precautions**

- Protect any electrical, hydraulic and pneumatic lines nearby; and
- Make sure that other people are not at risk from the welding or cutting operation.

## **ii. Gas cutting and welding**

- Hazards arising from gas cutting and welding may include the following:

**General hot work risks**

Refer to section 6.1€ on Hot Work.

**Gas escape**

The escape of oxygen, acetylene or LPG can cause a hazardous atmosphere which may result in fire or explosion. Acetylene or LPG can also cause oxygen deficiency which may result in asphyxiation.

**Exposure to welding fumes**

Exposure to welding fumes from some heavy metals, e.g. the chromium (VI) compounds, are carcinogenic.

- **Procedures**

Gas hoses, torches, blowpipes, pressure regulators, nozzles, connections, flash-back arrestors and non-return valves must be inspected as often as the current legislation requires. Any equipment not complying with company and statutory requirements must be withdrawn and not used until it has been inspected and approved by a competent person. The procedures should specify safety precautions, such as disconnecting hoses from a manifold during breaks

and at the end of the task and shift. Isolation by valves alone is not adequate to prevent possible leakage. The use of exhaust ventilation should be considered to effectively remove welding fumes at source.

### iii. Electric arc welding

- Hazards arising from electric arc welding may include the following:

#### **General hot work risks**

Refer to section 6.11 on Hot Work.

#### **Electric shock**

While the voltage is low, wet skin or standing in water can increase the risk of shock.

#### **Electric arc**

Exposed conductors or faulty connections can cause arcing with the possibility of overheating and fire.

- Procedures

Welding transformer equipment, electrode holders, welding cables, connectors and low voltage shock preventers must be inspected as often as the current legislation requires. Any equipment not complying with company and statutory requirements must be withdrawn and not be used until it has been inspected and approved by a competent person.

The procedures should specify safety precautions such as:

- Check the condition of all equipment before work;
- Ensure suitable connections for the earth lead (not pipe-work containing flammable liquid or gas, hydraulic lines, cables and conduit, chains, wire ropes or scaffolding);
- Ensure that the electrode is stowed in a position where it cannot come into contact with the metal structure when not in use; and
- Switch off the welding machine during breaks.

### iv. Grinding

- Hazards arising from grinding may include the following:

#### **Cutting, burning and welding**

Refer to section 6.1(e)(i) on Cutting, Burning and Welding.

#### **Eye injury**

Particles of metal from the workpiece or from the grindstone may cause eye injuries.

#### **Noise**

Hearing loss may result from persistent exposure to high noise levels during grinding.

#### **Facial injury**

A grindstone can break and cause facial injuries.

- Procedures

Company rules and procedures must specify the precautions to be taken when grinding, whether using a fixed bench grinder, portable electric or air-driven grinder.

The precautions include, as appropriate:

- PPE must be worn;
- Training in the use of the relevant grinder;
- Permit-to-work; and
- Confined space entry and gas freeing.

## **f) Confined space entry**

The company must have procedures and resources to carry out its obligations under the WSH (Confined Spaces) Regulations. This covers any chamber, tank, manhole, vat, silo, pit, pipe, flue or other enclosed space in which the hazards listed below exist. The Regulations also makes provisions which restrict the conditions for entry into confined spaces.

- Hazards arising from confined spaces may include the following:

### **Dangerous gases, vapours or fumes**

Risk of fire or explosion and persons being overcome.

### **Inadequate supply of air**

Insufficient oxygen to sustain life.

### **Inadequate lighting**

Structural members, debris, sludge and other items may make access hazardous, particularly if there is inadequate lighting for the work to be done.

### **Assumptions of safety**

A confined space may have been used previously for harmless purposes such as water ballast but may be hazardous because of contamination by leakage of hydrocarbons or by microbiological action.

- The company must have the following resources to support confined space entry procedures:
  - Adequate means of access to the confined space;
  - Breathing apparatus, belts, ropes and resuscitator;
  - Means of certifying that the atmosphere is safe for entry;
  - A competent person to carry out that certification;
  - Adequate ventilation;
  - Periodic atmospheric monitoring of confined space;
  - Records of tests for dangerous fumes; and
  - A person keeping watch outside the confined space.
- Record of entry  
Records of persons entering a confined space should be recorded in a tally box or board located close to the point of entry. Each person should leave an identification card or tag in the box or on the board when entering and retrieve it when leaving.
- Procedures  
The WSH (Confined Spaces) Regulations make provisions for the restriction and steps to be taken for entry into confined space. In accordance with the WSH Act, MOM has approved the



Code of Practice for Confined Spaces as the applicable practical guidance for safety and health for such work. This will be used as a yardstick to assess whether reasonable practical measures have been taken in compliance with safety and health standards for confined space entry.

The procedures outlined in Code of Practice include:

- Hazard identification and evaluation;
- Entry permit;
- Testing of atmosphere in a confined space;
- Authorised person to approve entry permit;
- Display of name tags;
- Period testing of atmosphere;
- Use of retrieval system; and
- Confined space vacated for a significant period of time.

It also contains guides on ventilation, training, appointment of attendant and rescue operation.

## **g) Surface treatment**

### **i. High pressure water jetting or steam cleaning**

- Hazards arising from high pressure water jetting or steam cleaning may include the following:

#### **High pressure and temperature**

These operations use high pressure and high temperature jets to treat the metal surface. The workers must be aware of the associated hazards and follow company procedures including the use of appropriate PPE to avoid injury. Pressure settings must be correct for the work. The lance must not be directed at any part of the human body.

#### **Debris**

Water jetting and steam cleaning are used to dislodge surface particles which can be propelled into the air. This may cause injury particularly to workers' eyes.

#### **Trip hazards**

The pump and its supply lead or hose and delivery hoses should be located where they will not cause obstructions.

#### **Emergency escape**

The equipment with its leads and hoses must not obstruct an emergency escape route or the close off fire doors, bulkhead doors or other safety-critical protective provisions.

#### **Noise**

Provision must be made to protect workers' hearing in the area when the equipment generates a high level of noise.

- Procedures

#### **Personal protective equipment**

Specify the PPE to be used by workers involved in the work. This includes waterproof clothing, waterproof boots and goggles or face mask.

### **Preparation**

Specify the checks on the equipment and workplace to be carried out by the worker or his supervisor. Barriers and warning signs should be erected around the area or work carried out at a time when other workers are not within range.

### **Operation**

- Specify the method of working.
- Review the WSH hazards and measures to reduce risk.
- Set up and check the equipment.
- Stop up pipes, valves, ducts and ventilators.
- Provide precautions to be taken during breaks.

## **ii. Shot blasting, grit blasting and chipping**

The company must implement procedures which fulfil the provisions of the WSH (Abrasive Blasting) Regulations.

- Hazards arising from shot blasting, grit blasting and chipping may include the following:

### **Air-borne debris**

Eye injuries and health problems may result from the blasting medium or particles from the surface being treated.

### **Noise**

Abrasive blasting can create high level of noise which may cause hearing loss.

### **Contaminated air**

The air may be contaminated and cause silicosis, lung cancer, and breathing problems. An air-fed mask must be supplied with suitable quality of air.

- Procedures  
MOM has laid down noise control provisions for personnel using blasting equipment:
  - A blasting helmet should be equipped with silencers or other noise reducing devices to lower the noise level inside the helmet to less than 85 dBA;
  - Pressure reducing devices are required to maintain the breathing air in the blasting helmet at a pressure within the range recommended by the supplier;
  - The blaster should use suitable earplugs. Hearing tests should be carried out for all blasters before employment and at yearly intervals; and
  - The breathing air quality of the compressed air supplied from the air compressors should be monitored closely with a Carbon Monoxide (CO) monitoring device.

## **iii. Spray painting**

The WSH (Shipbuilding and Ship-repairing) Regulations cover spray painting.

- Hazards arising from spray painting may include the following:

### **Fire and explosion**

The vapour given off by spray painting is flammable and may build up, particularly when working in a confined space.

## **Residual vapour**

After the painting operation is completed, it should not be assumed that the atmosphere is safe for breathing as the paint surface may not have dried or cured completely. The atmosphere should be properly ventilated and tested.

## **Health problems**

Breathing the toxic vapour for too long may cause headaches, dizziness, and nausea. Long term exposure to the vapour may lead to health issues, e.g. cancer.

- **Permit-to-work procedures**

The permit-to-work must ensure that no incompatible work is done in the area, particularly hot work. The permit-to-work procedures should also cover work done by the ship's crew to ensure it is compatible with tasks carried out by shipyard personnel.

- **Preparation**

The intention to carry out painting at the worksite must be discussed at the VSCC. It should be made clear that no hot work may be done at the same time in the vicinity as paint may contain flammable or toxic substances. Any gas, sludge, and film adhering to surfaces in the vicinity must be cleaned, and the atmosphere tested before and during the painting operation.

- **Permit**

The permit for painting should follow the WSH (Shipbuilding and Ship Repair) Regulations.

- **Hazardous substances**

During spray painting, hazardous substances such as paints and solvents must be accompanied by an SDS. This must be brought to the attention of persons receiving, transporting, storing, using and disposing of such materials and to their supervisors. The provisions stipulated in the SDS should be adhered to.

The use of hazardous substances includes substances which are toxic, corrosive, volatile, explosive, irritant, carcinogenic and allergenic. These substances must be subjected to procedures covering their purchase, receipt, transport, storage, handling, use and disposal. Refer to section 6.1(w) on Occupational Health Hazards.

- **Procedures**

- Adequate ventilation must be maintained so that the space is gas-free. This eliminates the danger of fire and paint intoxication;
- Fumes arising from welding works are hazardous. The SDS of the welding electrodes should be obtained for risk assessment on personal exposures;
- Electrical equipment must be suitable for use in a hazardous atmosphere and securely bonded to earth;
- Signboards should be prominently displayed around the work area, for example 'No Smoking', 'No Hot Work' and 'Spray Painting in Progress', and all pipelines to other compartments should be blanked off;
- Lighting and electrical equipment must be suitable for use in a flammable atmosphere; and
- Painters should use an approved type of air-fed mask.

- **Completion of task**

Once the painting operation is ended, the relevant personnel must be informed. After painting, a confined space must be made safe by ventilation and checked for the presence of flammable or toxic gases before subsequent operations, particularly hot work, begin. This applies also to hot work on the opposite side of bulkheads, tanks and decks.

## **h) Pressure testing**

Pressure testing of vessels, pipework, valves, pressure relief valves and tanks involving high pressures generated by compressors, pumps or hydrostatic head. When high pressure is applied, there is a hazard of injury or drowning from the loss of containment. There is also the danger of injury from projectiles.

- Procedures

### **Barriers**

When pressure testing is in progress, procedures should require that barriers are erected to prevent unauthorised entry.

### **Risk assessment**

Before commencing testing operations:

- Identify the hazards;
- Assess their associated risk;
- Put in place means to mitigate the risk when necessary; and
- Monitor the operation to protect people, plant, ship and work area.

### **Use of compressed air**

The pressure must be correct for the work to be tested. Gradual application allows the responsible personnel to spot failures before the released energy becomes dangerous.

## **i) Radiography**

Radiography may pose a radiation hazard. A high radiation dose from exposure over a short period may cause acute radiation effects such as nausea, vomiting, and loss of hair. As it is invisible, its effects may not be apparent for a considerable time after exposure.

- Procedures

### **Control of sources**

Procedures should specify the method of controlling the movement and the use of radioactive sources, recording these movements and accounting for their removal from the company's premises. The procedures should also specify the actions to be taken in the event of an exposed source, a lost source and damage to the protective container.

### **Health monitoring**

Workers involved in radiography must be qualified and trained in the work. Where the work is not done by a specialist contractor, procedures must specify:

- The training required;
- The routines for monitoring any dose received; and
- The action to be taken in the event of an excessive dose.

Where the work is done by a contractor, the company should ensure that the contractor has adequate procedures in place for the protection of its own and other personnel nearby.

## **j) Commercial diving**

- Hazards arising from commercial diving may include the following:

### **Asphyxiation**

A loss of air supply which can be caused by failure of air-line apparatus, exhaustion of a self-contained breathing apparatus cylinder or interruption of supply through an air-line pipe, can result in asphyxiation.

### **Bends**

A failure to observe diving procedures for the rate of return to the surface may cause 'bends' or nitrogen release in the diver's blood on decompression.

### **Snagging and abrasion**

Air lines and communication lines can be snagged on underwater objects or abraded on rough surfaces.

### **Poor visibility**

The inshore water in which shipyard divers operate is often cloudy. This can possibly lead to disorientation or difficulty in carrying out the work involved.

### **Hazards from other activities**

Other activities in the vicinity of the diving operations, like working on a hanging staging can result in dropped objects and endanger a diver's safety.

- Procedures

### **Preparation**

- Divers and their support team must be trained and qualified in the work to be done;
- Divers must be given adequate briefing to ensure that they are aware of conditions underwater, including local hazards such as currents, intakes and outflows, submerged objects and dock machinery;
- The work plan must clearly show the work to be done;
- Life support systems must be checked and be in good working order;
- The surface team must be aware of the activities being carried out; and
- Isolation lock-out/tag-out to ship's underwater system should be performed to avoid any accidental activation that could jeopardise the diving operations.

- Systems

There must be procedures for the maintenance and operation of the life support systems. These systems should include means of communication and the following safety equipment:

- Diving helmet;
- Diver's umbilical with lifeline/communication line;
- Diver's full body harness; and
- Emergency air supply cylinder.

## **k) Ship movements**

### **i. Ship crew briefing**

- Hazards arising from ship crew operations may include the following:

#### **Incompatible operations**

The ship's crew may have tasks which are not compatible with the shipyard's work. The crew's work is subjected to the same permit-to-work procedures and VSCC control as work done by shipyard personnel.

#### **Unfamiliarity with the shipyard**

The ship's crew are unfamiliar with the shipyard's layout, the company rules and the need for precautions related to other work in progress. This can lead to misunderstanding and infringement of the company's rules and procedures.

- Procedures

#### **Briefing**

The company should have a clear briefing document explaining matters such as:

- Company rules, particularly regarding to smoking and access to the shipyard;
- Function of the VSCC and the requirement for representation by the ship's master;
- Operation of the permit-to-work system;
- Procedures for bringing materials and equipment into the shipyard;
- Rules and procedures for transferring or discharging cargo, bunker fuel, slops, ballast and bilge contents; and
- Precautions regarding propeller turning, rudder movements, hydraulic systems operations, winches, anchors, steam system operations, inserting and fire protection systems, and actions to be taken in an emergency.

### **ii. Slipping and launching**

- Hazards arising from slipping and launching operations may include the following:

#### **Loss of stability**

Vessels may lose their stability at the time of slipping and/or launching which may result in damage to the vessel and injury to the personnel involved.

#### **Collision**

When the vessel is launched, there is a danger of collision with other craft in the area or with fixtures such as quays, mooring dolphins, buoys or floating docks.

#### **Failure of gear**

During slipping and launching operations, there may be a risk of failure of any winches or other mechanical gear which may result in uncontrolled movement to the ship, cradle or other equipment, and may cause injury to personnel or damage to the vessel.

- Procedures

#### **Preparation**

The company should have generic procedures for slipping and launching, and a plan for each individual operation, taking into account the following:

- Nature of the vessel
- Vessel's dimensions and gross weight
- Conditions at the time
- Position of the slip
- Means of control of the vessel in the water
- Provision for contingencies
- Water clarity and depth, warping and berthing required
- Maintenance of winches

The plan must include consultation with the Maritime and Port Authority of Singapore (MPA) and obtaining its authorisation. It should include a thorough risk assessment, covering all the WSH risks and means of eliminating or mitigating those risks.

### **Launch procedure**

The launch procedure including the allocation of duties to company personnel, contractors, ship's crew and representatives, and should be prepared well before the launch. Depending on the size and nature of the vessel, type of slip and method of control, the procedure should cover:

- o Allocation of duties
- o Layout of moorings and lines
- o Tug assistance
- o Port supervision and pilotage
- o Chock removal
- o Restraint after launch
- o Safety requirements of all involved personnel, including external parties, such as distinguished guests
- o Communication plan among the working parties involved in the operation

### **iii. Berthing and unberthing**

- Hazards arising from berthing and unberthing may include the following:

#### **Hazardous materials**

Exposure to flammable, corrosive or toxic chemicals such as bunker fuel, hydraulic oil, lubricating oil, paints and solvents.

#### **Reasons for berthing**

A vessel arriving for repair may have a fault which is hazardous. For example, its manoeuvrability may be affected, it may have damage which affects its stability, or its integrity may be breached, resulting in leakage and pollution.

- Procedures

#### Preparation

Vessels arriving to Singapore need to make notifications, declarations and follow the relevant procedures and guidelines stipulated by MPA. The company should have procedures for the arrival of the vessel, including information such as:

- The name and call sign of the vessel;
- Country of registration;
- Overall length, draught and beam of the vessel;
- Estimated time of arrival;

- Nature of cargo, flash point and quantity,;
- Distribution of cargo on board;
- The work to be done, such as tank cleaning, hull and repair; and
- Need for tug assistance.

### **Shipyard equipment**

There should be information on the shipyard's berth layout, bollards, quick-release hooks and depth of water.

### **Berthing**

There should be procedures for handling the vessel on arrival, including mooring, gangways and towers, connection of services and as a means of communications. The master and crew must be briefed on the shipyard's rules using the briefing document detailed above.

## **iv. Dry-docking and flooding**

- Hazards arising from dry-docking and flooding may include the following:

### **Damage to ship**

A ship may be damaged through failure to follow a fully prepared docking plan, e.g. through windage, current, failure of mooring systems, collision with other vessels. A ship may be improperly set on blocks, particularly if it is not flat bottomed.

### **Injury and drowning**

Operations at a quayside or dockside are subjected to the risk of injury from contact with mooring lines and winch equipment. There is a risk of falling in the water and possible drowning.

### **Falls**

There is a risk of injury from falling into the dock when it has been drained of water. During the process of establishing access to the ship or vessel using a dock arm or gangway, the risk of flooding is particularly high.

### **Premature flooding**

Refer to section 6.1(x)(ii) Accidental Flooding of Dry Dock or Floating Dock.

- Procedures

### **Preparation**

When vessel-docking instructions are received from the responsible authority, the dock master must confirm the docking with the vessel's agent (if the vessel is at anchorage) or the captain (if the vessel is in the yard). The following procedures should be adopted:

- Provide a vessel-docking plan for the block arrangement;
- Ensure that personnel affected are familiar with the emergency and evacuation procedures;
- Check the vessel before docking;
- Instruct the dock operator to flood the dock if it is not already flooded;
- Deploy the line handler and mobilise tugs and machinery;
- Check electrical and cooling lines and other relevant systems and ensure they are operational. Inspect the yard's immediate dock, if any, for structural damage or defects;
- Inspect and test all rubber seal installations, pumps and electrical high water level sensors to ensure that all is in working order;



- Ensure the bilge pump is ready to be operated manually should the high-level water sensors fail;
- Close the drain sump valves on both sides of the dock;
- Install polypropylene ropes at the 15m mark from the intermediate dock gate. Side-wall markings of 15m, 10m, 5m and 0m should be clearly marked and visible; and
- Ensure that life buoys are in place and in good condition.

### **Docking**

- Manoeuvre the ship into the dock according to the plan;
- Instruct divers to check the alignment of the vessel aft and forward. Place additional packing for a non-flat bottom vessel;
- Instruct the dock operator to pump the dock dry when the vessel is in position;
- Check that the vessel is set correctly on the blocks when the dock is dry. Re-pack the vessel if necessary; and
- Install the gangway to the vessel.

## **v. Docking in floating dock**

- Hazards arising from docking in floating dock may include the following:

### **Damage to ship**

A ship may be damaged if it is improperly set on blocks, particularly if it is not flat-bottomed.

### **Falling/drowning**

Workers working at a quayside or on a floating dock are subjected to the risk of falling in the water and drowning.

### **Premature flooding**

Refer to section 6.1(x)(ii) Accidental Flooding of Dry Dock or Floating Dock.

- Procedures

### **Preparation**

- When vessel docking instructions are received from the responsible authority, the dock master is to confirm the docking with the vessel's agent (if the vessel is at anchorage) or the master (if the vessel is in the yard);
- Provide a vessel-docking plan for the block arrangement;
- Check the vessel before docking;
- Instruct the dock operator by dock master to flood the dock;
- Deploy the line handler and mobilise tugs and machinery; and
- Check electrical, cooling lines and other relevant systems and ensure they are operational.

### **Docking**

- Manoeuvre the ship into the dock according to the plan;
- Instruct the divers to check the alignment of the vessel (aft and forward); Place additional packing for a non-flat bottom vessel;
- When the vessel is in position, the dock master is to instruct the dock operator to pump the dock dry;
- When the dock is dry, check that the vessel is set correctly on the blocks. Re-pack the vessel if necessary; and

- Install the gangway to the vessel.

## **I) Transfers of fluids between tanks and to shore**

### **i. Ballasting and deballasting**

- Hazards arising from ballasting and deballasting may include the following:

#### **Stability**

It is the responsibility of the ship's officers to ensure the stability of the vessel to prevent capsize. The company must approve the operations to be carried out.

#### **Draught**

Excessive freeboard may cause problems e.g. mooring lines breaking in high wind. There must be sufficient draught for the operations to be carried out, taking into account the sea and tide conditions to prevent grounding.

#### **Other operations on board**

Operations must be coordinated to ensure that personnel engaged in other operations are not endangered.

- Procedures

#### **Communication and approval**

The transfer of ballast into shore tanks or the transfer of ballast between tanks on board requires procedures to ensure that company personnel are not at risk and that the arrangements for transfer to shore are understood and followed. Each transfer must be subjected to specific information and agreement.

### **ii. Cargo movements, bunkering and transferring of fuel oil**

- Hazards arising from cargo movements, bunkering and transferring of fuel oil may include the following:

#### **Stability**

Refer to section 6(I)(i) Ballasting and deballasting.

#### **Hydrocarbons**

The movement of hydrocarbons including volatile components carries the risks of loss of containment, fire or explosion.

#### **Simultaneous operations**

The movement of cargo while at a berth must only be carried out subject to the work schedule as agreed at the VSCC meeting.

- Procedures

#### **Cargo movements**

The following procedures in shipyards must be in place:

- Communication between the ship and yard personnel;
- Agreement on the planned movement and the safety of other work being carried out; and
- A risk assessment to ensure that hazards have been taken into account and provided for. The effect on other work in progress, particularly the risk from operating pumps, pipe work and inverting system.

## **m) Use of tools and equipment**

### **i. Electric tools**

This includes portable drills, sanders, grinders and saws. Legislation relating to such equipment is in the WSH (Shipbuilding and Ship-Repairing) Regulations.

- Hazards arising from use of electric tools may include the following:

#### **Electric shock**

Damaged, poorly maintained or wrongly used tools can cause electric shock, which is potentially fatal. Mains voltage electric tools used in wet weather are particularly hazardous.

#### **Trips on leads**

Trailing leads across walkways and decks can cause trips.

#### **Rotating parts**

Clothing may catch onto rotating parts. They can also whip about if not properly controlled, e.g. on starting or when catching on some part of the work.

#### **Reciprocating parts**

These can catch on the work and jerk dangerously.

- Procedures

#### **Use of tools**

Companies should have procedures for:

- Issuance of hand tools;
- Use of bench tools;
- Checks to ensure users are competent;
- Checks of the tool and its cable and plug before use;
- Checks that appropriate guards are in place and are in good condition;
- Use of the PPE appropriate to the job;
- Use of hand tools including a prohibition on use outside their capacity or specification;
- Switching off the power supply when the tool is not in use and disconnecting hand tools when they are not being used;
- Inspection of hand tools on their return to store; and
- Regular inspections.

### **ii. Pneumatic hand tools**

This includes air-driven drills and grinders.

- Hazards arising from use of pneumatic hand tools may include the following:

#### **Compressed air**

Faulty couplings, damaged hoses and unauthorised interference with the tool can cause serious injury from the release of compressed air.

#### **Trips on leads**

Trailing hoses across walkways and decks can cause trips.

### **Rotating parts**

Clothing can be caught between rotating parts. Rotating parts can also whip about if they are not properly controlled, e.g. on starting or when catching on to some part of the work.

### **Reciprocating parts**

Reciprocating parts can be caught on the work and jerk dangerously.

- **Procedures**

Use of tools

Companies should have procedures for the following:

- Issue of hand tools;
- Ensure users are competent;
- Check tools before use;
- Use of hand tools including restrictions on use outside their capacity or specification;
- Inspect tools on their return to store; and
- Regular inspections.

### **iii. Workshop machinery**

This applies to machinery in the shipyard and equipment operated on contractors' premises. It includes lathes, boring machines, drills, grinding machines, cutting, bending and folding machines, forging and casting equipment, and all other fixed workshop equipment.

It covers manually operated, numerically controlled and profiling machines.

- Hazards arising from use of machinery may include the following:

#### **Moving parts**

Hands and clothing can be caught in the moving parts, particularly when setting up or maintaining machines or if the guards are faulty or disabled.

#### **Unsecured workpiece**

Workpieces and tools are to be properly secured by clamps or vices to avoid injuries.

#### **Damage to the work**

Inexpert or careless work can cause extensive damage to work in progress.

- **Procedures**

#### **Guards**

Companies must ensure that the machines are properly guarded in accordance with provisions made under the WSH (General Provisions) Regulations. Procedures for maintenance and lubrication should include provision for times when the guards are disabled.

#### **Operation**

Company rules must limit the operation of machinery to persons who are appropriately trained, experienced and supervised.

The instructions for a specific task should include an assessment of the WSH risks involved and the means of avoiding or mitigating that risk. When a change to an instruction becomes necessary, the change should be approved by a supervisor.

## **n) Compressed air and gases**

### **i. Compressed air**

- Hazards arising from compressed air may include the following:

#### **Failure of hose or coupling**

This can release a jet of compressed air which can cause serious injury. A hose, tool-lance or jet can whip about causing injury to personnel or damage to equipment.

#### **Failure of valves**

An opened hand-held control valve can cause an uncontrolled jet of compressed air. A valve failure at the manifold can leave equipment live when it is expected to be depressurised.

- Procedures

#### **Condition of equipment**

Ensure that equipment is inspected at regular intervals, and at least as often as any relevant legislation demands.

#### **Use of equipment**

Procedures must cover the use of compressed air and signs to warn of any hazards involved. Operations involving compressed air should be preceded by an assessment of the risks involved in the particular situation.

The use of equipment must be restricted to persons properly trained and qualified.

### **ii. Compressed gases**

- Hazards arising from compressed gases may include the following:

#### **Toxic gases**

Some gases are toxic or asphyxiating when they are at a concentration greater than the permissible exposure level.

#### **Escape of flammable gas**

A concentration of flammable gas between its flammable limits can cause fire or explosion.

- Procedures

#### **Condition of equipment**

Ensure that equipment is inspected at intervals as required in the WSH (Shipbuilding and Ship-Repairing) Regulations for inspection of hot work equipment.

#### **Use of equipment**

Gas cylinders must be colour-coded to conform to the Singapore Standard on Identification of Contents of Industrial Gas Containers. This stipulates a colour code system for gas cylinders. The colours for hoses are defined in Singapore Standard Code of Practice for Safety in Welding and Cutting (and other operations involving the use of heat).

Gases Hose	Hose Colour	Cylinder Colour
Acetylene	Red	Maroon
Oxygen	Blue	Black
LPG	Orange	Grey*

\* May vary from company to company.  
 Table 4: [Colour code system for gas cylinders](#)

- Procedures should cover the use of compressed/dissolved gases and include the following:
- Permanent and temporary storage precautions;
  - Handling gas cylinders (keeping upright in trolleys and quads);
  - Marking and segregation when empty;
  - Protection from impact, especially on valves, regulators, flashback, arrestors and non-return valves;
  - Inspection before use to ensure no damage to fittings or hoses; and
  - Certification of hoses at stipulated intervals.

## o) Transport and materials handling

### i. Forklift trucks

- Hazards arising from using forklift trucks may include the following:
 

**Unauthorised use**

Unauthorised personnel of forklift trucks without the necessary training or qualification can suffer serious injury or cause property damage.

**Failure**

Mechanical or electrical failures involving the brakes, tyres, lights, motor or engine, hydraulic lifting systems, and reversing signal may result in injury
- Procedures
 

**Maintenance**

Ensure that the equipment is regularly inspected, lubricated and maintained in accordance with the manufacturer’s instructions. Maintenance records must be kept.

**Pre-use checks**

Pre-use checks must be carried out by the driver at the start of the shift. It should cover the operation of the controls, condition of hoses, oil levels, coolant level and overhead guard.

Unauthorised personnel are not allowed to use the truck. For example, the immobiliser key should be removed when the truck is unattended.

**Instructions**

Ensure that there are shipyard-specific instructions on the use of forklift trucks defining where they may be used, who may use them, and the types of trucks to be used for different purposes. Particular care should be taken when carrying wide loads such as tubulars. A side-lift is preferred to avoid hazards to personnel or assets at the side of a roadway.

## ii. Crane operations and lifting equipment

The lifting and transporting of heavy loads have resulted in many accidents in the industry. The availability and enforcement of the company's procedures should reflect this concern.

These topics are contained in:

- The WSH (General Provisions) Regulations
- The WSH (Shipbuilding and Ship-Repairing) Regulations
- The WSH (Operation of Cranes) Regulations
- Singapore Standard SS536: Code of practice for safe use of mobile crane
- Singapore Standard SS497: Code of practice for design, safe use and maintenance of gantry cranes, overhead travelling cranes and monorail hoists

The WSH Act defines a lifting machine as "a crane, crab, winch, teagle, runway, transporter, piling frame and any suspended scaffold capable of being raised or lowered by climbers or winches". This is a comprehensive list and includes, for example, mooring winches.

Under the WSH (Operation of Cranes) Regulations, only an approved crane contractor can install, repair, alter or dismantle a crane. A shipyard must apply to the Commissioner to become an Approved Crane Contractor. MOM has issued a guide on the application as an Approved Crane Contractor, setting out the criteria for approval as an approved crane contractor, approved crane erector and the erection team.

- Hazards arising from crane operations and lifting equipment may include the following:

### **Crane failure**

A brake failure can result in a dropped load. A failure of the limit switches and overload prevention systems can result in operation outside safe limits and crane failure.

### **Inadequate maintenance**

This may result in any of the above or in a structural failure. Other failures may include a seized sheave, inefficient engine, jammed line or worn bearing and stewing ring.

### **Shared load**

Where lifting devices are used in tandem, there is a risk of unequal load sharing and potential overload failure.

### **Planning and risk assessment**

A failure to plan the details of a task adequately may result in injury and damage. For example, a mud door is assessed on the basis that the weight of metal may cause a chain block to fail because the enclosed mud accounts for 150% extra weight.

- Procedures

Procedures should detail:

- The use of crane;
- Methods of slinging;
- Signalling;
- Training requirements; and
- Inspection and maintenance of slings.

## **Preparation**

Before operating a mobile crane, the following checks should be done:

- All mobile cranes in operation should have a valid MOM certificate;
- Before taking over the crane, the operator should check for operations adjacent to the work site;
- The hook should have a safety catch which should be in good working condition;
- A checklist should be completed covering all operator-accessible and safety-critical items, such as engine oil level, operation of controls, safety interlocks, brakes, electrical systems;
- No signs of undue wear and damage on the wire ropes; and
- No significant oil leakage.

## **Operation**

- Ensure that the operator is trained and has a valid license/certification on the appropriate type of crane. Competent lifting supervisor, rigger and signalman shall also be appointed to discharge their duties under WSH (Operation of Cranes) Regulations;
- On-road cranes should extend the stabilising outriggers fully and ensure that they are resting on firm ground;
- Operate only with a trained signalman;
- Ensure that the signalman has an uninterrupted view throughout the lifting operation. If this is not possible, use more than one signalman, each in full view of the other and able to communicate effectively with the crane operator;
- Ensure full visual and, if possible, voice communication between the lifting supervisor, signalman, crane operator and riggers;
- Ensure no personnel is under any suspended load;
- Ensure tag-lines are secured onto load to control suspended load during movement;
- Trained lifting crew assigned for the operation shall be attired in such a way that he/she will be distinctively identified to their appointment;
- No overloading of lifting machine and/or lifting appliance and ensure they are tested and examined by an authorised examiner in accordance with the WSH (General Provisions) Regulations; and
- Ensure a lifting plan has been established and implemented.

## **p) Electrical installations and equipment**

- Hazards arising from electrical installations and equipment may include the following:

### **Electric shock**

- Use of equipment in unsuitable circumstances (too high a voltage or in wet surroundings);
- Inadequately maintained equipment;
- Damaged equipment; and
- Unqualified entry to power distribution systems.

### **Physical injury**

- Hands or clothing being caught in rotating parts;
  - Inadequate guards; and
  - Misuse of equipment.
- Procedures



Rules and practices should be publicised for the use of a particular type of tool or equipment and for particular operations such as entry to switchboard panels should be provided, including provisions for safety.

Electrical installations and equipment must comply with the following:

- Regulation 14 of the WSH (General Provisions) Regulations;
- The Public Utilities (Electricity) Regulations;
- The Public Utilities (Electricity Supply) Regulations;
- Part VII of the WSH (Shipbuilding and Ship-repairing) Regulations which cover the requirements applying to electrical safety;
- SS571: Code of Practice for Energy Lockout and Tagout should be applicable to prevent inadvertent turning on of energy sources during installation, troubleshooting, repair and maintenance;
- CP88-3: Code of practice for temporary electrical installations - Shipbuilding and ship-repairing yards covers all temporary electrical installations in the building and repairing of vessels in the yards;
- The maximum voltage allowed for use in confined spaces (120V);
- The provision of effective residual current circuit breakers with tripping current not exceeding 30mA;
- Low voltage shock shall be fitted to all alternating current (AC) electric arc welding equipment which reduces the open-circuit secondary voltage to not exceeding 25 volts;
- The use of heavy-duty industrial plugs and sockets; and
- Earthing of metal parts.

Refer to section 6.1(m) on Use of tools and equipment.

## **q) Personal protective equipment**

Personal protective equipment (PPE) should be used as a last resort for control for WSH risks. It is the least preferred method in the hierarchy of controls and should be used in conjunction with other methods of controls.

### **i. Types of PPE**

- The types of PPE needed should be specified in the permit-to-work or work procedures. The following are some examples:
  - Safety helmet/air supplied blasting helmet
  - Overalls
  - Safety footwear
  - Gloves
  - Aprons
  - Safety glasses and goggles
  - Safety harness
  - Life jackets
  - Respiratory protective equipment such as respirator and breathing apparatus
  - Hearing protectors

### **ii. Selection of PPE**

In selecting and specifying the requirement for PPE, consideration must be given to:

## **Type of hazards and risks involved**

The type of PPE selected should be in accordance with the identified hazards and risks. Information of the hazards must be made available to workers and supervisors in the selection of appropriate PPE that provides adequate protection.

## **Standards specification**

The following are mandatory Singapore Standards that are applicable to PPE:

- Code of Practice for Selection, Use and Maintenance of Respiratory Protective Devices
- Code of Practice for Selection, Use, Care and Maintenance of Hearing Protectors
- Specification for Industrial Safety Helmets
- Specification for Personal Eye-Protectors
- Specification for P-E - Footwear

## **Location of use**

The type of PPE selected should consider the location where it is being used. For instance, if a worker is working in a confined space, he may require wearing a suitable breathing apparatus.

### **iii. Use of PPE**

Persons at the workplace must be made aware of the type(s) of PPE necessary to be worn prior to entry into the area where they are likely to be exposed to the hazards. For example, hearing protectors would be required at places where persons are likely to be exposed to excessive noise. Signs must be posted at conspicuous location(s) to warn people of such necessity. Where it is required, PPE must be worn by every person exposed, for the duration of the period of exposure.

Users should be given instructions as to the correct way of putting on PPE and of verifying whether the PPE has been put on correctly prior to exposure to the hazards. An example is when wearing respiratory protectors, the user should use the correct method of wearing the respirator and check using 'fit test' to ensure that the respirator has been put on with a good seal to prevent inhalation of any toxic substances.

Having decided what PPE is/are to be worn, the organisation should set rules on PPE and ensure that they are being enforced and followed. A blanket rule in an area requires compliance by all personnel in the area including supervisors, management and visitors. In some instances, it may be necessary to monitor the effectiveness of PPE by personal health checks.

### **iv. Maintenance of PPE**

Users of PPE must be trained on proper maintenance of their PPE to ensure the effectiveness and personal hygiene. Users must be aware of the shelf life of PPE where applicable. PPE such as filter cartridges of respiratory protectors have expiry dates or may 'break-through' from continuous use. These may render the PPE ineffective and fail to provide the intended protection.

## **r) Management of change**

The shipyard should establish and maintain a procedure to ensure that all hazards arising out of any temporary or permanent changes to procedures, equipment, material or personnel is evaluated, managed, controlled, documented and approved.

## **Establishment of procedure**

The shipyard should ensure that there is a system for evaluating, managing and controlling temporary and permanent changes that impact WSH performance, including:

- Safe work procedures, practices or instructions.
- Facilities, layouts, work environment, equipment.
- Statutory regulations and legislations.
- Hazards and WSH risks.
- New knowledge and technology.

The procedure should institute a systematic evaluation of the possible hazards or concerns arising from the change and ensure that appropriate measures are put in place. A plan that clearly specifies the timeframe for the change and any control measures to be developed and implemented.

The plan should be approved and authorised by the person responsible for the change. Any deviation, change or extension required for the implementation of the plan should be subjected to review and authorisation by the appointed personnel responsible for the change.

## **s) Evaluation, selection and control of contractors**

The shipyard should establish a system to evaluate the WSH performance of prospective contractors, select competent contractors who meet the WSH requirements and expectations before contracting the works; and control the contractors' WSH performance standards to ensure that all contractors working in the shipyard are aware of their WSH obligation

### **i. Evaluation and selection of contractors**

The shipyard should evaluate contractors based on their WSH performance and competency. The criterion should include, but not limited:

- Ability to fulfil contract conditions;
- Contractors' safety policy and management's commitment to safety;
- WSH plan, targets and objectives;
- Risk management capability;
- Robustness of control measures, including safe work procedures to be used for the job;
- Attainment or certification such as bizSAFE;
- WSH track records;
- Availability and deployment of technology;
- Training, qualification and experience of managers, supervisors and workers;
- Maintenance and state of all machinery and equipment; and
- Effectiveness in shipyard-contractor communications.

### **ii. Control of contractors**

The shipyard should establish procedures to effectively monitor and control the WSH performance of contractors within its premises and ensure the WSH requirements as specified in the written agreement are implemented.

The procedures should include:

- Conducting periodic inspections to ensure contractor's compliance with WSH requirements;
- Verifying WSH training records of contractors;

- Coordinating procurement processes with the contractors; and
- Maintaining and monitoring safety performance of contractors.

## **t) Outsourcing control**

When outsourcing works, activities, processes or functions, shipyards shall ensure that these arrangements meet the regulatory requirements. Shipyards as buyers of commercial diving services shall ensure the appointed service provider are competent in carrying out the work. Shipyards shall ensure the arrangement with service providers are communicated clearly to ensure that works are carried out in a safe and healthy manner.

## **u) Maintenance**

General provisions can be found in the WSH Act, stipulating that employers and principals have the duty to not only provide, but also maintain an environment which is safe and without risks to health for their workers. Occupiers, employers, self-employed, principals, and other responsible persons also need to fulfil their general duties of ensuring WSH. As such, they have to maintain the machinery, equipment, plant, article or substance at the workplace so that they continue to be in good condition and safe for use.

Plant and equipment which are not adequately maintained may fail in service, e.g. vehicles, cranes and lifting equipment, compressed air and gas equipment. This is especially serious on safety-critical items, which could endanger personnel, plant, vessels or, production in case of failure. Safety critical items should be given particular attention in the maintenance programme.

- Procedures
  - i. Maintenance regime**

The WSH (General Provision) Regulations specifies 'maintenance regime' as an element to be included in the WSHMS. The shipyard should establish a maintenance programme to ensure safe and efficient operation of hand tools, machinery and equipment owned by all suppliers and contractors and used in the shipyard.

This procedure must include inspection and certification where necessary. Contractors must also demonstrate that equipment they are responsible for are properly maintained and where applicable, certified.

### **ii. Establishment of maintenance regimes**

- The shipyard should establish preventive maintenance procedures or programmes to ensure safe and efficient operation of all machinery and equipment owned and used in the shipyard including those provided and used by suppliers and contractors.
- The maintenance programme should cover the repair, maintenance of machinery, equipment and hand tools specified under the WSH Act and its subsidiary legislation, relevant Code of Practices, Singapore Standards, and manufacturer's specifications. It should include, but not limited to:
  - A list of the machinery and equipment;
  - Schedule of inspection and maintenance;
  - Procedure for breakdown repair; and
  - Record of inspection and maintenance.

- The maintenance programme should take into consideration the safety and health exposure of personnel carrying out the maintenance work. It should incorporate safety precautionary measures such as lock-out/tag-out procedures, permit-to-work system and job safety analysis.
- Materials used in the maintenance of equipment should continue to meet design specifications, and any substitution of materials shall be appropriately reviewed before use.

### **iii. Training and competency for maintenance works**

The shipyard should ensure that the maintenance personnel are trained and competent in the relevant work practices and maintenance procedures. Where applicable, permit-to-work should be implemented on maintenance works similar to normal operations.

### **iv. Maintenance records**

The shipyard should document and maintain records of all inspections, maintenance and repairs carried out by both in-house personnel and external parties.

## **v) Hazardous materials**

The main risks associated with materials encountered in shipyards are flammability (risk of injury or property damage) and toxicity (health risk). Some hazardous materials encountered are brought in for use by shipyard or ship's crew, while others are residues remaining from cargoes or ship's systems, e.g. hydraulic oil, cargo oil and fuel oil.

### **i. Hazardous residues and structural materials**

The main substances in this category are:

- Hydrocarbon – cargo, fuel, lubricating or hydraulic oil in tanks, pipe-work, valves, pumps, beneath rusty scales on bulkheads, pipes and insulation areas;
- Oily water in bilges;
- Contaminants such as mercury or hydrogen sulphide; and
- Asbestos insulation or friction materials.

Petroleum cargo and oil tanks are potentially hazardous when the residual oil trapped in the scale or sludge evaporates or when the surface has been disturbed. The pump rooms may have petroleum vapour due to leakage from pumps, pipelines or valves. The hazardous effect will depend mainly on the concentration and nature of the substance present.

Table 5 shows the effects of exposure based on duration different concentrations of petroleum vapour:

Hydrocarbon	% v/v in air	Time	Effect
Crude oil, motor gasoline, jet fuel, kerosene, naphtha, white spirit, gas or diesel oil, heavy fuel oil	0.05 (500 ppm)	8 hours	None
	0.20 (2000 ppm)	30 minutes	Giddiness and irritation
	1.0 (10 000 ppm)	10 minutes	Loss of consciousness
	2.0 (20 000 ppm)	-	Death

Table 5: Effects of exposure duration to concentrations of petroleum vapour

- Hazards arising from hazardous substances may include the following:

### Fire and explosion

Petroleum is mainly a mixture of hydrocarbons. Petroleum products, especially the more volatile ones are hazardous. An accumulation of petroleum vapour in cargo tanks, pump rooms or any confined spaces in the presence of a source of ignition may result in an explosion or fire. The flash points of hydrocarbons can be found in the “Fire Protection Handbook” by the National Fire Protection Association.

### Sources of ignition

Some sources of ignition are sparks from welding, cutting and grinding. They can cause fire and burn injuries.

### Contact with hydrocarbons

Contact with some hydrocarbons can result in skin disease.

### Exposure to toxic substances

Some substances which may be present in residues are toxic, such as hydrogen sulphide. An exposure to a concentration of 700 ppm will result in paralysis of the nervous system and death within a few minutes.

- Procedures

The permit-to-work system designed to ensure that the workplace is free of such hazards, must be adhered to rigorously and should be supported by operational procedures, practices and safety rules.

There must also be provision to deal with emergency:

- Emergency procedures to deal with fire and explosion;
- Stand-by man to monitor the well-being of a person in a potentially hazardous location, particularly in confined spaces;
- Trained first-aiders and access to medical services; and
- Provision of suitable breathing apparatus, reviving apparatus and rescue equipment.

## ii. Other types of hazardous substances used in shipyards

- Hazards arising from other hazardous materials may include the following:

## **Chemical**

These include toxins, asphyxiants, caustic, dust and fibres that may be allergenic or carcinogenic, and other health-damaging chemicals.

## **Physical**

Physical hazards to health include noise, vibrations and radiation. They also include high and very low temperature, and excessive or inadequate lighting.

## **Biological**

Biological hazards arise from such sources as water storage, unhygienic food handling and damage to the skin from chemicals.

- **Procedures**

Where these hazards are present, the company must have a means for:

- Identifying the hazards which exist;
- Assessing the degree of risk associated with each hazard;
- Evaluating the acceptability of the risk; and
- Taking the appropriate action to eliminate the hazard, mitigate its effects, or protect personnel and the workplace against the hazard.

The procedures should cover:

- Approval of the materials for receipt into the shipyard, including materials required by ship's crew and to be used on board;
- Contract details, including the provision of a SDS;
- Receipt into the shipyard of hazardous materials; and
- Transport of the materials within the shipyard, how it is stored, handled, used and disposed.

### **iii. Asbestos**

Inhaling asbestos fibres can damage the lungs and lead to serious or terminal illness. It was widely used as an insulating material and also for friction surfaces like brake shoes and pads.

- **Procedures**

The company must put in place safeguards where work has to be done involving asbestos, e.g. drilling or removing plates. The essential safeguards include:

- An approved asbestos-removal contractor (AARC) must be engaged to carry out asbestos removal and for management of asbestos containing materials;
- The WSH (Asbestos) Regulations and WSH Guidelines on Management and Removal of Asbestos must be adhered to;
- Notification to the WSH Commissioner seven days prior to commencement of work;
- The work should be carried out in a 'habitat', an enclosure which retains the asbestos dust and filters the ventilation air before releasing it to the atmosphere;
- The operators must use full body protective coveralls and breathing apparatus; and
- All residual dust must be cleaned up by a suitable vacuum cleaner.

### **iv. Mercury**

Tanks which have contained crude oil or condensate in floating storage units or offtake tankers may be contaminated with mercury. Inhaling mercury compounds can cause:

- Fever, chills, tiredness, breathlessness and chest pain;
- Burning pain in the mouth and stomach;
- Inflammation of the lungs;
- Diarrhoea;
- Vomiting, and ultimately collapse; and
- Kidney damage leading to death.

- **Procedures**

The following measures should be included:

- Test the surfaces and atmosphere before and during work in particular hot work. If necessary, grit blast the surfaces to clear any mercury deposit;
- Train all workers close to blasting, hydro-washing, cleaning and hot work in contaminated tanks in the proper use of respirators;
- Use respiratory protection when working in these areas;
- Wear air-fed mask when conducting blasting operations;
- Wear particulate masks and disposable suits when cleaning grit and blasting debris;
- Take samples of dust to monitor the cumulative exposure during blasting operations;
- Hydro-wash cargo oil tanks after blasting and cleaning before hot work. Conduct a water analysis test after hydro-washing to verify that contaminant levels meet disposal requirements. Wastes that do not meet the relevant discharge limits are required to be disposed of via licensed Toxic Industrial Waste Collectors (TIWCs);
- Disposal of mercury waste at an approved landfill should be done with written permission from the National Environment Agency accompanied by a recent report of analytical results from Toxicity Characteristic Leaching Procedure (TCLP) leachate tests carried out on the wastes. Waste that does not pass the TCLP test are required to be disposed of via licensed TIWCs;
- During hot work, test the vapours produced with a mercury analyser to ensure that mercury levels are below the threshold limit value of 0.025 ppm;
- Use air blowers with trunking and air extractors in each tank where hot work is being carried out to prevent an accumulation of vapour;
- Screen the workers involved in or close to the operations to detect mercury poisoning and to ensure that protection measures are adequate; and
- Ensure worker who is exposed to mercury fumes or vapour undertakes statutory medical examination.

## **v. Lead in paint**

Similar precautions as Mercury in the section above should be taken when carrying out hot work on materials which have been treated with paint containing lead.

## **vi. Establishment of hazardous material control programme**

The shipyard should establish a hazardous material control programme which should include but not limited to:

- Procedures for approving the acquisition, receipt, transporting, storage and use of hazardous materials by all in the shipyard.



- Any person who brings any hazardous materials into a shipyard or on board a ship in a harbour should obtain approval to do so from:
  - In the case of a shipyard, the occupier of the shipyard; and
  - In the case of a ship in a harbour, the master, owner or agent of the ship.
- Appointment of a competent person to receive such materials and ensure safe storage, movement and use.
- Workers who handle hazardous materials should be informed of the hazards and procedures for safe handling, minimising exposure and first-aid. This should include provision of instructions to the users, PPE, and correct method of transportation. They should be adequately trained before being assigned to handle the hazardous materials.
- Maintenance of a register of hazardous materials held or used on site, supported by a SDS, which should contain accurate and adequate information on the composition, physical and chemical properties of the material, and instruction for safe handling, storage, use and disposal. The register should show:
  - Identification (including generic or trade name);
  - Safeguards to be applied in the transportation, storage, handling and use of the hazardous materials;
  - Maximum quantity stored; and
  - Emergency measures to be taken including medical first-aid in the event of an incident occurring in the handling or use of the hazard materials.
- Establishment of procedures for labelling, storage, issue, distribution, movement and use.
- Designation of storage areas which should be suitable for the materials and secured against unauthorised access. The hazardous materials should be returned to the designated storage areas when not in use.
- Establishment and implementation of procedures for disposal of hazardous materials which should be carried out in accordance with statutory requirements or manufacturer's recommendations.
- The typical procedures for the acquisition and control of hazardous materials are shown in Table 6:

Person-in-charge	Workflow
Supervisor, Engineer, Project Manager, Ship's Master	Request chemical with justification.
Safety Department	Assess need for this substance.
<i>If risk is low or there is no satisfactory alternative:</i>	
Safety Department	Issue approval along with conditions, if necessary.
Purchasing Department	Issue order along with conditions, especially SDS.
Safety Department	Notify user, security and stores of substance, hazards, and so on.
Gatehouse Security	Check goods agree with notification.
Gatehouse Security	Notify Safety Department and user.

Safety Department	Check goods and approve if okay. Ensure that all personnel affected know procedures, precautions and the means of storage, movement, use and disposal.
Safety Department	Include inspections to ensure that hazards are properly controlled.

Table 6: Typical procedure for acquisition and control of hazardous materials

**vii. Safety data sheet**

The Globally Harmonised System of Classification and Labelling of Chemicals (GHS) Safety Data Sheet (SDS) is provided by the manufacturer or supplier of a chemical to give information on the following:

- Identification
- Hazards identification
- Composition/information on ingredients
- First-aid measures
- Firefighting measures
- Accidental release measures
- Handling and storage
- Exposure controls/personal protection
- Physical and chemical properties
- Stability and reactivity
- Toxicological information
- Ecological information
- Disposal considerations
- Transport information
- Regulatory information
- Other information

This is specified in SS586: Part 3 for Hazard communication for hazardous chemicals and dangerous goods.

**w) Control of occupational health hazards**

Occupational health issues should be controlled and managed similar to that of workplace safety issues. The approach is similar for workplace safety: identifying health hazards, evaluating the associated risks, implementing control measures to minimise the risks, monitoring the control measures and workplace environment as well as health surveillance of persons exposed to agents which may be injurious to health.

**i. Types of hazards and control**

**Chemical**

Fumes, gases, vapours, mists and liquids.

**Physical**

Dust and powder, fibres, noise, vibration, lighting, temperature, pressure and radiation.

### **Biological**

Bacteria, viruses, moulds and fungi.

### **Ergonomic**

Psychological (especially stress) and physiological, e.g. working position and conditions.

The hierarchy of control: Elimination, Substitution, Engineering Control, Administrative Control and PPE is also applicable here. The management of occupational health typically covers areas of worker health, for example:

### **Lighting**

Sufficient and suitable lighting, whether natural or artificial, should be provided for workers to perform their tasks. Lighting should allow workers to see displays, move and use equipment and controls safely, accurately and efficiently. Glare should be avoided to enable a comfortable visual environment for workers.

## **ii. Hearing conservation**

A Hearing Conservation Programme (HCP) should be established and implemented for workers who are exposed to excessive noise (above 85 dBA over an eight-hour period). The objective of an HCP is to minimise the risk of hearing loss as a result of exposure to excessive noise. The programme should have the following key elements:

- Regular monitoring of noise levels for identification of noise sources;
- Reduction of noise exposure levels through engineering and administrative control measures where feasible;
- Selection and provision of hearing protectors and supervision of their usage;
- Periodic audiometric examinations of exposed workers for early detection of hearing loss; and
- Training and health education of workers on the hazards of noise and its prevention.

A responsible staff member should be in-charge of the programme. Set targets for the programme, develop procedures and keep the relevant records. Evaluate the programme regularly to ensure its effectiveness.

## **iii. Industrial ventilation**

Local exhaust ventilation (LEV) systems are widely used to remove airborne contaminants such as toxic gases, vapours, dusts, fumes and mists from industrial operations and processes. A LEV system usually consists of exhaust hoods and ducts, an air-cleaning device and a fan and motor. A proper design of a LEV system is essential for the effective removal of airborne contaminants that would otherwise pollute the work environment resulting in occupational health hazards. The engineering drawings of a LEV system and the design specifications such as capture velocity, duct velocity, exhaust rates, fan capacity and fan static pressure should be kept for reference.

A new LEV system should be tested to check whether the design specifications are met. Existing LEV systems are to be maintained and tested regularly to ensure acceptable performance. Tests can be performed by using smoke tubes, anemometers, manometers and pilot tubes. Records of checking and testing performed should be kept.

Persons involved in the design or vetting of design, testing and maintenance of LEV systems should receive appropriate training.

**iv. Quality of breathing air**

To maintain the quality of breathing air, the following actions are required:

- The use of a separate compressor from that used for other purposes such as abrasive blasting unless the breathing air is suitably treated;
- A suitable type of compressor, preferably not oil lubricated;
- If an oil-lubricated compressor must be used, suitable filters on the compressor outlet to remove contaminants like oil mist and particulates;
- A filter system to remove harmful gases, particularly carbon monoxide and carbon dioxide;
- A maintenance programme to ensure that the filters are functioning efficiently, and a carbon monoxide monitor and an alarm system to warn if the carbon monoxide present is above a threshold concentration; and
- Separation between the exhaust of any internal combustion engine and the compressor intake to avoid carbon monoxide in the air stream.

The acceptable limits for indoor air contaminants and physical factors are listed in Table 7:

Carbon monoxide	10 ppm
Carbon dioxide	1000 ppm
Ozone	0.05 ppm
Formaldehyde	0.1 ppm
Volatile organic compounds	3 ppm
Bacterial count	500 cfu/m3*
Fungi count	500 cfu/m3*
Suspended particulate matter	0.15 mg/m3
Temperature	22.5 – 25.5 °C
Relative humidity	<= 70%
Air movement	<=0.25 m/s

Source MOM Guidelines in Office Ergonomics

\*cfu = colony forming unit

Table 7: [Acceptable limits for indoor air contaminants and physical factors](#)

**v. Industrial hygiene monitoring**

Occupiers have the responsibility to ensure that no persons at the workplace are exposed to toxic substances in excess of level as specified in the WSH (General Provisions) Regulations.

An industrial hygiene monitoring programme (IHMP) should be established to achieve this. The scope of the IHMP should be defined in writing and include the following:

- Objective
- Sampling methodology
- Sample preparation
- Instrument calibration
- Sampling procedures
- Sample collection
- Sample analysis
- Sampling strategies
- Location of monitoring
- Duration of monitoring
- Size of sampling
- Frequency of monitoring

An important aspect of the IHMP is the valid interpretation of the data collected on a continuing basis. The individual responsible for the IHMP should be qualified by training and has experience in the practice of industrial hygiene monitoring.

Industrial hygiene monitoring should be carried out for:

### **Noise**

The shipyard should appoint a competent person to put in place proper noise control measures when there are 50 or more relevant persons employed or working in the workplace. The noise which workers are exposed to should not exceed the permissible exposure limit.

For more information on noise monitoring, refer to the WSH Council's WSH Guidelines on Hearing Conservation Programme.

### **Air contaminants**

The shipyard should take all reasonably practicable measures to ensure that no person at work is exposed to the toxic substances in excess of the permissible exposure levels.

The atmosphere of any place of work in which toxic substances are manufactured, handled, used or given off should be tested by a competent person at sufficient intervals to ensure that toxic dust, fumes, gases, fibres, mists or vapours are not present in quantities liable to injure the health of persons at work.

The shipyard should ensure that regular monitoring of workers, exposure to air contamination is carried out. The record of the result of every monitoring should be kept available for at least five years.

### **vi. Medical surveillance**

Under the WSH (Medical Examinations) Regulations, workers are required to undergo pre-employment and periodic medical examinations if they are employed in any hazardous occupations involving the exposure of excessive noise or hazardous substance such as arsenic, asbestos, benzene, cadmium, raw cotton, lead, manganese, organophosphates and silica.

The objective of medical monitoring and supervision is to detect early signs of over-exposure to toxic chemicals or noise and thus help to prevent occupational diseases.

The WSH (Medical Examinations) Regulations require workers involved in hazardous occupations listed in The Schedule of the Regulations:

- Undergo medical examination carried out by a designated workplace doctor to certify their fit-to-work before employment;
- Undergo examination and investigation on a regular basis specified in The Schedule of the Regulations; and
- Submit their medical examination reports to MOM

A medical surveillance programme should be established to achieve the above objective. The programme should include the following:

- Identification of the exposed workers;
- Arrangement for medical examinations;
- Evaluation of the results of medical examinations; and
- Maintenance of medical records.

The designated workplace doctor should report his findings to the employer of the affected persons. When appropriate, advise the persons involved in the hazardous occupation accordingly, including suspension or cessation of employment in such occupations.

### **vii. Respiratory protection**

Workers who are exposed to a significant level of airborne contaminants such as toxic dusts, fumes, mists, gases and vapours should be protected by wearing respirators.

There are basically two categories of respirators: air-filtering, e.g. dust mask and chemical cartridge respirator, and air-supplied, e.g. air-line respirator and self-contained breathing apparatus. Each respirator has its applications and limitations. A Respiratory Protection Programme (RPP) should be established to ensure that workers are adequately and effectively protected.

The key elements in the RPP are:

- Regular monitoring of exposure levels to airborne contaminants to identify the need of respiratory protection;
- Selection of suitable types of respirators;
- Training and health education of workers on the proper use of respirators;
- Fit testing of respirators to ensure proper fit during issuance of respirators;
- Supervision of and checking the usage of respirators; and
- Maintenance of respirators.

In addition, appropriate signs should be displayed in areas where respiratory protection is required.

### **viii. Confined space work**

A confined space is a space with limited access, poor natural ventilation and lighting. It is not meant for continuous work.

The potential hazards in confined space work fall into three main categories:

- Lack of oxygen which can cause suffocation;
- Presence of flammable gases or vapours which can cause fire and explosion; and

- Presence of toxic gases or vapours which can cause health effects and poisoning.

Other dangers such as electrical and mechanical hazards, poor illumination level and adverse thermal environment may be encountered in confined space work.

To minimise or eliminate these hazards, written procedures for confined space entry should be established in accordance with the requirements in the WSH (Confined Spaces) Regulations, taking the following into consideration:

- Isolation of the confined space from other systems;
- Purging of space and providing mechanical ventilation;
- Testing for oxygen level, flammable and/or toxic gases and vapours;
- Administering an entry permit;
- Documenting the work practices and procedures;
- Providing safety equipment and appliances;
- Planning an emergency rescue procedure; and
- Training of workers and supervisors on the health and safety aspects of confined space work.

#### **ix. Manual handling**

Manual handling is responsible for injuries, particularly back pain and trapped hands and feet. Companies should ensure that those involved in manual handling of heavy loads:

- Know how to lift without causing injury;
- Use mechanical assistance when the size or weight of the load requires it;
- Use kinetic techniques to facilitate the operation; and
- Use tag lines instead of hands and feet to guide loads being lifted by cranes, pulley blocks or hoists. The ACOP SS569: Code of Practice for manual handling provides information and guidance on the identification of manual hazards, and the assessment and control of risk arising from manual handling activities.

#### **x. First-aid facilities**

First-aid is provided to mitigate the severity of injury and to preserve human life. Refer to section 6.1(x)(iv) on First-aid.

#### **x) Emergency preparedness and response**

In the event of an emergency, timely and appropriate response is crucial. Procedures must be developed, documented and communicated to all persons responsible for managing the response and mobilising assistance.

Emergency response consists of:

- Decision-making based on the situation at the time;
- Notification of external authorities including the Singapore Civil Defence Force (SCDF) or Singapore Police Force to mobilise assistance, particularly firefighting, ambulance and crowd control; and
- Mobilisation of internal resources such as Company Emergency Response Team (CERT) and first-aiders.

An emergency is likely to consist of several different events at the same time. For example, an explosion may result in multiple injuries, people in the water, vessel in danger of sinking or capsizing, and danger to adjacent facilities or ships.

Emergency response is a combination of:

- Physical action such as firefighting, rescue, recovery of property;
- Local direction to mobilise assistance; and
- Management support to deal with the authorities.

The company's priorities are to:

- Prevent incidents by establishing a planned response to emergency situations, including the provision of first-aid;
- Train people for the planned response;
- Evaluate performance on the planned response after emergency drills and after occurrence of emergency situations;
- Ensure duties and responsibilities are communicated to all workers, contractors, visitors, emergency response services, government authorities and local community (if appropriate);
- Restore operations as quickly as possible to minimise the disruption to ship owners, company and the workers; and
- Maintain a record of the plans for responding to emergency situations.

#### **i. Identification of types of emergency situations**

The company must identify the types of emergency situations that may arise from its operations and establish response to such situations. Such emergency situations may include:

- Fire and explosion
- Gas escape
- Oil or chemical spill
- Structure collapse or loss of stability
- Collision, capsize or sinking
- Transport emergency
- Accident flooding of dry dock or floating dock
- Man-overboard
- Criminal acts
- Medical emergency
- Epidemic sickness

#### **ii. Emergency response procedures**

The SCDF provides guides on drawing fire emergency plans on its websites. A sample of the Evaluation Drill Report is included in Annex H.

Emergency response procedures may comprise the following:

- Alarms and mobilisation  
The means of raising an alarm should be explained. This leads to the mobilisation of the resources to deal with the emergency, e.g.:
  - Activate fire alarm at call point;
  - Raise the siren; and
  - Calling security or CERT.



- Actions on specific types of incidents

### **Fire or explosion**

The procedures for fire or explosion will depend on the extent to which the shipyard has available firefighting resources on site. It should include:

- Liaise with and providing assistance to the emergency services, for example by providing escorts to the location of the incident;
- Treat any injured personnel; and
- Shut down affected operations.

### **Gas escape**

The procedures for gas escape should include:

- Identify the nature of the gas and its source;
- Isolate of the source;
- Shut down all hot work in the vicinity;
- Ventilate potentially affected confined spaces, using flameproof equipment; and
- Do gas testing to verify that the area is clear for work to re-commence.

### **Oil or chemical spill**

The procedures should include the following:

- Identify of the nature of the spill and its source;
- Assess the hazards associated with the substance spilled;
- Isolate the source, taking care to protect personnel exposed to the hazard;
- Notify to the appropriate authorities; and
- Mobilise limitation measures, including floating boom, dispersant or other means in consultation with the appropriate authorities.

### **Structural collapse or loss of stability**

In the event of a structural collapse or loss of stability of a building, crane, vessel or other structure:

- Make the area safe for personnel and placing barriers to prevent access to all but essential personnel;
- Treat the injured personnel;
- Assess the situation and deciding the appropriate action;
- Inform the appropriate authorities and other bodies, particularly ship owner or agent; and
- Prepare follow up actions and a recovery plan.

### **Collision, capsize or sinking**

Urgent steps on the ground must first be taken to prevent further deterioration of the situation with regard to the safety of lives at sea and protection of the marine environment. Once this is ensured, the Owner, Manager or Master of the affected Singapore-registered ship should alert MPA of the incident immediately or at the latest, within two hours.

### **Transport emergency**

The procedures for a collision on land, affecting vehicles, crane, fixed structure or other assets should include:

- Rescue and treat injured personnel;
- Assess the damage; and

- Notify relevant parties, such as the owner of a vehicle.

### **Accidental flooding of dry dock or floating dock**

The company's safe operating procedures should include the precautions to be taken when docking or floating a vessel, including warning signals, visual checks, vessel preparation and moorings. In the event that a structural failure or premature flooding takes place, the emergency procedures should include:

- Send a warning signal to both ship and yard personnel;
- Assess the reason for the flooding, e.g. failure of the structure or the valve systems or improper operation of the systems;
- Assess if there is any danger to the vessel, particularly if the hull integrity is breached, e.g. at the propeller shaft stern tube or where plates have been removed;
- Rescue any personnel, whether on board, on scaffolding or on the dock floor;
- Take action to arrest the flooding; and
- Take action to make the vessel safe.

### **Criminal acts**

Criminal acts include such events physical assaults, bomb threats and terrorist attacks. The procedures should be compiled in consultation with the Singapore Police Force.

### **Man-overboard**

Procedures should include:

- Keep continuous watch on the person;
- Activate search and rescue;
- Mobilise resuscitation and medical assistance; and
- Notification the relevant authorities.

### **Medical emergency**

Procedures should specify the actions to be taken in the event of a medical emergency, arising from an accident (such as fall, amputation, overcome by gases) or illness (such as heat exhaustion, heat stroke, heart attack). This will include:

- First-aid and medical assistance; and
- Briefing to all relevant personnel on what to do in such a case, particularly that the injured person should not be moved except by trained paramedics or medical experts.

### **Epidemic sickness/flu pandemic**

There should be procedures for the early detection of such an epidemic, and response plan during an outbreak such as contact tracing, identifying the source and actions to isolate that source, quarantine actions and notifying the Ministry of Health (MOH).

Companies should follow MOH's recommendations during a health pandemic. MOH has come up with a Disease Outbreak Response System. The response plan allows an appropriate risk management approach to the transmissibility and virulence of the virus. A colour coding system is used to rate the stage of alert of the outbreak: green being the lowest level of alert, followed by yellow, orange, red and black. Specific actions are recommended for each alert level. Depending on the mutation pattern of the virus, the intermediate colour codes may be skipped.

## **iii. Emergency response resources**

The company should invest in and maintain its own facilities in the event of an emergency. This may include:

### **First-aid**

Section 6.1(x)(iv) on First-aid contains guidance on the provisions for first-aiders, first-aid boxes and first-aid rooms which are statutory requirements.

### **Lifting cages**

The use of lifting cages is subject to the WSH (General Provisions) Regulations and SS617: Code of practice for the lifting of persons in work platforms suspended from cranes.

### **Rescue operations**

The resources available for rescue include:

- Rescue from the sea: flotation devices, small craft, radio, facilities available from the MPA; and
- Rescue from a vessel or workshop: stretchers and trained stretcher parties, first-aiders, medical and other assistance from the external emergency services.

### **Firefighting**

The company must make provisions for fire protection, means of escape and effective warning devices in the case of fire. It should follow the relevant Acts, Codes and Regulations, e.g. the Fire Safety Act.

Companies should have portable fire extinguishers and hose-reels as basic resources for general firefighting response.

### **Search operations**

Search parties may be assembled from groups of personnel acquainted with the area to be searched.

This could include:

- Work parties familiar with specific ship projects;
- Divers for underwater searches; and
- Workshop personnel for searches in their workplaces.

In the event of a bomb threat,

- Activate Emergency Response Plans and CERT;
- Call 999 or SMS 71999 to inform the police;
- Alert workers and neighbouring buildings of the bomb threat; and
- Coordinate building evacuation with the CERT.

## **iv. First-aid**

The WSH (First-Aid) Regulations require the provision of first-aid boxes, first-aiders, a first-aid room (where more than 500 persons are employed) and facilities for treatment.

Companies must have a scheme to ensure that. The requirements are as follows:

### **First-aiders**

For a shipyard with more than 25 workers, appointed first-aiders shall be readily available during working hours.

For every 100 workers employed, there must be one first-aider. The ratio of first-aiders is applicable to the first-aiders available in each work shift.

Appointed first-aiders must:

- Be trained in an approved course to the standard defined in the WSH (First-Aid) Regulations;
- Record and maintain all records of all the treatment that they rendered; and
- First-aiders' must be re-trained at least every two years.

**First-aid boxes**

Sufficient number of first-aid boxes must be provided. There should be at least one first-aid box or container on each floor of a building. First-aid boxes must be accessible and portable.

**First-aid for exposure to toxic or corrosive substances**

Suitable facilities such as emergency shower and eyewash must be provided for quick drenching or flushing of the eyes and body when the eyes or body of any person in a workplace come into contact with toxic or corrosive substances.

**v. Notification of an emergency**

The emergency plan should include procedures for the notification to internal and external parties about the occurrence of incidents and emergency situations.

Table 7 lists the emergency incidents and the respective government agency to notify:

Emergency Incident	Government Agency to Notify
Dangerous occurrence as listed in the Second Schedule, WSH Act. (The list of dangerous occurrence can be found in Section 5.5.2.1.a of this Manual)	MOM
Incidents that involve spill or release of hazardous substances having off-site impact.	NEA
Fire	SCDF
Criminal act, bomb threats	Police
Building structural-related	BCA

Table 7: [Emergency notification to government agency](#)

Notifications to internal stakeholders may include:

- o Senior management;
- o Crisis management team; and
- o Corporate management.

Requirements on incident reporting are also discussed in section 8.1 on Incident Report.

# 7. Performance Evaluation

Companies should identify and set key performance parameters to measure WSH performance.

These parameters may include:

- Having qualitative and quantitative measurements;
- Measure and monitor the extent to which the company WSH objectives and WSH requirements are met;
- Measure and monitor WSH effectiveness of operational activities and other controls; and
- Monitoring WSH parameters e.g. near misses to prevent recurrence.

Equipment and instruments which are used for monitoring should be properly maintained and calibrated. Equipment and instruments brought by contractors to the workplace are subjected to the same requirements. The organisation shall decide the compliance frequency, method and follow-up actions.

Organisations shall analyse, evaluate or communicate the parameters set to the parties who are involved and maintain all relevant records such as calibration reports, maintenance record and compliance evaluation results.

## 7.1 Proactive and Reactive Monitoring

Proactive monitoring include:

- Number of workers trained in WSH
- Effectiveness of WSH training
- Number of promotional campaigns done
- Workers' participation in promotional campaigns and WSH programmes
- Number of risk assessments conducted
- Extent to which risk control measures are complied with
- Frequency of safety inspection and audits done
- Frequency and effectiveness of WSH committees and group meetings
- Frequency and effectiveness of WSH communications
- Number of WSH suggestions completed
- Time taken to implement suggestions
- Compliance in the use of PPE

Reactive monitoring include:

- i. Accident Frequency Rate (Refers to the number of workplace accidents per million man-hours worked.) =  $\text{Number of workplace accidents} \times 1,000,000 / \text{Man-hours worked}$

- ii. Accident Severity Rate (Refers to the number of man-days lost to workplace accidents per million man-hours worked.) =  $\text{Number of man-days lost to workplace accidents} \times \frac{1,000,000}{\text{Man-hours worked}}$
- iii. Fatality Rate (Refers to the number of workplace fatalities per 100,000 persons employed. Figures used are victim based.) =  $\text{Number of workplace fatalities} \times \frac{100,000}{\text{Number of persons employed}}$
- iv. Injury Rate (Refers to the number of fatal and non-fatal workplace injuries per 100,000 persons employed.) =  $\text{Number of fatal and non-fatal workplace injury} \times \frac{100,000}{\text{Number of persons employed}}$
- v. Disease Incidence (Refers to the number of occupational diseases (chronic confirmed cases) per 100,000 persons employed.) =  $\text{Number of chronic confirmed occupational diseases cases} \times \frac{100,000}{\text{Number of persons employed}}$

A confirmed case of occupational disease is one where there is definite evidence that the worker suffers from a disease which is related to his occupation.

- vi. Number of Reportable Dangerous Occurrences
- vii. Number of dangerous occurrences as defined in the First Schedule, WSH Act being reported.
- viii. Regulatory Enforcement Actions
- ix. Number of regulatory enforcement action taken against the company in the period.

## 7.2 Inspection and Compliance Verification

### i. Equipment

Inspect the equipment regularly to ensure that they are in proper working condition. Mobile equipment such as cranes and forklift trucks should be inspected by the operators at the start of each shift, with the aid of a checklist to ensure that essential items (such as brakes and tyres) are in good working order.

The company should keep an inventory of equipment subjected to statutory or technical inspection.

The general requirements for maintenance are detailed in the WSH (General Provisions) Regulations or as determined by the Authorised Examiner. The WSH (Shipbuilding and Ship-repairing) Regulations also specify the inspection of hot work equipment to be done by competent persons and the WSH (Scaffolds) Regulations specify the inspection to be done by a scaffold supervisor.

## **ii. Work conditions**

Establish and document criteria in specifying the acceptable conditions at the workplace.

Regular inspection should be conducted by line supervisors, managers and safety committee members. An example of the safety inspection programme is as follows:

- Daily inspection by supervisors;
- Weekly inspection by departmental manager;
- Monthly inspection by safety committee; and
- Middle and senior management to involve themselves in these inspections by taking part in the scheduled inspections or conducting inspections on their own.

Housekeeping patrols should be conducted on a regular basis to maintain housekeeping standards. One of the ways is to form a team tasked to carry out the patrol once a week.

## **iii. Occupational Health Inspection Audit**

Besides the inspection of equipment and work condition for safety, occupational health aspects should also be taken into consideration for monitoring.

## **7.3 Internal Audit**

In accordance with the WSH (Safety and Health Management System and Auditing) Regulations, a shipyard shall implement and maintain a WSHMS at all times to protect and ensure the safety and the health of every person at work or worker of the occupier.

For shipyards with 200 or more workers, the Occupier should appoint an approved WSH auditor to audit the WSHMS at least once every 12 months.

In shipyards where less than 200 workers are employed, the Occupier must conduct an internal review of the WSHMS at least once every 12 months. Where necessary, MOM may require an external audit to be conducted instead of a review of the WSHMS.

The occupier shall, as far as being practicable, implement the recommendations of the audit or the review without undue delay.

The content of this manual may serve as a guide for the establishment and maintenance of the WSHMS.

## **7.4 WSH Management System Audit**

Shipyards are encouraged to establish, implement and have the WSHMS audited or certified by an external independent auditor according to SS ISO45001 and/or this document.

The WSH system audit provides opportunities for the company to continually evaluate the effectiveness of its system.

The frequency and coverage of the WSH system audit should be related to the risk associated with the failure of the WSHMS elements, availability of performance data and extent of changes.

The results of the audit should be updated to relevant parties involved for corrective actions and provide inputs for improvement of the system and WSH performances.

## **7.5 Management Review**

The top management of a shipyard should review the WSHMS at regular intervals to ensure its suitability, adequacy and effectiveness. The review should consider the appropriateness of the WSH policy, an update of objectives, the risks level and adequacy of control measures, an evaluation of performance, and whether changes to the element of WSHMS are required. The outcome of the management review shall be communicated to all workers or the workers' representatives.



## 8. Improvement

The organisation shall identify the opportunities for improvement to WSH and to implement necessary actions to meet desired outcomes of the WSHMS. When an incident or a nonconformity happens, the organisation shall report, investigate, take necessary actions and enhance the WSHMS.

### 8.1 Incident Reporting Requirements

Under the WSH (Incident Reporting) Regulations, the following workplaces incidents must be reported to MOM:

- Dangerous Occurrences as defined in the First Schedule of the WSH Act;
- Accident leading to injury or death as certified by a registered medical practitioner or registered dentist; and
- Occupational Diseases as specified in the Second Schedule of the WSH Act.

For incidents such as dangerous occurrences and death cases, the WSH Commissioner should be notified immediately. Please refer to MOM's website for the information to be provided.

For all other cases, the incident report should be submitted to the WSH Commissioner within 10 days via iReport.

It is not necessary to submit a separate report for workmen's compensation. The incident report includes a section for that purpose.

Employers/occupiers are required to keep a record of any incident reports made for a period of three years from the time of report.

### 8.2 Incident Investigation and Analysis

As part of statutory requirements, the company should investigate the history of events preceding the incident, verify that details are consistent with the incident and whether there are any potential situations that caused serious injury, damage or loss. The investigation should be designed to arrive at the following:

- History of events before the incident in which errors had occurred;
- Basic and root causes, as distinct from the resulting injury or damage;
- Prevent recurrence and improved safety performance; and
- Actions recommended to correct the failure at source.

Incident investigation which should form part of the training of safety specialists and line supervisors. The shipyard should establish in its WSHMS written procedures to identify, record, investigate and analyse all incidents. Specific corrective actions must be implemented to prevent recurrence. The procedures should include the following:

i. Identification and record of incidents

- The shipyard should set up a system to identify and record all incidents (accidents and near-misses) at work; and
- The incidents should be reported and recorded promptly, including incidents by contractors.

ii. Investigation of incidents

- The shipyard should establish procedures for the investigation of incidents.
- The investigation of incidents should not be limited to the identification of unsafe conditions and acts but should probe into the underlying systemic cause and deficiencies of the WSHMS.
- Incident investigation procedures should include, but limited to:
  - Identification of types of incidents to be investigated;
  - Prompt reporting of incidents to designated persons, including incidents involving contract workers;
  - Assignment of competent persons responsible for the investigation;
  - Establishment investigation procedures;
  - Identification of root causes, and recommendation; and
  - Implementation of recommendations and corrective measures.
- Ship-repair managers, line managers, supervisors, WSH personnel and WSH committee members should be included in the incident investigation team.
- The investigation team should not be part of the stakeholders involved in the incident.

iii. Implementation and review of corrective actions

- The shipyard should establish a system to ensure that recommendations arising from investigations and corrective actions are followed through and effectively implemented.

iv. Analysis of incident statistics

- The shipyard should establish procedures to monitor, analyse incident trends, and prescribe holistic preventive solutions.
- Incident statistical analysis should include, but not be limited to the following:
  - Types of incidents
  - Agency of incidents
  - Causes of incidents
  - Human factors and behavioural considerations
  - Incident frequency rate
  - Incident severity rate
- The report of analysis should be made available to all key relevant personnel in the shipyard and maintained for future reference.
- The shipyard should carry out analysis of all incident statistics periodically. This information should be used for the drawing up of safety and health workplans, promotional programmes and training courses.

## 8.3 Corrective and Preventive Actions

Corrective actions should be taken when non-conformances are found during the walkthrough, inspection, audit or arising from incident/accident investigation and performance analysis. These actions are aimed at eliminating the root cause(s) of identified non-conformances, accidents or incidents to prevent recurrence. This may include, but not limited to:

- Implementing short term and long-term actions;
- Evaluating hazard identification and risk assessment results;
- Making changes to safe work procedures; and
- Implementing new or modifying existing control measures.

Preventive actions are needed to prevent occurrence of non-conformances, accidents, incidents or ill health. Examples may include:

- Using information such as workplace observation trends, audit report, workers' feedback, expert advice and lesson learnt from other workplaces;
- Identifying problems requiring preventive action through walk through, inspection, use of hazard identification and risk assessment tool such as checklists, job hazard analysis; and
- Initiating actions to ensure controls measures are effective.

Companies should ensure that correctives and preventive measures are assigned to owners for responsibility and accountability for completion date, be monitored and followed up for closure and the effectiveness evaluated.

## 8.4 Continual Improvement

Companies should continually explore opportunities to improve the suitability, adequacy and effectiveness of the WSHMS. The action plans shall be implemented with the participation of workers, with the outcome of the continual improvement communicated to all workers or the workers' representatives.

# 9. Annexes

## Annex A: List of WSH Related Applicable Legal Requirements, Approved Code of Practices and Singapore Standards

S/No.	Authorising Act	Subsidiary Legislations
1	Workplace Safety and Health Act (Chapter 354A)	<div>1. WSH (Abrasive Blasting) Regulations</div> <div>2. WSH (Asbestos) Regulations</div> <div>3. WSH (Composition of Offences) Regulations</div> <div>4. WSH (Confined Space) Regulations</div> <div>5. WSH (Exemption) Order</div> <div>6. WSH (Explosive Powered Tools) Regulations</div> <div>7. WSH (First-Aid) Regulations</div> <div>8. WSH (General Provisions) Regulations</div> <div>9. WSH (Incident Reporting) Regulations</div> <div>10. WSH (Learning Report) Regulations</div> <div>11. WSH (Medical Examinations) Regulations</div> <div>12. WSH (Noise) Regulations</div> <div>13. Workplace Safety and Health (Offences and Penalties) (Subsidiary Legislation under section 66(14)) Regulations</div> <div>14. WSH (Operation of Cranes) Regulations</div> <div>15. WSH (Registration of Factories) Regulations</div> <div>16. WSH (Risk Management) Regulations</div> <div>17. WSH (Safety and Health Management System and Auditing) Regulations</div> <div>18. WSH (Scaffolds) Regulations</div> <div>19. WSH (Shipbuilding and Ship-repairing) Regulations</div> <div>20. WSH (Transitional Provision) Regulations</div> <div>21. WSH (Work at Heights) Regulations</div> <div>22. WSH (Workplace Safety and Health Committees) Regulations</div> <div>23. WSH (Workplace Safety and Health Officers) Regulations</div> <div>24. WSH (Approved Codes of Practice) Notification</div> <div>25. WSH (COVID 19 Safe Workplace) Regulations</div>

		<p>Regulations under the repealed Factories Act which are still applicable:</p> <ol style="list-style-type: none"> <li>1. Factories (Registration and Other Services Fees and Forms) Regulations</li> <li>2. Factories (Safety Training Courses) Order</li> <li>3. Factories (Work of Engineering Construction) Order</li> </ol>
2	Fire Safety Act (Chapter 109A)	<ol style="list-style-type: none"> <li>1. Fire Safety (Building and Pipeline Fire Safety) Regulations</li> <li>2. Fire Safety (Company Emergency Response Team) Regulations</li> <li>3. Fire Safety (Composition of Offences) Regulations</li> <li>4. Fire Safety (Emergency Response Plan) Regulations</li> <li>5. Fire Safety (Exemption) Order</li> <li>6. Safety (Fire Certificate) (Designated Buildings) Order</li> <li>7. Fire Safety (Fire Safety Engineers) (Code of Professional Conduct and Ethics) Regulations</li> <li>8. Fire Safety (Fire Safety Engineers) Regulations</li> <li>9. Fire Safety (Fire Safety Managers) Regulations</li> <li>10. Fire Safety (Flammable Refrigerants — Exemption) Order</li> <li>11. Fire Safety (Marine Fire-Fighting Fees) Regulations</li> <li>12. Fire Safety (Petroleum and Flammable Materials — Exemption) Order</li> <li>13. Fire Safety (Petroleum and Flammable Materials) Regulations</li> <li>14. Fire Safety (Pipelines — Exemption) Order</li> <li>15. Fire Safety (Premises Requiring Emergency Response Plan) Notification</li> <li>16. Fire Safety (Premises Requiring Fire Safety Manager and Company Emergency Response Team) Notification</li> <li>17. Fire Safety (Registered Inspectors) (Code of Professional Conduct and Ethics) Regulations</li> <li>18. Fire Safety (Registered Inspectors) Regulations</li> <li>19. Fire Safety (Regulated Fire Safety Products) Regulations</li> <li>20. Fire Safety (Supplementary Enforcement Officers) Regulations</li> </ol>
3	Radiation Protection Act (Chapter 262)	<ol style="list-style-type: none"> <li>1. Radiation Protection (Exemption for Transit, Transhipment and Carriage of Conveyance Equipment) Regulations</li> <li>2. Radiation Protection (Ionising Radiation) Regulations</li> <li>3. Radiation Protection (Non-Ionising Radiation) Regulations</li> <li>4. Radiation Protection (Transport of Radioactive Materials) Regulations</li> </ol>
4	Work Injury Compensation Act. (Chapter 354)	<ol style="list-style-type: none"> <li>1. Work Injury Compensation (Composition of Offences) Regulations</li> <li>2. Work Injury Compensation Insurance Regulations</li> </ol>

		<ol style="list-style-type: none"> <li>3. Work Injury Compensation (Saving and Transitional Provisions) Regulations</li> <li>4. Work Injury Compensation (Workers' Fund) Regulations</li> <li>5. Work Injury Compensation Regulations</li> </ol>
5	Electricity Act (Chapter 89A)	<ol style="list-style-type: none"> <li>1. Electricity (Cable Detection Workers) Regulations</li> <li>2. Electricity (Composition of Offences) Regulations</li> <li>3. Electricity (Electrical Installations) Regulations</li> <li>4. Electricity (Electrical Workers) Regulations</li> </ol>
6	Road Traffic Act (Chapter 276)	<ol style="list-style-type: none"> <li>1. Road Traffic (Bicycle Crossing) Rules</li> <li>2. Road Traffic (Bicycles) Rules</li> <li>3. Road Traffic (Carriage of Persons in Goods Vehicles) Rules</li> <li>4. Road Traffic (Carbon Emissions Tax) Rules</li> <li>5. Road Traffic (Composition of Offences) Rules</li> <li>6. Road Traffic (Driver Improvement Points System) Rules</li> <li>7. Road Traffic (Exemption from Carbon Emissions Tax) Order</li> <li>8. Road Traffic (Motor Vehicles, Compulsory Inspection) Rules</li> <li>9. Road Traffic (Motor Vehicles, Driving Licences) Rules</li> <li>10. Road Traffic (Motor Vehicles, Rear and Side Markings) Rules</li> <li>11. Road Traffic (Motor Vehicles, Registration and Licensing) (Exemption) Order</li> <li>12. Road Traffic (Motor Vehicles, Seat Belts) Rules</li> <li>13. Road Traffic (Motor Vehicles, Speed Limiters) Rules</li> <li>14. Road Traffic (Motor Vehicles, Test) Rules</li> <li>15. Road Traffic (Motor Vehicles, Wearing of Seat Belts) Rules</li> <li>16. Road Traffic (Pedestrian Crossings) Rules</li> <li>17. Road Traffic (Prescribed Offences) Rules</li> <li>18. Road Traffic (Regulation of Speed) Rules</li> <li>19. Road Traffic (Traffic Signs) Rules</li> <li>20. Road Traffic Rules</li> </ol>
7	Maritime and Port Authority of Singapore (Chapter 170A)	<ol style="list-style-type: none"> <li>1. Maritime and Port Authority of Singapore (Composition of Offences) Regulations</li> <li>2. Maritime and Port Authority of Singapore (Dangerous Goods, Petroleum and Explosives) Regulations</li> <li>3. Maritime and Port Authority of Singapore (Port Limits) Notification</li> </ol>
8	Guns, Explosives and Weapons Control Act	N/A

9	Biological Agents and Toxins Act (Chapter 24A)	<ol style="list-style-type: none"> <li>1. Biological Agent and Toxins (Exemption) Regulations</li> <li>2. Biological Agents and Toxins (Proficiency Testing) Regulations</li> <li>3. Biological Agents and Toxins (Transportation) Regulations</li> </ol>
10	Gas Act (Chapter 116A)	<ol style="list-style-type: none"> <li>1. Gas (Supply) Regulations</li> <li>2. Gas (Transporter's Licence) (Exemption) Order</li> </ol>
11	Poisons Act (Chapter 234)	<ol style="list-style-type: none"> <li>1. Poison Rules</li> </ol>
12	Explosive Substances Act (Chapter 100)	N/A

## Annex B: Typical Contents of Safety Handbook

The typical contents of a safety handbook can be:

### Introduction

- Company safety policy
- Objectives of the handbook
- Definitions and abbreviations

### Safety Rules

- Compliance with safe work procedures and permit-to-work system
- Provision and use of PPE
- Operation and maintenance of machinery, and equipment and tools
- Handling, storage and use of substances and materials
- Reporting of accidents, incidents and hazards
- Housekeeping and cleanliness at the workplace
- Ensuring personal conduct is observed
- Prohibition and misuse of equipment
- Ensuring competency at work
- Prohibition of smoking except at designated areas
- Prohibition of speeding of motorised vehicles and equipment

### Organisation for Safety

- Specific responsibilities of management, technical workers, trade supervision, manual workers, safety specialists
- Constitution and functions of committees
- Responsibilities of ship's crew

### Safety at Work

- PPE
- Permit-to-work
- Confined space entry, hot work permit, other permits, gas freeing and monitoring
- Inhibiting safety systems
- Lifting and slinging
- Certification of lifting equipment and crane signals
- Manual handling
- Access point
- Scaffolding, mobile towers and entry into confined space
- Surface treatment
- Cleaning, grit blasting and painting
- Electrical work on electrical installations
- Use of tools and equipment
- Electrical, manual and workshop
- Hazardous materials
- Ship movements
- Berthing and unberthing, floating dock, dry dock, slipway, launching, turning propeller and rudder
- Ships and on-board systems
- Hydraulics, engine and propulsion, and sea chest



**Accidents and Emergencies**

- Follow up actions in the event of injury or illness
- Summarise actions for emergency and list contact numbers in a prominent place, such as inside the front or back cover for quick access

# Annex C: Risk Register Cover Sheet

## Risk Register Cover Sheet

Workplace Name						
RA Ref. No.	Dept, Activity or Trade Assessed	Process, Activity, Location or Design Consideration	RA Approval Date	Next RA Review Date	RA Leader & Designation	Remarks
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						

Note: Complete this form before filling in the Risk Assessment Form

Page \_\_ of \_\_ page(s)

# Annex D: Risk Assessment Form

Risk Assessment Form			
Department, activity or trade assessed:	RA leader:	<b>Approved by</b>  Signature:  Name:  Designation:  RA approval date:	<b>Reference number</b>
Process/design consideration:	RA member 1:		
Process/activity Location:	RA member 2:		
Original RA date:	RA member 3:		
Current RA review date:	RA member 4:		
Next RA review date:	RA member 5:		

Hazard Identification				Risk Evaluation				Risk Control						
S/ No	Work activity/sub-activity	Hazard	Potential injury/ill-health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Implementation person	Due date	Remarks
1.														
2.														
3.														
4.														

S = Severity; L = Likelihood; RPN = Risk Prioritisation Number; RA = Risk Assessment

Page \_\_ of \_\_ page(s)

Notes:

# Annex E: Sample of Risk Assessment

Risk Assessment Form			
Department, activity or trade assessed:	RA leader:	<b>Approved by</b>  Signature:  Name:  Designation:  RA approval date:	<b>Reference number</b>
Process/design consideration:	RA member 1:		
Process/activity Location:	RA member 2:		
Original RA date:	RA member 3:		
Current RA review date:	RA member 4:		
Next RA review date:	RA member 5:		

Hazard Identification				Risk Evaluation				Risk Control						
S/ No	Work activity/sub-activity	Hazard	Potential injury/ill-health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Implementation person	Due date	Remarks
1.														
2.														
3.														
4.														

S = Severity; L = Likelihood; RPN = Risk Prioritisation Number; RA = Risk Assessment
 

Page \_\_ of \_\_ page(s)

Notes:

The samples below are for reference only and are non-exhaustive. Companies should conduct and customise their own risk assessments according to work activities .

# Example Relating to Hot Work

Risk Assessment Form			
Department, activity or trade assessed:	RA leader:	<b>Approved by</b>  Signature:  Name:  Designation:  RA approval date:	Reference number
Process/design consideration:	RA member 1:		
Process/activity Location:	RA member 2:		
Original RA date:	RA member 3:		
Current RA review date:	RA member 4:		
Next RA review date:	RA member 5:		

Hazard Identification				Risk Evaluation				Risk Control						
S/ No	Work activity/sub-activity	Hazard	Potential injury/ill-health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Implement ation person	Due date	Remarks
1.	Welding	Fire and explosion	<ul style="list-style-type: none"> <li>Burns</li> <li>Body injury</li> <li>Lung injury</li> <li>Fatality</li> </ul>	<ul style="list-style-type: none"> <li>Confined space entry permit system</li> <li>Gas checks conducted by Confined Space Safety Assessor and evaluated safe before permit can be issued</li> </ul>	5	2	10	Nil	-	-	-	NAME	DD MM YY	Nil

Hazard Identification				Risk Evaluation				Risk Control						
S/ No	Work activity/s ub- activity	Hazard	Potential injury/ill- health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Implement ation person	Due date	Remarks
				<ul style="list-style-type: none"><li>• Thorough confined space forced ventilation for an extended period before entry</li><li>• Confined Space Attendant</li><li>• in position</li><li>• Checks to ensure confined space entrant has been trained/ is competent for the task</li><li>• Continuous atmospheric monitoring</li><li>• Adequate ventilation</li><li>• Confined space entrant equipped with portable gas detector</li></ul>										

Hazard Identification				Risk Evaluation				Risk Control						
S/ No	Work activity/s ub- activity	Hazard	Potential injury/ill- health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Implement ation person	Due date	Remarks
				<ul style="list-style-type: none"> <li>• Communication system between entrant and attendant</li> <li>• Emergency Rescue Plan, equipment, and team in place</li> <li>• Full PPE including supplied air respirator/ self-contained breathing apparatus as necessary</li> </ul>										

Notes:

Page \_\_ of \_\_ page(s)

## Example Relating to Working in Confined Space

### Risk Assessment Form

Department, activity or trade assessed:	RA leader:	<b>Approved by</b>  Signature:  Name:  Designation:  RA approval date:	<b>Reference number</b>
Process/design consideration:	RA member 1:		
Process/activity Location:	RA member 2:		
Original RA date:	RA member 3:		
Current RA review date:	RA member 4:		
Next RA review date:	RA member 5:		

Hazard Identification				Risk Evaluation				Risk Control						
S/No	Work activity /sub-activity	Hazard	Potential injury/ill-health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Implementation person	Due date	Remarks
1.	Confined space entry	<ul style="list-style-type: none"> <li>Oxygen deficiency</li> <li>Possible presence of toxic gases/substances</li> </ul>	<ul style="list-style-type: none"> <li>Fatality</li> <li>Asphyxiation</li> </ul>	<ul style="list-style-type: none"> <li>Confined space entry permit system</li> <li>Gas checks conducted by Confined Space Safety Assessor and evaluated safe before permit can be issued</li> </ul>	5	2	10	Nil	-	-	-	NAME	DD MM YY	Nil



Hazard Identification				Risk Evaluation				Risk Control						
S/ No	Work activity /sub- activity	Hazard	Potential injury/ill- health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Imple- mentation person	Due date	Remarks
				<ul style="list-style-type: none"> <li>• Thorough confined space forced ventilation for an extended period before entry</li> <li>• Confined Space Attendant in position</li> <li>• Checks to ensure confined space entrant has been trained/ is competent for the task</li> <li>• Continuous atmospheric monitoring</li> <li>• Adequate ventilation</li> </ul>										

Hazard Identification				Risk Evaluation				Risk Control						
S/ No	Work activity /sub- activity	Hazard	Potential injury/ill- health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Imple- mentation person	Due date	Remarks
				<ul style="list-style-type: none"> <li>• Confined space entrant equipped with portable gas detector</li> <li>• Communication system between entrant and attendant</li> <li>• Emergency Rescue Plan, equipment, and team in place</li> <li>• Full PPE including supplied air respirator/ self-contained breathing apparatus as necessary</li> </ul>										

Notes:

Page \_\_ of \_\_ page(s)

### Risk Assessment Form

Department, activity or trade assessed:	RA leader:	<b>Approved by</b>	<b>Reference number</b>
Process/design consideration:	RA member 1:	Signature:	
Process/activity Location:	RA member 2:		
Original RA date:	RA member 3:	Name:	
Current RA review date:	RA member 4:	Designation:	
Next RA review date:	RA member 5:	RA approval date:	

Hazard Identification				Risk Evaluation				Risk Control						
S/No	Work activity/sub-activity	Hazard	Potential injury/ill-health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Implementation person	Due date	Remarks
1.	Set up hanging staging at anchorage for side shall repair (over water)	Fall from height into water	<ul style="list-style-type: none"> <li>Body injury</li> <li>Fatality/drowning</li> </ul>	<ul style="list-style-type: none"> <li>Safe Work Procedure (SWP) for the task</li> <li>Workers briefed on the SWP during daily toolbox meeting</li> </ul>	5	2	10	Nil	-	-	-	NAME	DD MM YY	Nil

## Example Relating to Working at Height

Hazard Identification				Risk Evaluation				Risk Control						
S/ No	Work activity/sub- activity	Hazard	Potential injury/ill- health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Implement ation person	Due date	Remarks
				<ul style="list-style-type: none"> <li>Equipment and tools inspected to be in good condition before setup</li> <li>Workers attended work at height and fall protection training.</li> <li>Check workers are fit before starting work</li> <li>Ensure Fall Prevention Plan is in place.</li> <li>Use of personal fall arrest system hooked to secure anchor point or independent vertical lifeline, with 100% tie-off</li> </ul>										

Hazard Identification				Risk Evaluation				Risk Control						
S/ No	Work activity/sub- activity	Hazard	Potential injury/ill- health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Implement ation person	Due date	Remarks
				<ul style="list-style-type: none"> <li>• All workers to put on life jacket</li> <li>• Maintain communication</li> <li>• On-site supervision</li> <li>• Emergency Response Plan (ERP) and response team on standby</li> <li>• Life buoys available</li> </ul>										

# Example Relating to Personal Health-Risk Situation

Risk Assessment Form			
Department, activity or trade assessed:	RA leader:	<b>Approved by</b>  Signature:  Name:  Designation:  RA approval date:	Reference number
Process/design consideration:	RA member 1:		
Process/activity Location:	RA member 2:		
Original RA date:	RA member 3:		
Current RA review date:	RA member 4:		
Next RA review date:	RA member 5:		

Hazard Identification				Risk Evaluation				Risk Control						
S/ No	Work activity/sub-activity	Hazard	Potential injury/ill-health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Implementation person	Due date	Remarks
1.	Tower Crane Lifting Operation	Runway crane operation with unconscious operator (e.g. Operator with uncontrolled high-blood pressure)	Fatality	Medical examination for crane operators aged 50 and above	5	3	15	<ul style="list-style-type: none"> <li>Job redesign for operators with such chronic conditions</li> </ul>	5	2	10	NAME	DD MM YY	Nil

Hazard Identification				Risk Evaluation				Risk Control						
S/ No	Work activity/sub-activity	Hazard	Potential injury/ill- health	Existing risk controls	S	L	RPN	Additional controls	S	L	RPN	Impleme ntation person	Due date	Remarks
								<ul style="list-style-type: none"> <li>Targeted wellness program mes for persons with chronic health conditions</li> <li>Regular Health Screening with close follow-up</li> </ul>						

## Annex F: Sample of VSCC Meeting

**VESSEL SAFETY CO-ORDINATION COMMITTEE MEETING MINUTES (DAY SHIFT)**

NAME OF VESSEL: \_\_\_\_\_  
PROJECT MANAGER: \_\_\_\_\_  
HSE PERSONNEL: \_\_\_\_\_  
SIGNATURE OF HSE PERSONNEL: \_\_\_\_\_

DATE: \_\_\_\_\_

TIME START: \_\_\_\_\_ hrs

TIME END: \_\_\_\_\_ hrs

Part A- Attendance								
Direct Employees	S/N	Department	Name	Designation	No of Man	Name	Designation	No of Man
	1	Staging, painting, clearing						
	2	Hull & joinery						
	3	Mechanical						
	4	Pipe & boiler						
	5	Electrical & instrumentations						
	6	Operations support						
	7	Others						
					Total			

Grand Total of Manpower	
Attending VSOC	
Working on board	

Shipstaff	Present	
	Y	N
Superintendent		
Master		
Chief Officer		
Chief Engineer		
Others		
<b>Total</b>		

S/N	Trade	Company	Name of Rep	No of Man	Company	Name of Rep	No of Man	Remarks
1	Painters / Blasters							
2	Cleaners							
3	Scaffolders							
4	Steel workers							
5	Fitters							
6	Joiners							
7	Pipe & boiler workers							
8	Electrical & instrumentations							
9	Others							
		Total						

Part B - Documents Attachment/List of Appendices				
S/N	Name of Department	Yes	No	Remarks
1	Hot work daily endorsement list			
2	Work at height (WHA) endorsement list			
3	Vessels confined space register			
4	Location of hazardous work processes			
5	Vessels daily work notification by ship staff			
6	Toolbox briefing acknowledgement by contractors			
7	Firewatch list			
8	Additional attendance sheet			
9	Others infopage overviews			

Part C - HSE Statistics Information		Current Week	Previous Week	Cumulative
S/N	HSE Statistics			
1	LTA/Work related accident (4 days MC & above) (Reportable to MOM)			
2	FAC			
	MTC/RWDC			
	LNUDC			
	LT			
3	Incident (environmental, near miss, fire, etc)			

MFC = MC or LD on the day of the accident  
RWDC = LD after the day of the accident  
LWDC = 1 day MC or more after the day of the accident (exclude fatality)  
LTI = LWDC + Fatal incident

[illegible]

Part E - Incompatible work processes (flow)						
Permit-to-Work (PTW)	S/N	Process	Y	N	Type of Work	Remarks
	1	Bunkering/debunkering by barge				
	2	Transferring of oil by ship system/manual (road tanker)				
	3	Ballasting/deballasting by ship system/shore supply (gravity)				
	4	Repair/maintenance work of hydraulic system				
	5	Chemical cleaning/flushing/pickling of boiler/heat exchanger/ pipe system/generators/motors				
	6	Disassembling/bowing/ship blanking/removal of blank of valves/ steam lines/pipe/line				
	7	Testing of valves/steamlines/pipelines/heating coils (specify testing medium and pressure level)				
	8	General/tank cleaning (sludge/scales) in confined spaces				
	9	Painting	Spray Roller			

Note: Delete the processes accordingly

REV 2\_Oct 2015\_HSE Dept  
FAS 1.1



Part I - Other Work Activities					
S/N	Performed by		Type of Work	Locations/Time	Remarks
	Dept	Owner's contractor			
Miscellaneous					

Note: Delete the processes accordingly.

[illegible][illegible][illegible]

## Declaration by Project Manager

**Declaration by project manager**  
I hereby agree that the works carried out by the workforce (direct employees/sub-contractors/ship crews/owner's contractor) have been highlighted and co-ordinated at the VSCC meeting and all reasonably practicable measures have been taken to ensure the safety and health of the workforce.  
I also declare that no incompatible work is allowed to be carried out simultaneously in the vicinity of the hot work area.

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date & Time: \_\_\_\_\_

**Acknowledgement by Master/Superintendent**

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date & Time: \_\_\_\_\_

# Annex G: Sample of Permit to Work Forms

## PERMIT FOR DISMANTLING/TESTING OF PIPES/ VALVES AND HEATING COILS

☐ OIL    ☐ GAS    ☐ CHEMICAL    ☐ STEAM

☐ CONFINED    ☐ OPEN

S/NO  
OTHERS

(DISMANTLING/TESTING SHALL NOT COMMENCE UNTIL STAGES 1 TO IIIA - IIIB FOR TENDER JOBS  
ARE DULY COMPLETED AND SIGNED BY THE RESPECTIVE PERSONNEL.)

Vessel's Name:		Location of Work:	
Commencement:	Date:    /    /	Completion:	Date:    /    /
	Time:                      Hrs		Time:                      Hrs
Type of Work: *Dismantling/Testing of Pipelines/Valves/Heating Coils			

### Stage I: Application by Trade Foreman Supervisor

1. Special hazards and risks (if any):

2. Measure taken:

I have highlighted the work at the Vessel Safety Co-ordination Committee (VSCC) meeting and it has been co-ordinated.  
Further, I shall take the undementioned safety measures prior to the commencement of the work process and shall be responsible for maintaining them during the entire process:

**A. Precautions while working with oil/gas/chemical pipes/valves and heating coils**

☐ Confined Space (all pipes and valves)

☐ # Lockout-Tagout done

☐ Prominent display of appropriate signboards at all entrances to the confined space

☐ Supply of sufficient forced ventilation

☐ Provision of adequate flame proof lights with cables in good condition

☐ NO HOT WORK in the above location/all confined spaces\*

☐ Valves of confined spaces in ballast or containing oil isolated/rendered inoperative

☐ Use of containers/plastic bags for collecting oily water/oil

☐ Open Space (oil, gas, chemical pipes and valves)

☐ # Lockout-Tagout done

☐ Prominent display of appropriate signboards at the vicinity of work

☐ NO HOT WORK within a radius of 3 metres of the area and condonring off the area with red and white tape

☐ Use of containers/plastic bags for collecting oily water/oil

☐ Please tick the applicable requirements in the appropriate boxes.

**B. Precautions while working with system containing steam**

☐ The steam system isolated/depressurised as necessary

☐ The steam system rendered inoperative by lock out/tag out

☐ Provision of adequate lightnig and ventilation (for confined spaces)

Name:                      Designation:                      Signature:                      Date:    /    /    Time:                      hrs

Note: The necessary safety measures must be complied with before the application is handed over to the safety assessor/ safety assistant for his endorsement.

### Stage II: Endorsement by Safety Asseessor/Safety Assistant

I have inspected the work area and its surroundings and confirm that the necessary safety requirements have been complied with.  
I hereby endorse the permit.

Name:                      Designation:                      Signature:                      Date:    /    /    Time:                      hrs

### Stage IIIA: Approval by Project Manager

1. I have evaluated the hazards and risks associated with the work.

2. I confirm that I have co-ordinated the work at the VSCC meeting to ensure that all hot-work will be stopped  
\*in the above-mentioned space/in all confined spaces (applicable for testing of valves and pipelines using hydraulic system).

3. I have instructed the Safety Assessor/Safety Assistant to ensure that the hazards and risks are eliminated or critically reduced to a contemporary objective standard and all recommended safety measures are complied with.

4. I confirm that there are no other incompatible work processes being carried out.

5. I am satisfied that a thorough inspection and proper assessment of the work area and its surroundings have been made so that the work can be carried out safely.

I hereby approve the permit.

Name:                      Designation:                      Signature:                      Date:    /    /    Time:                      hrs

### Stage IIIB: Endorsement by Sub-contractor Foreman/Supervisor (for tender jobs only)

I hereby acknowledge that I have understood the briefing conducted by the Trade Foreman/Supervisor on the safety measures to be taken for the work and shall ensure compliance with the same.

Name:                      Designation:                      Signature:                      Date:    /    /    Time:                      hrs

### Stage IV: Notification of Completion of Work by Trade Foreman/Supervisor

The above-mentioned work was completed on    /    /    at                      hours.

Name:                      Designation:                      Signature:                      Date:    /    /    Time:                      hrs

### Stage V: Verification by Safety Personnel (for confined space dismantling/testing only)

I confirm that the space                      is certified gas free.

Name:                      Designation:                      Signature:                      Date:    /    /    Time:                      hrs

\* Delete where not applicable  
# Refer to overleaf for general requirements of Lockout-Tagout (l)(j)  
REV. July 2015

DISPLAY

SAFE 08

# PERMIT FOR ENTRY INTO CONFINED SPACES

S/NO  
OTHERS

(DO NOT ENTER THE SPACE UNTIL STAGES I TO IVS ARE DULY  
COMPLETED AND SIGNED BY THE RESPECTIVE PERSONNEL)

<b>Name of Vessel:</b>	<b>Commencement</b>		
<b>Name of Confined Space:</b>	<b>Date:</b> /    /	<b>Time:</b>	<b>Hrs</b>
	<b>Date:</b> /    /	<b>Time:</b>	<b>Hrs</b>
<b>Type of Work: *Dismantling/Testing of Pipelines/Valves/Heating Coils</b>			

Daily  
endorsement  
by authorised  
manager

## Stage I: Application by Trade Foreman Supervisor

- Potential atmospheric hazards:  
Potential non-atmospheric hazards:
- Control measures: I have highlighted my intention to enter the confined space at the Vessel Safety Co-ordination Committee (VSCC) meeting and it has been co-ordinated. Further, I shall take the under mentioned control measures prior to the entry into the space and during the course of work in the space.

<input type="checkbox"/> People adequate lighting and ventilation	<input type="checkbox"/> Provide pocket gas detector (PGD)
<input type="checkbox"/> Display entry permit prominently at the entrance to the space	<input type="checkbox"/> Ensure entrants carry personal torchlight
<input type="checkbox"/> Provide barricades and/or signboards	<input type="checkbox"/> Ensure ladders are free from defects
<input type="checkbox"/> Display HSSE induction pass at the entrance to the space	<input type="checkbox"/> Ensure unguarded lightening holes/openings are protected
<input type="checkbox"/> Maintain escape routes free from obstructions	<input type="checkbox"/> Ensure hinged grating platforms (if any), are securely fastened
<input type="checkbox"/> Perform de-energization/Lockout-tagout (LOTO)	

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

Note: 1. The necessary safety measures must be complied with before the application is handed over to the confined space safety assessor for HSS evaluation.

2. Where reasonably practicable applicant to provide a sketch of the area within the confined space where the entry is to be made or work is to be conducted on a separate sheet of paper and attach it with the permit.

## Stage II: Evaluation by Confined Space Safety Assessor

Results of initial gas monitoring:

*\*indicates permissible entry level*

<b>Oxygen (19.5% Vol to 23.5% Vol*)</b>
_____ %

<b>Flammable gas (&lt; 10% ____*)</b>	
Hydrocarbon (HC)	

<b>Toxic gas (&lt; PEL values*)</b>		
H <sub>2</sub> S		(10 ppm)
CO		(25 ppm)

I have gas monitored the space and confirm that it is fit for entry.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

## Stage III: Issuance/Approval by Authorized Manager

I am satisfied that:

- the work has been co-ordinated at the VSCC meeting (for vessels).
- the levels of oxygen, flammable gas and toxic substances are within the permissible range.
- the confined space is adequately ventilated and illuminated.
- effective steps have been taken to prevent any ingress of dangerous gases, vapours or any other dangerous substances into the confined space.
- all reasonably practicable measures have been taken to ensure the safety and health of the entrants.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

## Stage IVa: Posting of Entry Permit by Trade Foreman/Supervisor/Vessek Representative

I shall ensure that the copy of the entry permit, along with a stretch of the area within the confined space where the entry is to be made or work is to be performed (where practicable), is posted at the entrance to the confined space.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

## Stage IVb: Notification of Removal of Entry Permit by Trade Foreman/Supervisor/Vessek Representative

The permit has been removed for following reasons:

- ☐ Permit expired    ☐ Work completed    ☐ Permit revoked (state reasons below)

Remarks: \_\_\_\_\_

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

Note: ☐ Tick where applicable

*This permit is strictly for entry into the space only and it does not entitle the applicant to carry out hot-work or any other hazardous works requiring permit-to-work.*

# PERMIT FOR HAZARDOUS WORK AT HEIGHT

S/NO

DEPARTMENT:

COMPANY:

REFER OVERLEAF FOR REQUIREMENTS AND DEFINITION OF \*HAZARDOUS WAH  
(THE WORK SHALL NOT COMMENCE UNTIL ALL THE REQUIREMENTS STATED IN STAGE I  
HAVE BEEN DULY COMPLIED WITH)

Name of Vessel/Building/Structure:	Commencement	
	Date: / /	Time: Hrs
Location:	Completion	
	Date: / /	Time: Hrs

Daily  
endorsement  
by authorised  
manager

## Stage I: Application by Trade Foreman/Work-At-Height Supervisor/Vessel Representative

- ☐ Scaffolding works > 3m in height (erection/modification/dismantling of scaffold/working on hanging scaffold)
- ☐ WAH using scaffold which requires a Professional Engineer to certify the scaffolding (e.g. > 15m tower scaffold, cantilever/jib support)
- ☐ Using rope access method to gain access to WAH
- ☐ Roofing work (> 2m in height)
- ☐ Work at shipside for Lifeboat/Accommodation Ladder/Side Shell Steel Work
- ☐ Work on Derrick/Flare Tower Structure (> 3m in height)
- ☐ Others (hazardous WAH > 3m): \_\_\_\_\_

- I have fully understood the work to be carried out and have complied with all the reasonable fall prevention measures and methods prior to the commencement of the work. (to attach a sketch of the location where work will be carried out, if applicable)
- I have stated below the control measures for other hazards which are not listed in the Fall Prevention Plan below: (if applicable)

* Tick as applicable		Control Measures																		
		*Fall Prevention Control Measures/ Precautions	Hard barricade/ guard rails	Cover/grating over opening	Safe anchorage points	Lifelines/Self Retracting Lifeline	Toe Board	Secured Tools/ Equipment	Secured Object	Container/ Tools Bag	Safety Belt	Full Body Harness with Lanyard	Life Buoy	Life Jacket	Rope Grab					
Working at Height Hazards	from scaffold																			
	from opening/ skylight/hatch opening																			
	from vertical ladder																			
	from top of machinery/equipment																			
	from vehicle/ transporter																			
	from roof over edges																			
Falls	into water																			
	into dry dock																			
Struck by	tools/equipment																			
	objects																			

Control measures for other hazards:  
(Not specified above)

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

## Stage II: Evaluation by Work at Height Safety Assessor

I have inspected the work area and its surroundings to verify that all necessary safety requirements have been complied with.

Remarks (if any): \_\_\_\_\_

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

## Stage III: Evaluation by Work at Height Safety Assessor

- I have coordinated with the Work-At-Height (WAH) Safety Assessor and the relevant parties to ensure that the hazards and risks are eliminated/critically reduced to a contemporary objective standard.
- I have ensured that there is no incompatible work processes being carried out in the same vicinity at the same time.
- I am satisfied with the thorough inspection and proper assessment conducted for the work area.

I hereby approve the permit.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

## Stage IVa: Posting of Permit by Trade Foreman/Work at Height Supervisor/Vessel Representative

I shall ensure that the copy of the permit is clearly posted at the vicinity of the work area.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

## Stage IVb: Notification of Permit Removal by Trade Foreman/Work at Height Supervisor/Vessel Representative

The permit has been removed for the following reasons:

- ☐ Permit expired ☐ Work completed ☐ Permit revoked (state reasons below)

Reason(s) for revoke: \_\_\_\_\_

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

## PERMIT FOR HOT-WORK

S/NO  
OTHERS

(HOT-WORK SHALL NOT COMMENCE UNTIL STAGES I TO IIIA - IIIB FOR TENDER JOBS -  
ARE DULY COMPLETED AND SIGNED BY THE RESPECTIVE PERSONNEL)

<b>Vessel's Name:</b>	<b>Commencement:</b>	Date:    /    /	
		Time:                      Hrs	
<b>Location of Work:</b>	<b>Completion:</b>	Date:    /    /	
		Time:                      Hrs	
<b>Type of Hot-Work: (gouging/burning/welding/preheating/brazing/grinding)*</b>			
<b>Details of the Hot-Work to be carried out:</b>			

Daily  
endorsement  
by authorised  
manager

DAY 2

DAY 3

DAY 4

DAY 5

DAY 6

DAY 7

DAY 8

DAY 9

DAY 10

DAY 11

DAY 12

DAY 13

DAY 14

### Stage I: Application by Trade Foreman/Supervisor

1. Special hazards and risks (if any): \_\_\_\_\_

2. Measures taken: \_\_\_\_\_

I have highlighted the work at the Vessel Safety Co-ordination Committee (VSCC) meeting and it has been co-ordinated. Further, I shall ensure compliance with the undermentioned requirements prior to the commencement and during the hot-work:

☐ # Lockout-Tagout done

☐ Presence of firewatch with fire extinguishers/fire hoses

☐ Prominent display of the Hot-Work Permit with sketch

☐ Supply of sufficient forced ventilation and provision of adequate lighting

☐ Prominent display of hot-work signboards

☐ Display of revolving lights

Name: \_\_\_\_\_ Designation: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

Please tick the applicable requirements in the appropriate boxes.

**SKETCH**

### Stage II: Endorsement by Safety Assessor

I have inspected and confirm that:

- The hot-work area and its surroundings are free from combustible/flammable substances and
- The necessary safety requirements have been complied with.

Additional safety precautions to be taken: \_\_\_\_\_

\_\_\_\_\_

I hereby endorse the permit.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

### Stage IIIA: Approval by Project Manager

- I have evaluated the hazards and risks associated with the work.
- I confirm that I have co-ordinated the work at the VSCC meeting.
- I have instructed the Safety Assessor to ensure that the hazards and risks are eliminated or critically reduced to a contemporary objective standard and all recommended safety measures are complied with.
- I have ensured that there are no incompatible work processes being carried out in the same vicinity at the same time.
- I am satisfied that a thorough inspection and proper assessment of the hot-work area and its surroundings have been made so that the work can be carried out safely.

I hereby endorse the permit.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

### Stage IIIB: Endorsement by Sub-contractor Foreman/Supervisor (for tender jobs only)

I hereby acknowledge that I have understood the briefing conducted by the Trade Foreman/Supervisor on the safety measures to be taken for the work and shall ensure compliance with the same.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

### Stage IV: Notification of Completion of Work by Trade Foreman/Supervisor

The above-mentioned work was completed on \_\_\_\_/\_\_\_\_/\_\_\_\_ at \_\_\_\_\_ hours.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

\*Delete where not applicable  
# Refer to overleaf for general requirements of Lockout-Tagout (ii)(j) (See overleaf for explanatory notes)

# PERMIT FOR REPAIR/MAINTENANCE WORK OF HYDRAULIC SYSTEM

S/NO  
OTHERS

(THE WORK SHALL NOT COMMENCE UNTIL STAGES I TO IIIA - IIIB FORTENDER JOBS -  
ARE DULY COMPLETED AND SIGNED BY THE RESPECTIVE PERSONNEL)

<b>Vessel's Name:</b>	<b>Commencement:</b>	<b>Date:</b> /     / <b>Time:</b> Hrs
<b>Location of Work:</b>	<b>Completion:</b>	<b>Date:</b> /     / <b>Time:</b> Hrs

## Stage IA: Application by Trade Foreman/Work-At-Height Supervisor/Vessel Representative

(1) Special hazards and risks (if any):

(2) Measures taken:

I have highlighted the work at the Vessel Safety Co-ordination Committee (VSCC) meeting and it has been co-ordinated. Further, I shall take the undermentioned safety measures prior to the commencement of the work process and shall be responsible for maintaining them during the entire process:

- ☐ # Lockout-Tagout done
- ☐ Power supply isolated and tagged
- ☐ Valves for the system closed/lashed/tagged
- ☐ No hot-work in the affected area
- ☐ Display of warning signboards

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

*Note: The necessary safety measures must be complied with before the application is handed over to the safety assessor/safety assistant for his endorsement.*

## Stage IB: Confirmation by Master/Chief Engineer/Chief Officer

I agree to the following safety precautions:

- ☐ Power supply isolated and tagged
- ☐ Valves for the system closed/lashed/tagged
- ☐ No hot-work by the shipcrew in the affected area

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

*Note: The necessary safety measures must be complied with before the application is handed over to the safety assessor/safety assistant for his endorsement.*

## Stage II: Endorsement by Safety Assessor/Safety Assistant

I have inspected the work area and its surroundings and confirm that the necessary safety requirements have been complied with. I hereby endorse the permit.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

## Stage IIIA: Approval by Project Manager

1. I have evaluated the hazards and risks associated with the work.
  2. I confirm that I have co-ordinated the work at the VSCC meeting to ensure that all hot-work will be stopped in the affected area.
  3. I have instructed the Safety Assessor/Safety Assistant to ensure that the hazards and risks are eliminated or critically reduced to a contemporary objective standard and all recommended safety measures are complied with.
  4. I am satisfied that a thorough inspection and proper assessment of the work area and its surroundings have been made so that the work can be carried out safely.
- I hereby approve the permit.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

## Stage IIIB: Endorsement by Sub-contractor Foreman/Supervisor (for tender jobs only)

I hereby acknowledge that I have understood the briefing conducted by the Trade Foreman/Supervisor on the safety measures to be taken for the work and shall ensure compliance with the same.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

## Stage IV: Notification of Completion of Work by Trade Foreman/Supervisor

The above-mentioned work was completed on \_\_\_\_/\_\_\_\_/\_\_\_\_ at \_\_\_\_\_ hours.

Name: \_\_\_\_\_ Designation: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_\_ hrs

# Refer to overleaf for general requirements of Lockout-Tagout (L/T)

(See overleaf for explanatory notes)

## Annex H: Sample of Evaluation Drill Report

Emergency Fire and Emergency Drill Report									
Date of drill:									
Vessel:									
Location of fire:									
Nature of drill (tick box):									
	Evacuation		Fire		Rescue		Oil spill		Flooding
Procedure:									
Objective:									
Procedure for Fire and Evacuation Exercise									
Scenario of Fire and Evacuation Drill									



Checklist For Fire and Evacuation Drill			
1	Actions during serious fire/explosion	Yes	No
1.1	Action by personnel at the scene		
a.	Shout "Fire!"; and if safe to do so, fight the fire with suitable fire extinguisher/fire hoses.		
b.	Disconnect the followings: i. Welding cables from the welding machines ii. Gas hoses from gas manifolds		
c.	Notify EHS Department personnel by pressing on screen at the emergency alarm box, or call emergency hotline (phone number) or EHS office number (phone number). If no one picks up the call, notify security section at (phone number).		
d.	Give details of fire or incident to the EHS personnel who is taking charge of the operation on his arrival.		
e.	Switch off electrical equipment or power supply upon request. (Note: The shore supply of electric power lines).		
1.2	Action by ship crew		
a.	All ship crews must proceed to the emergency assembly area. EHS personnel must ensure that every ship crew evacuate the vessel.		
b.	All line supervisors must collect the head count chit from EHS personnel and do a head count. The head count chit must be filled and return to assembly area EHS officer.		
1.3	Action by shipyard personnel and contractor's supervisory staff		
a.	All line supervisors must proceed to the assembly area and ensure their workers have evacuated.		
b.	Carry out the head count and submit the chits to EHS officer in charge.		
c.	Ensure that all contractors carrying out head count and submit the chits to EHS office in charge.		
d.	Provide any useful information pertaining to the vessel to EHS personnel (if any) i. Hazard ii. Access routes iii. Obstructions		
e.	Standby to assist Note: Yard Security Office to activate the Yard PA system and sound alarm during the fire drill period upon request by EHS Officer.		
1.4	Action by ship-repair manager		
a.	Inform ship's representatives.		
b.	Provide necessary information about the ship.		
c.	Provide information on all areas where they are work in progress.		
d.	Help to assist the situation and predict any further explosion or spread of fire with knowledge of ship's condition.		
e.	Standby to assist when called upon.		
1.5	Action by EHS personnel on duty		
a.	Turn on the fire engine and proceed to the scene with all available manpower.		
b.	Recall all other EHS personnel from other vessels to the scene by the quickest means.		
c.	Assess the situation, and if necessary, instructs the security to sound the alarm.		
d.	Announce through the walkie-talkie to order all other walkie-talkie communication to cease except for those involved in fire-fighting and rescue operation and the SRM involved.		
e.	Help to evacuate workers by using a loud hailer.		



Review of Fire Drill		
Location:		
Date:		Time:
Ship Duty Officer:		
S/NO	Comments/Findings	Action Party
1.	Emergency response time	
2.	Fire alarm signal	
3.	Emergency alarm panel	
4.	Evacuation	
5.	Power shutdown of shore supply	
6.	Fire-fighting team	
7.	Rescue report	
8.	Headcount	
9.	Display of dual tag	
10.	Debrief	
	Name and Designation	Signature
Prepared by:		
Approved by:		
Reviewed by:		

## Annex I: Sample of Near-miss/Accident/Incident Report

Near-Miss/Accident/Incident Report			
Report No:		Date of near-miss/accident/incident:	
Vessel:		Local time:	
Location:			
Type of near-miss/accident/incident:			
<input type="checkbox"/>	Property damage/Loss of cargo	<input type="checkbox"/>	Slip/trip/fall/line of fire/body position
<input type="checkbox"/>	Oil spill	<input type="checkbox"/>	Elevated works/falling objects
<input type="checkbox"/>	Fire/explosion	<input type="checkbox"/>	Lifting/crane operation
<input type="checkbox"/>	Engines/steering failure	<input type="checkbox"/>	Others (please state):
Type of injury:			
<input type="checkbox"/>	Fatality	<input type="checkbox"/>	Medical treatment case
<input type="checkbox"/>	Loss time injury (LTI)	<input type="checkbox"/>	First-aid case
<input type="checkbox"/>	Restricted workdays case (MC)	<input type="checkbox"/>	Others (please state):
Details of injured/casualty if any:			
1.	Name:	Job Title:	Sex: Age:
2.	Name:	Job Title:	Sex: Age:
3.	Name:	Job Title:	Sex: Age:
Detail description of near-miss/accident/incident (Use additional sheet and sketch, photographs if necessary):			

## Near-Miss/Accident/Incident Report

### Cause of near-miss/accident/incident:

<input type="checkbox"/>	Communication failure	<input type="checkbox"/>	Inadequate personal protective equipment
<input type="checkbox"/>	Incompliance of rules/procedures (SOP)/ Industry recommendations	<input type="checkbox"/>	Fatigue
<input type="checkbox"/>	Incompatible equipment/tools	<input type="checkbox"/>	Poor housekeeping
<input type="checkbox"/>	Inadequate supervision	<input type="checkbox"/>	Unsafe working environment
<input type="checkbox"/>	Inadequate training	<input type="checkbox"/>	Mishandling of equipment/tools
		<input type="checkbox"/>	Others (please state):

### Root cause:

(Use additional sheet and sketch, photographs if necessary)

### Corrective actions taken:

(Use additional sheet and sketch, photographs if necessary)

### Recommendations to prevent similar recurrence:

(Use additional sheet and sketch, photographs if necessary)

### Reported by:

Name:	Designation:
Signature:	Date:

### Reviewed & Closed by:

Name:	Designation:
Signature:	Date:

### Approved by:

Name:	Designation:
Signature:	Date:

## Annex J: Sample of Noise Monitoring Report

### Recommendations for Implementation of HCP for Noisy Workplaces (An Example)

S/N	Element of HCP	Implemented (Y/N)	Remarks
1	<b>Identification of Noise Hazard</b> Risk assessment identifies noise as a hazard and controls are in place to manage exposure.	Yes	Supporting documents
	Noise monitoring successfully identifies workstations or tasks exposing workers to excessive noise.	Yes	Supporting documents
2	<b>Noise Control Plans</b> If there are more than 50 workers exposed to excessive noise, the legal requirement for a Noise Control Officer is made known to the occupier/responsible person(s).	Yes	Included in Noise Monitoring Report
	If the company has more than 50 workers exposed to excessive noise, a long term and short-term plan are put in place to manage excessive noise at the workplace.	No	Short-term: Provide hearing protectors to exposed workers. Long-term: Company to appoint a Noise Control Officer to advise on all noise control solutions. N.B. All reasonably practicable noise controls must be explored. The provision of hearing protectors is a short-term measure while long term controls are being implemented.
3	<b>Audiometric Examinations</b> If any worker is exposed to excessive noise, he is included in the list of workers to be examined for hearing loss (including audiometric examinations) annually.	Yes	Supporting documents
	Any new worker expected to be working in the identified noisy areas must have a preplacement audiometric examination	Yes	Supporting documents

	conducted no later than three months of commencing work in the workplace.		
	Audiometric examinations are carried out by trained persons, i.e. industrial audiometric technicians.	Yes	Supporting documents
4	<b>Training and Education</b> If any worker is exposed to excessive noise, he is included in the list of workers to be trained annually. Any new workers who are expected to be working in the identified noisy areas must be trained within three months of commencing work in the workplace. The training topics should include the following: - Relevant provisions of the WSH Act and Noise Regulations; - Effects of noise on hearing; - Purpose of hearing protectors; - Advantages, disadvantages and attenuation of various types of hearing protectors; - Selection, use, care and maintenance of hearing protectors; - Purpose of hearing tests and appropriate procedures and requirements of such tests; and - Any other relevant topics.	Yes	Supporting documents
	Hazard identification of noisy areas/machines/ processes including posting of warning signs displaying the typical noise levels and the requirement of wearing hearing protectors when working or entering the area. Warning signs should be posted at all entrances or at periphery of all areas of the workplace identified to be noisy.	No	<ul style="list-style-type: none"> <li>• Supporting documents</li> <li>• Evidence to support claims that warning signs are being posted in noisy areas.</li> </ul>
5	<b>Provision of Personal Protective Equipment</b> Workers working in the identified noisy areas must be provided with hearing protectors while long term controls are being put in place. There should be an issue and maintenance record.	Yes	Supporting documents
	Workers are instructed on the proper use, care, maintenance and change of the hearing protectors.	Yes	Supporting documents

## Annex K: Hearing Conservation Program Evaluation Checklist

Recommendations for Implementation of HCP for Noisy Workplaces (An Example)

Date of Evaluation:		
Name of Evaluators	Designation	Signatures

Checking “No” to any of the following items indicates a need for corrective actions to be taken to address the deficiencies.

1. Planning for Hearing Conservation Programme (HCP)	Yes	No	Remarks
Is a programme administrator appointed for the HCP?			
Does the programme administrator have the relevant knowledge to coordinate all aspects of the programme? (i.e., Understanding of the individual elements of the HCP, relevant provisions of the legislation, effects of noise on hearing and the purpose of hearing protectors and audiometric examinations.)			
Elements of Hearing Conservation Programme			
2. Identification of Noise Hazard	Yes	No	Remarks
Has risk assessment been conducted and documented for all noisy processes?			
Is the risk assessment reviewed and revised at least once every three years; and upon occurrence of any bodily injury or significant change in work practices or procedures?			
Is the noise monitoring performed once every three years or when there are changes in the conditions which are likely to cause any persons in the workplace to be exposed to excessive noise (more than 85 dB(A) over eight hours)? (For workplaces with 10 or more persons exposed to excessive noise.)			

Is the noise monitoring conducted by a competent person?			
Is the noise measuring equipment used for noise monitoring calibrated before use?			
Is a copy of the noise monitoring report submitted to the Ministry of Manpower, and kept available for at least 10 years?			
Are the contents of the report communicated to all persons exposed to excessive noise not later than 14 days after preparation of the report?			
Is the latest noise monitoring result compared with the previous report to determine if there is any significant change in noise levels?			
Have appropriate steps been taken to include or exclude workers in the HCP whose exposures have changed significantly?			
<b>3. Noise Control</b>	<b>Yes</b>	<b>No</b>	<b>Remarks</b>
Are all practicable measures taken to reduce or control noise from any machinery, equipment or processes such that no workers are exposed to excessive noise?			
Is a competent person appointed to advise the management on proper noise control measures? (For workplaces with 50 or more persons exposed to excessive noise.)			
Are workers encouraged to participate in the development of noise control measures?			
Are noise emission levels considered during the selection and procurement of new machines?			
Is a noise control plan to reduce the excessive noise through engineering controls established?			
Is the noise control plan implemented?			
Is the noise control plan reviewed at least once every three years after noise monitoring is conducted?			
Are the noise control projects monitored to ensure timely completion?			

When the implementation of engineering controls is not reasonably practical, are the administrative controls implemented to reduce workers' exposure to excessive noise?			
Is noise monitoring performed after noise control to evaluate the residual risk?			
Is a maintenance programme established to ensure that all noise control systems or devices remain effective and do not deteriorate over time?			
<b>4. Hearing Protectors</b>	<b>Yes</b>	<b>No</b>	<b>Remarks</b>
Are suitable hearing protectors provided to all persons exposed to excessive noise?			
Are procedures established and implemented to ensure that:			
- Hearing protectors are properly issued and maintained;			
- Persons exposed to excessive noise use hearing protectors; and			
- Such persons are instructed on the proper use of hearing protectors?			
Are workers provided with a range of appropriate hearing protectors to allow them to choose the ones which fit them comfortably?			
Are the hearing protectors checked regularly for wear and defects and replaced immediately when necessary?			
Are replacements for hearing protectors readily available to workers who are using the disposable hearing protectors?			
Are warning signs indicating the use of hearing protectors placed at all entrances to areas where persons are or are likely to be exposed to excessive noise?			
Are regular inspections conducted to ensure that workers wear hearing protectors correctly and consistently in designated areas?			
Is there an incentive or disincentive scheme in place to encourage workers to put on hearing protection?			
<b>5. Training and Education</b>	<b>Yes</b>	<b>No</b>	<b>Remarks</b>
Is a training programme implemented and conducted every year for all persons exposed to excessive noise?			



Is training provided to all new workers within three months of commencing work?			
Does the training programme include instructions in: <ul style="list-style-type: none"> <li>- Relevant provisions of the WSH Act, WSH (Risk Management) Regulation, WSH (Noise) Regulations and WSH (Medical Examinations) Regulations;</li> <li>- Effects of noise on hearing;</li> <li>- Purpose of hearing protectors and its proper use and maintenance; and</li> <li>- Purpose and procedure of audiometric examinations?</li> </ul>			
Is the training content reviewed periodically?			
Does the management demonstrate commitment to HCP by personal example, such as wearing hearing protectors in designated areas and participating in the training programme?			
<b>6. Audiometric Examinations</b>	<b>Yes</b>	<b>No</b>	<b>Remarks</b>
Are all workers who are exposed to excessive noise medically examined by a designated workplace doctor and certified fit to work in the occupation before commencement of work?			
Are yearly audiometric examinations conducted for all persons exposed to excessive noise?			
Are the audiometric examinations performed by competent persons who are properly trained?			
Are records of audiometric examinations kept for at least five years from the date of examination?			
Are the audiometric examination results evaluated to determine information such as identification of high-risk group, etc?			
Are the results of the audiometric examinations communicated to the workers?			
Is counselling provided to workers who show significant threshold shifts and are they informed of the preventive measures they can take to avoid further hearing loss?			

Are follow up actions arising from the evaluation of the audiometric results implemented and documented?			
<b>7. Record Keeping</b>	<b>Yes</b>	<b>No</b>	<b>Remarks</b>
Are all records related to the HCP activities (such as noise monitoring records, risk assessment forms, training records, noise control plans, documents on hearing protector issue and fitting, audiometric related records, etc) properly documented, maintained and available for review?			
<b>8. Programme Evaluation</b>	<b>Yes</b>	<b>No</b>	<b>Remarks</b>
Is a thorough evaluation of the HCP conducted on a periodic basis to determine the effectiveness of the programme in preventing noise-induced hearing loss?			
Does the evaluation involve a team effort?			
Are audiometric database analysis used to evaluate the programme's overall effectiveness in preventing noise-induced hearing loss?			
Are workers encouraged to provide feedback on the merits or shortcomings of the programme and to offer suggestions on possible improvements to the HCP?			
Are appropriate steps taken to address the deficiencies identified promptly?			

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