Workplace Safety and Health Guidelines

Implementation of WSH Management System for the Marine Industries

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1. Introduction

1.1 Scope and Application

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.

Under the Workplace Safety and Health (Safety and Health Management System and Auditing) Regulations, shipyards are required to establish a WSHMS, which includes conducting audits and reviews. For companies to have a better understanding of the WSHMS requirements, the Association of Singapore Marine Industries (ASMI), Ministry of Manpower and the 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 the ASMI have reviewed to integrate all 14 elements and content of the Guideline (2009) using a systematic approach with alignment to the ISO 45001:2018.

The guidelines provide guidance to companies preparing for a WSHMS. It also highlights the importance of WSH as well as good industry practices**.**

1.2 Terms and Definitions

The following terms are used in this document with the definitions as shown below:

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 that during emergency), warnings and signs, work-rest regime etc.
Competent Person	A person who has sufficient experience and training to perform the work required.
Confined Space	An area where dangerous gases, vapour or fumes are liable to be present to such an extent as to involve risk of fire or explosion, or persons being overcome thereby; or the supply of air is inadequate, or is likely to be reduced to be inadequate, for sustaining life; or there is a risk of engulfment by material, as defined in the WSH (Confined Space) Regulations.
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	A competent person appointed in writing by: • An occupier of a shipyard; • An employer of persons carrying out work in a shipyard or on board a ship in a harbour; or • 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.
Element	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: 1. Safety Policy 2. Safe Work Procedures 3. Safety Training 4. Group Meetings 5. Incident Investigations & Analysis 6. In-house Rules 7. Safety Promotion 8. Contractors Selection, Evaluation & Control 9. Safety Inspection 10. Maintenance Regime 11. Hazard Analysis 12. Hazardous Substances 13. Occupational Health 14. Emergency Preparedness
Engineering Control	• The application of any scientific principle for the control of any workplace hazard; and • 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.
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	A source, situation or act with the potential for harm in terms of: • Ill health or injury, or both; • Damage to property, plant or ships; • Pollution of environment; • Production losses or increased liabilities.
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: • Ill health or injury; • Damage to property, plant, ships or environment; and • Production losses or increased liabilities.
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.
Must	Mandatory
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: • To supply any labour for gain or reward; or • To do any work for gain or reward.
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	In relation to any work carried out in at the company, means: • In the case of a shipyard, the occupier of the shipyard; and • In the case of a ship in a harbour: - The employer of any person who carries out the work; or - The principal under whose direction any person carries out the work.
Shipyard	Shipyard includes any dry or wet dock, wharf, jetty and quay, and the precincts thereof.
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 (ALARP).
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	Freedom from unacceptable risk of harm including: • The protection of people from physical or health hazards; • The protection of assets; and • The maintenance of production capability.
Shall	Requirement of WSHMS
Should	Recommendation
System	The organisation, responsibilities, procedures, resources and processes by which an enterprise plans to achieve its policy and objectives. In this document, 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.

1.3 Abbreviations

MOM	Ministry of Manpower
MOH	Ministry of Health
MPA	Maritime and Port Authority of Singapore
SDS	Safety Data Sheet
PPE	Personal Protective Equipment
SCDF	Singapore Civil Defence Force
VSCC	Vessel Safety Coordination Committee
WSH	Workplace Safety and Health
WSHC	Workplace Safety and Health Council
WSHMS	Workplace Safety and Health Management System

2. Implementing WSH Management System

2.1 Leadership and Worker Participation

2.1.1 Demonstration of Leadership Commitment

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

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 WSHMS.
- Provide guidance and support to personnel who is leading WSHMS implementation.
- Support other relevant management roles to demonstrate their leadership.

b) Effective Implementation of WSHMS

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

c) Engaging Employees

- Communicate the importance of an effective WSHMS and conformance to the requirements to all employees.
- Establish employee's consultation and participation processes.
- Ensure the identity of employees is 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.
- Ensure employees are represented in the WSH Committee.

2.1.2 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 person working in the company.
- Eliminate WSH hazards and reduce the risks.
- Ensure continual improvement to WSHMS.

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

2.1.3 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:

- Available resources to establish, implement, maintain and improve the systems. Such resources may include financial, human resources, specialised skill, technology and infrastructure.
- Staff roles, responsibilities and accountabilities on WSH are defined including reporting on the performance of the WSHMS to top management.
- 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.

2.1.4 Consultation and Participation of Workers

The key to the success of 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. The various ways to involve a worker in the implementation of WSHMS include:

- Drafting and reviewing of WSH policies, goals and objectives.
- Conducting risk assessment and risk management process.
- Implementing feedback mechanism for WSH issues and suggestions for improvement e.g. safety suggestion box, incentives for suggestions or annual WSH climate survey.
- Having a representative to be in the Vessel Safety Coordination Committee (VSCC), WSH Committee and toolbox meeting.
- Conducting Incident investigations and its preventive actions.
- Organising WSH promotional activities for the organisations.
- Conducting safety and health inspections, the outcomes and corrective actions.
- Conducting WSHMS audits and the outcomes.
- Implementing changes in materials, work processes, equipment and chemicals.
- Having regular updates and discussions via in-house newsletters and notice boards.
- Updating on legal requirements and other requirements.
- Developing or making changes for in-house WSH rules.

2.2 Planning

2.2.1 Hazard Identification and Assessment of Risks and Opportunities

2.2.1.1 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 assessment in relation to WSH risks posed to any person who may be affected by his undertakings and take reasonably practicable measure 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.
- Review.

2.2.1.2 Risk Register

Organisations are to conduct WSH risk assessment 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 Risks Register".

2.2.2 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 when establishing, implementing and maintaining of WSHMS.

Organisations must ensure that they keep up to date information on the applicable legal requirements and other requirements.

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-1.

2.2.3 Objectives and Programmes

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

- Be measurable and updated.
- Be consistent with the WSH policy.
- 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 the programme(s) for achieving its WSH objectives. To implement these programmes and achieve the objectives, the organisation should define clearly:

- A list of objectives, evaluation criteria for monitoring, as well as 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.
- Communication of the objectives to all employees and relevant parties involved.

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

2.3 Support

2.3.1 Resources

The organisation should ensure that persons in the workplace take responsibility for aspects of WSH over which they have control, including adhering to the organisation's applicable WSH requirements. Top management should take ultimate responsibility in WSHMS. They should ensure:

- Resources are made available to establish, implement, maintain and improve the systems. Such resources may include financial, human resources, specialised skill, infrastructure and technology.
- Staff roles, responsibilities and accountabilities on WSH are clearly defined. Authorities are delegated for effective implementation of the system.

These roles, responsibilities, accountabilities and relevant authorities should be communicated to relevant persons and documented in the system.

2.3.2 Competence and Awareness

Persons working at the shipyard must be given sufficient training, instructions and information on the measures taken to minimise risks carried out at the workplace. They must be competent in performing their tasks that can impact their safety and health.

The shipyard should establish procedures to identify training needs and provide adequate WSH training for all levels of employees including contractors. The WSH training should provide management staff with the knowledge and skills necessary for organising and managing WSH programmes. Empower first-line supervisors and team leaders with leadership skills and knowledge to lead, implement and apply WSH activities. Equip workers with the knowledge, skills and right attitudes to enable them to work safely. The 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:

- Training needs analysis by comparing a person's skills level with the demands of his/her job to identify the skills shortfalls. The shipyard 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.
- Planning courses to ensure that people are trained before they are able to apply the skills.
- Administering by allocating people to initial and refresher courses and maintaining completed records of training.
- Evaluating training programmes.
- Monitoring to ensure that the training is achieving the planned results.
- Reviewing the need for refresher training to ensure competency.

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 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 Signalman	WSQ Perform Rigger and Signalman tasks
Shipyard Supervisor	Shipyard 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
Shipyard Hot Work Safety Assessor	Shipyard Safety Assessor (Hot Works Certification) Course/WSQ Assess Shipyard Safety for Hot-Work Certification
Shipyard Worker (Hot Work Trade)	Shipyard Safety Instruction Course for Workers (Hot Work Trade)
Shipyard Worker (Painter Trade)	Shipyard Safety Instruction Course for Workers (Painter Trade)

WSH Officer	WSQ Specialist Diploma in Workplace Safety and Health (Level C)
Tower Crane Operator	i) BCA – Luffing jib Tower Crane Operation Course ii) Workshop to Enhance Safety of Crane Operation (License Renewal)
Mobile Crane Operator	i) BCA – Mobile Crane (Truck Mounted) Operation Course ii) Workshop to Enhance Safety of Crane Operation (License Renewal)

Table 1: List of WSH training for various appointments.

b. WSH Orientation and Awareness

The shipyard shall conduct safety and health orientation courses for all employees as well as direct and indirect (contract) workers. They should cover:

- WSH policy and WSH objectives of the company.
- Employees' 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.
    - Emergency response procedures such as fire-fighting and evacuation procedures.
- Relevant incidents or accidents and investigation findings.
- Empowering employees to protect themselves from possible harms and injuries.

c. Skills Training

New employees are to be given training in the skills appropriate to their trades so that they can improve their individual performance in their respective trades. 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 that are involved.

<u>WSH Training Programme</u>

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

- General WSH issues, rules, policy and regulations.

- Hazard identification and risk assessment as well as the 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.
- Topics that are of concern which include eye protection, scaffolding, slips, trips and falls.
- Toolbox or pre-task briefings, highlighting hazards and the methods of dealing with them.
- Supervisory demonstrations of particular tasks.
- Development of supervisory skills.
- Drills and exercises.

Training for Different Personnel at Various Organisation Level

Courses for:

Management

- All relevant management staff to undergo safety training and be equipped with the proper understanding of the WSHMS, WSH policy and organisation, statutory requirements on WSH, their duties and responsibilities in safety and health in the shipyard.
- Relevant management staff are to be equipped with tools and techniques to manage safety and health effectively at the workplace.

Supervisors

- All direct and contractors' supervisors to undergo the necessary training to achieve a better understanding of the safety aspect of work operations to ensure that tasks are carried out safely.
- 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 direct and contractors' workers to attend the shipyard's in-house safety orientation training programme before they are allowed to start work.
- No worker is to be assigned to carry out any high-risk or hazardous job unless he/she has undergone the necessary training.
- WSH orientation training for workers to cover relevant safe work procedures, in-house WSH rules and regulations, hazard identification in work areas and responses to emergency.
- Conduct WSH talks to workers on a regular basis to inculcate WSH awareness.
- Conduct WSH training programmes that is understood by workers.

Types of WSH Training

- Training Schedule

    - Plan training courses in advance with information such as course date, duration, training and assessment methods to be made available to stakeholders.
    - Provide information to include both in-house and external trainings.

- Competency of Trainers
    - Engage approved and competent trainers to conduct WSH training programmes for workers.
    - Engage accredited and competent external training providers for WSH training, if and when internal resources are insufficient or staff are not competent to conduct the specific or required training.

- WSH Training Records
    - Document and maintain records of all WSH training received by all workers.
    - Maintain training records which include date of training, topics covered in the training programmes, trainers conducting the training and examination results of the training.

- Training Programme Review
    - Document and periodically review WSH training programmes.
    - Conduct reviews to measure the effectiveness of the WSH training and determine the extent to which the identified training needs are being met.

<u>Provisional Identification Labels for New and Inexperienced Workers</u>
All new and inexperienced workers should be identified with identification labels during the provision period.

2.3.3 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 WSHMS. During the consultation and communication process, the organisation shall consider the best method to reach out to the workers taking into consideration the workers' profile, for example the worker's native language and pictogram poster.

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

- Internal communication among various levels and functions of the organisation.
- Communication with contractors and other visitors to the workplace.
- 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; 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 shipyard safety, health and well-being. This is a vital part of a company's WSH agenda, whereby the company communicates its intentions to its workforce.

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

- Keeping the initiatives relevant.
- Attracting the attention of the target audience and encouraging a deliberate change of behaviour or at least allowing them to examine their actions to ensure compliance.
- Ensuring the promotion programme do not distract those involved, particularly the supervisors and WSH Department from their main tasks.
- Reinforcing the message is important.

B. Small Group Meetings

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

i. WSH Committee

WSH Committee is one platform comprising of representatives from various departments and functions, as well as contractors, who work together on 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 continual improvement in improving, promoting and reviewing all matters relating to the safety and health of employees. 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 in incorporating WSH matters such as inspection findings and opportunities for improvement should be discussed at the WSH Committee meeting through consultation.

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 to be 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 Safety 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.
    - 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.
- Make arrangements and determine the locations for the display of safety signs and permits on board the ship.

iii. Toolbox Meetings

Toolbox meetings involving supervisors and workers are to be conducted before work starts for effective consultation, communication and coordination of work to be carried out on a daily basis.

C. Safety Information

i. Risk Assessment

The employer, self-employed and principal should provide information to all persons at the workplace affected by the risk arising from his undertaking. The information includes:

- The nature of the risk involved.
- 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 Singapore Standard 508: Parts 1, 2, 3, 4 and 5.

iii. WSH Handbook

The occupier of a shipyard should provide a handbook on WSH in languages easily understood by workers. The handbook should be an easy-to-read reference on WSH

aspects of common tasks and behaviour in the shipyard. The target readership should be stated. Although the regulation does not specify the contents, it can contain:

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

A sample of the typical contents of a WSH handbook is included in Annex A-2.

The rules and general practices can be printed in all relevant languages and illustrations in the form of cartoons, drawings or photographs can help to make the meaning clearer. 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. In writing the handbook, it is important to note the following:

- The document is a handbook and should therefore be small enough to handle and use.
- It should be written from the user's point of view. It should be easy for him or her to understand and put into practice. This includes speakers of languages other than English.
- It should contain only information which is essential for the reader.

D. Other Forms of Consultation and Communication

Below are examples of how consultation and communication can be made:

- WSH briefings for employees, and other interested parties.
- WSH handbook.
- Internal magazines.
- Notice boards.
- Hazard communication programmes such as labelling and safety signs.
- Safety Data Sheet (SDS) and its management system.

2.3.4 Documented Information

The organisation should establish and maintain information in a suitable medium e.g. paper, soft copy for up-to-date and adequate documentation to ensure effective operation of the WSHMS. The documentation should provide adequate information that describe the elements of the WSHMS and their interactions and provide direction to related documents.

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 employees 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 of the document name and number.
    - The issuing and approving authority.
    - The scope and application.
    - The revision history with revision number and date of revision and 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 indented purposes are fulfilled.
- Documents should be legible, easy to locate and access.

2.3.5 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 such a systematic manner that enable easy retrieval and protected against damage, deterioration or loss.

Examples of records that should be kept for the retention periods:

Records	Valid Period
Risk Assessment Records	3 years
Incident Reports	3 years
Medical Examination Reports of Persons Involved in Hazardous Occupations	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.
- Update the permit-to-work coordination notice board.

2.4 Operation

2.4.1 Operational Control

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 by the shipyard.
• 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.
• 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, the equipment to be used, precautions and procedures to be taken.

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 (2.4.2 – 2.4.25) provide guides on the typical (not exhaustive) types of operational controls for WSH at the shipyards.

2.4.2 Safe Work Procedures

The shipyards should implement a system of safe work procedures to ensure that all works are carried out safely to eliminate or minimise occurrence of incidents.

Safe work procedures are to be established to reduce and control risks as identified by means of risk assessment techniques such as job safety analysis, activity-based risk assessment and trade-based risk assessment.

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

• Work on any machinery where the fencing has been removed for the purpose of any examination, lubrication or other operations.

• Work at a place where a person is liable to fall into any substance that is likely to cause drowning, poisoning, chemical burns or asphyxiation.

• Work in any confined space.

• Work involving the application of heat, or the potential generation of any source of ignition, where any explosive or flammable substance is liable to be present.

• Work on process, plant, vessel or machinery that is liable to produce or give off any corrosive, toxic or flammable substances.

• Work 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 work.

• Explosive powered tools.

• Crane and lifting operation.

2.4.3 Permit-to-work System

The permit-to-work is the key system to apply for hazardous operations in shipyards. Permit-to-work systems are implemented to the following:

• Ensure that due diligence has been performed to ensure the safety and health of workers.

• Prevent incompatible work 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 work is being carried out.

• Permit-to-work procedure must be rigorously applied in all its stages to contribute effectively to safety. The samples on permit-to-work are included in Annex C-2.

	Stage	Responsibility		Action
		Shipyard	Ship in a Harbour	
1.	Implementation of Permit-to-Work	Occupier	Master, Owner, or Agent of Ship	• Implement a permit-to-work system. • Appoint a safety assessor (a WSHO or competent person).
2.	Prohibition of high-risk works without a permit	Occupier, Employer, or Principal	Employer or Principal	• Ensure that no high-risk works is carried out without a permit.
3.	Application of Permit-to-Work	Supervisor or Foreman of Person Who Carry out the High-risk Work		• Apply permit-to-work in such form and manner required by ship repair manager. • State the measures which will be taken to ensure the safety and health of the person who carries out the high-risk work. • Address the permit to the ship repair manager and submit to safety assessor.
4.	Evaluation of Permit-to-Work	Safety Assessor		• 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. • 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. • 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. • Exercise due diligence when performing evaluation and endorsement of permit-to-work.

	Stage	Responsibility		Action
		Shipyard	Ship in a Harbour	
5.	Issue of Permit-to-Work	Ship Repair Manager		Issue a permit-to-work in relation to the high-risk work if he is satisfied that: • There has been a proper evaluation of the risks and hazards; • 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; • 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 • All persons who are to carry out the high-risk work are informed of the hazards associated with it.
6.	Posting of Permit-to-Work	Supervisor or Foreman of Person Who Carry out the High-risk Work		• 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. • 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.
7.	Monitoring of High-risk Work	Ship Repair Manager		• Continually review the progress of all high-risk work carried out pursuant to any permit-to-work issued.
		Supervisor or Foreman of Person Who Carry out the High-risk Work		• 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 • Inform the SRM of the completion of the work.

Table 3: Stages of permit-to-work system.

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 for any given period of time.
- Increases transparency and eliminates waiting time in approval process since all are time stamped and qualifications and certification of the supervisor, safety assessor and ship repair manager can be pre-screened during registration process into the system.
- Provides better data protection security as all data are controlled by third party.

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.

2.4.4 Design and Engineering

The company should clearly define standards for all design and engineering work. Major contracts will already contain the basis of the standards to be applied. The design process must include the provision for systematic WSH risk assessment:

• 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 general principles which should be considered include the following:

• 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.
- 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 practice and standard procedures for design work, checking and risk assessment are to be followed closely by designers and engineers.

2.4.5 Safe Access

2.4.5.1 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 Codes of Practice for Scaffolds and Code of Practice for Suspended Scaffolds provide requirements related to scaffolds.

Hazards arising from scaffolding and staging may include the following:

i. Falls

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

ii. Falling Objects

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

iii. 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. The procedures must take into account the use of the

scaffold, for example, to avoid overloading with equipment or accumulations of blasting grit.

2.4.5.2 Mobile Tower Scaffolding

There should be procedures covering the erection, use and dismantling of mobile tower scaffolding which must conform to Regulation 51 of the WSH (Scaffolds) Regulations.

Hazards arising from mobile tower scaffolding may include the following:

i. Falls

Refer to 2.4.5.1 Scaffolding and Staging.

ii. Falling Objects

Refer to 2.4.5.1 Scaffolding and Staging.

iii. Collapse

Refer to 2.4.5.1 Scaffolding and Staging.

iv. Movement

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

Procedures

i. Construction

- The height of the scaffold does not exceed eight times the lesser of the base dimensions of the scaffold.

- The scaffold is 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 used on the scaffold at any time.

ii. 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.

iii. Locking

- Wheels to be securely braked.

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

iv. 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.

2.4.5.3 Aerial Work Platform

Aerial work platform also known as ‘cherry pickers’ are used to carry out work 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:

i. Working at Height

   Risk of falling or dropping objects.

ii. Failure in Service

   Risk of personnel falling or being stranded or of equipment falling during failure of the equipment.

Procedure

i. 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.

ii. 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.

2.4.5.4 Dock Arm

The use of dock arm as a means of access to a ship in a dry-dock must be covered by procedures relevant to the company.

Hazards arising from dock arm may include the following:

i. Mechanical Failure

   Inadequate maintenance may cause failure in use with consequent risk to users.

ii. Unauthorised Use

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

Procedures

i. Pre-operation
   - Grease the 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.

ii. 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.

iii. 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.

2.4.6 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. It is applicable to any operations involving the use or generation of flame, heat and/or sparks. These operations include cutting, burning and welding.

2.4.6.1 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:

i. 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 person available as the fire watchman to raise the alarm in the event of fire and apply immediate fire-fighting measures.

ii. 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.

iii. Tripping Hazards

Hoses and leads should be arranged to avoid trip hazards.

iv. High Temperature

Wearers of contact lenses may find their eyes becoming dry in addition to the fire risk. This may result in permanent damage.

v. Fumes

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

vi. 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.

vii. Equipment Hazards to Worker

Workers may be exposed to electric shock, gas escape, explosion or fire. Equipment used on site, 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. Set up a procedure for checking 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

The proposed hot work to be carried out is an agenda item for the VSCC meeting. The VSCC must ensure that all persons involved are aware of the work being done and that no incompatible work is carried out. The permit-to-work must provide a safeguard against incompatible work. The procedures for any such work must provide for such actions as the following:

Protection Against Fire and Explosion

i. Check that there is no flammable material, gas or dry woodwork which can catch fire. Surfaces which have been in contact with hydrocarbons or toxic substances are completely clean.
ii. Isolation.
iii. 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

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

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

Other Precautions

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

2.4.6.2 Gas Cutting and Welding

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

i. General hot work risks

Refer to 2.4.6 Hot Works

ii. Gas Escape

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

iii. Exposure to welding fumes

The exposure to heavy metals present in welding fumes and 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.

2.4.6.3 Electric Arc Welding

Hazards arising from electric arc welding may include the following:

i. General hot work risks
Refer to 2.4.6 Hot Works

ii. Electric Shock

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

iii. 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:

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

2.4.6.4 Grinding

Hazards arising from grinding may include the following:

i. Refer to 2.4.6.1 Cutting, Burning and Welding.

ii. Eye Injury

Particles of metal from the work-piece or from the grindstone may cause eye injury.

iii. Noise

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

iv. Other Injury

A grindstone can break and cause facial injury.

Procedures

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

The precautions include, as appropriate:

- The PPE which must be worn.
- Training in the use of the relevant grinder.
- Permit-to-work unless the grinding is a normal workshop operation.
- Confined space entry and gas freeing.

2.4.7 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 space.

Hazards arising from confined space may include the following:

i. Dangerous Gases, Vapours or Fumes

Risk of fire or explosion and persons being overcome.

ii. Inadequate Supply of Air

Insufficient oxygen to sustain life.

iii. 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.

iv. 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.

Resources to support confined space entry procedures

The company must have the following:

- 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.
- A person keeping watch outside the confined space.

Record of Entry

Persons entering a confined space should record the fact, for example by 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.

Procedure

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 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.
- Confined space vacated for a significant period of time.

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

2.4.8 Surface Treatment

2.4.8.1 High Pressure Water Jetting or Steam Cleaning

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

i. High Pressure and Temperature

These operations use high pressure and high temperature jets to treat the metal surface. These jets are hazardous to people and to electrical, hydraulic and pneumatic equipment. The workers must be aware of the 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.

ii. Debris

Water jetting and steam cleaning are used to dislodge surface particles which can be propelled through the air. This may cause injury particularly to the eyes to the worker or to other persons nearby.

iii. Trip Hazards

The pump and its supply lead or hose and delivery hoses should be located where they will not cause an obstruction to people.

iv. 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.

v. Noise

Provision must be made for hearing protection for the worker involved and of other personnel in the area when the equipment generates a high level of noise.

Procedures

i. Personal Protective Equipment

Specify the personal protective equipment (PPE) to be used by workers involved in the work. This will include waterproof clothing, waterproof boots and goggles or face mask.

ii. Preparation

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

iii. 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.

2.4.8.2 Shot Blasting, Grit Blasting and Chipping

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

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

i. Air-borne Debris

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

ii. Noise

There may be a high level of noise from the operation.

iii. Contaminated Air

An air-fed mask must be supplied with suitable quality of air (refer to 2.4.15 Acceptable Air Quality Limits).

Procedures

The MOM has laid down noise control provisions for personnel using blasting equipment. The precautions include the following:

- 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.
- The breathing air quality of the compressed air supplied from the air compressors should be monitored closely with a Carbon Monoxide (CO) monitoring device.

2.4.8.3 Spray Painting

The WSH (Shipbuilding and Ship-repairing) Regulations cover spray painting. This should form the minimum requirement in the company's procedures. Factors to be considered in the procedures should include the following hazards and procedures.

Hazards arising from spray painting may include the following:

i. Fire and Explosion

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

ii. Residual Vapour

After the painting operation is completed, the atmosphere cannot be assumed to be safe until it is properly ventilated, tested and the paint surface is dried or cured completely.

iii. Health Problems

The vapour may be injurious to health.

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. Such work must be controlled to ensure that it is compatible with tasks being carried out by shipyard personnel.

Preparation

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

Permit

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

Hazardous Substances

During spray painting, hazardous substances such as paints and solvents must be accompanied by a 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.

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. 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'. All pipelines to other compartments should be blanked off.
- Lighting and electrical equipment must be suitable for use in a flammable atmosphere.
- Painters should use an approved type of air-fed mask.

Completion of Task

Once the painting operation is ended, inform the relevant personnel. 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.

Use of Hazardous Substances

This 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 2.4.15 Occupational Health Hazards.

2.4.9 Testing

2.4.9.1 Pressure Testing

Hazards arising from pressure testing may include the following:

i. High Pressure

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

i. Barriers

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

ii. Risk Assessment

Before commencing testing operations:

• Identify the hazards.

• Assess their associated risk.

• Put in place means to mitigate the risk when necessary.

• Monitor the operation to protect people, plant, ship and work area.

iii. 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.

2.4.10 Radiography

Hazards arising from radiography may include the following:

i. Radiation

Radiation is a health hazard. The hazard may be invisible and its effects may not be apparent for a considerable time after exposure.

Procedures

i. 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.

ii. Health Monitoring

Workers involved in radiography must be trained and qualified 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.
- The action to be taken in the event of an excessive dose.

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

2.4.11 Commercial Diving

Hazards arising from commercial diving may include the following:

i. 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.

ii. 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.

iii. Snagging and Abrasion

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

iv. 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.

v. Hazards from Other Activities

Other activities in the vicinity of the diving operations can result in dropped objects, hence endangering a diver's safety.

Procedures

i. Preparation

- Divers and their support team must be trained and qualified in the work to be done.

- Adequate briefing for the divers 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.
- The life support systems must be checked and to be in good order.
- The surface team must be aware of the activities being carried out.
- Isolation Lock Out Tag Out (LOTO) 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. The systems available should include the following safety gadgets:

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

2.4.12 Ship Movements

2.4.12.1 Ship Crew Briefing

Hazards arising from ship crew operations may include the following:

i. 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.

ii. Unfamiliarity with the Shipyard

The ship's crews 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

i. Briefing

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

- Company rules, particularly regarding to smoking and access to the shipyard.
- Procedures for bringing materials and equipment into the shipyard.
- Function of the VSCC and the requirement for representation by the ship's master.
- Operation of the permit-to-work system.
- Rules and procedures for transferring or discharging cargo, bunker fuel, slops, ballast and bilge contents.

- 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.

2.4.12.2 Slipping and Launching

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

i. Loss of Stability

Any loss of stability at the time of launching is a serious hazard to the vessel and to the personnel involved.

ii. Collision

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

iii. Failure of Gear

During slipping and launching operations, any winches or other mechanical gear used must be in good working order to prevent injury or damage from uncontrolled movement of the ship, cradle or other equipment.

Procedures

i. 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.

ii. Launch Procedure

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

- Allocation of duties
- Layout of moorings and lines
- Tug assistance

- Port supervision and pilotage
- Chock removal
- Restraint after launch
- Safety requirements of all involved personnel, including external parties, such as distinguished guests
- Communication plan among the working parties involved in the operation

2.4.12.3 Berthing and Unberthing

Hazards arising from berthing and unberthing may include the following:

i. Hazardous Materials

Previous or present cargo, bunker fuel, hydraulic oil, lubricating oil, paints and solvents must be declared.

ii. Stability - Reason for Berthing

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

Procedures

i. Preparation

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.
- Need for tug assistance.

Vessels arriving to Singapore need to make notifications, declarations and follow the relevant procedures and guidelines stipulated by MPA.

ii. Shipyard Equipment

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

iii. 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.

2.4.12.4 Dry-Docking and Flooding

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

i. 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. It is important that crew and shipyard personnel are fully briefed on the plan. A ship may be improperly set on blocks, particularly if it is not flat bottomed.

ii. 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.

iii. 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.

iv. Premature Flooding

Refer to 2.4.25.3 (b) (vii) Accidental Flooding of Dry Dock or Floating Dock.

Procedures

i. Preparation

When vessel-docking instructions are received from the responsible authority, dock master to confirm the docking with the vessel's agent (if the vessel is at anchorage) or the captain (if the vessel is in the yard).

- 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 by the dock master 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. If the yard has an intermediate dock, inspect it for structural damage or defects.
- Inspect all rubber seal installations, pumps and electrical high water level sensors and test them 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.
- Ensure that life buoys are in place and in good condition.

ii. 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.
- Install the gangway to the vessel.

2.4.12.5 Docking in Floating Dock

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

i. Damage to Ship

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

ii. Drowning

Operations at a quayside or on a floating dock are subjected to the risk of falling in the water.

iii. Falling

There is a risk of falling on to the dock floor from the sides.

iv. Premature Flooding

Refer to 2.4.25.3 (b) (vii) Accidental Flooding of Dry Dock or Floating Dock.

Procedures

i. Preparation
- When vessel docking instructions are received from the responsible authority, 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.
- Check electrical, cooling lines and other relevant systems and ensure they are operational.

ii. 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, 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.
- Install the gangway to the vessel.

2.4.13 Transfers of Fluids between Tanks and to Shore

2.4.13.1 Ballasting and Deballasting

Hazards arising from ballasting and deballasting may include the following:

i. Stability

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

ii. Draught

There must be sufficient draught for the operations to be carried out, taking into account the sea and tide conditions to prevent grounding.

Excessive freeboard may cause problems e.g. with mooring lines in high wind.

iii. Capacity of Shore Tanks

Deballasting into shore tanks requires the cooperation of the shipyard personnel to avoid exceeding tank capacity.

iv. Other Operations On-board

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

Procedures

i. 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.

2.4.13.2 Cargo Movements, Bunkering and Transferring of Fuel Oil

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

i. Stability

Refer to 2.4.13.1 Ballasting and Deballasting.

ii. Hydrocarbons

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

iii. 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

i. Cargo Movements

There must be procedures in shipyards to which this requirement applies:

- Communication between the ship and yard personnel.
- Agreement on the planned movement and the safety of other work being carried out.
- 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.

2.4.14 Use of Tools and Equipment

2.4.14.1 Electric Tools

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

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

i. Electric Shock

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

ii. Trips on Leads

Trailing leads across walkways and decks can cause trips.

iii. Rotating Parts

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

iv. Reciprocating Parts

These can catch on the work and jerk dangerously.

Procedures

i. 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.
- Regular inspections.

2.4.14.2 Pneumatic Hand Tools

This includes air-driven drills and grinders.

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

i. Compressed Air

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

ii. Trips on Leads

Trailing hoses across walkways and decks can cause trips.

iii. 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.

iv. Reciprocating Parts

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

Procedures

i. 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.
- Regular inspections.

2.4.14.3 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:

i. 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.

ii. Unsecured Work-piece

Work-piece and tool are to be properly secured by clamps, vice to avoid the danger of injury.

iii. Damage to the Work

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

Procedure

i. 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.

ii. 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.

2.4.15 Compressed Air and Gases

2.4.15.1 Compressed Air

Hazards arising from compressed air may include the following:

i. Failure of Hose or Coupling

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

ii. Failure of Valve

A hand-held control valve sticking open 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.

iii. Unprofessional Conduct

Applying a jet of compressed air to the body can cause deaths.

Procedures

i. Condition of Equipment

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

ii. Use of Equipment

There should be procedures covering 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.

2.4.15.2 Compressed Gases

Hazards arising from compressed gases may include the following:

i. Toxic Gases

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

ii. Escape of Flammable Gas

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

Procedures

i. Condition of Equipment

Procedures should ensure that the equipment is inspected at intervals which satisfy relevant legislation. This is specified in WSH (Shipbuilding and Ship-Repairing) Regulations for inspection of hot work equipment.

ii. 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.

There should be procedures covering the use of compressed/dissolved gases and including aspects of the following:

- Permanent and temporary storage precautions.
- Handling gas cylinders (keeping upright in trolleys and quads).
- Marking and segregating when empty.
- Protecting from impact, especially on valves, regulators, flashback, arrestors and non-return valves.
- Inspection before use to ensure no damage to fittings or hoses.
- Certification of hoses at stipulated intervals.

2.4.16 Transport and Materials Handling

2.4.16.1 Forklift Trucks

Hazards arising from using forklift trunks may include the following:

i. Unauthorised Use

Unauthorised personnel can cause serious injury or damage by driving forklift trucks without the necessary training or qualification.

ii. Failure

Mechanical or electrical failure can make a forklift truck very dangerous. Such failures may involve the brakes, tyres, lights, motor or engine, hydraulic lifting systems, and reversing signal.

Procedures

i. Maintenance

There must be maintenance procedures and records to ensure that the equipment is regularly inspected, lubricated and maintained in accordance with the manufacturer's instructions.

ii. Pre-use Checks

There should be a programme of checks carried out by the driver before using the forklift truck for the first time on a shift, covering 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.

iii. Instructions

There should be shipyard-specific instructions on the use of forklift trucks defining where they may be used, who may use them, 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.

2.4.16.2 Crane Operations and Lifting Equipment

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 lifting machine as including: '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. The 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:

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.

i. 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.

ii. 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.

iii. Shared Load

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

iv. 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
- Inspection and maintenance of slings

Preparation

Before operating a mobile crane, the checks should include the following:

- 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.
- 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, 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 lift. 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 authorized examiner in accordance with the WSH (General Provisions) Regulations.
- Ensure a lifting plan has been established and implemented.

2.4.17 Electrical Installations and Equipment

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

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

ii. Physical Injury
   - Hands or clothing being caught in rotating parts.
   - Inadequate guards.
   - Misuse of equipment.

Procedures

Rules and practices should be publicised for the use of a particular type of tools 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.
- The maximum voltage allowed for use in confined space (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.
- Earthing of metal parts.
- 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.

Refer to 2.4.14 Use of Tools and Equipment.

2.4.18 Personal Protective Equipment

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

Types of PPE

The types of PPE needed should be specified in the permit-to-work or work procedures. It includes the following:

i. Protective clothing

- Safety helmets where there is a need to protect the head from obstructions such as pipework and from falling objects.
- Air-supplied blasting helmets.
- Overalls, boots and gloves (in accordance with the WSH (Abrasive Blasting) Regulations.
- Aprons to protect from projectiles, particularly hot slag, and from chemical.
- Splashes, rainwear such as jackets, boots, waterproof trousers, for exposed locations and especially where operations cannot be suspended during heavy rain.
- Gloves of an appropriate material and standard, for protection against penetration, abrasion, heat, cold, fire, chemicals, and other hazards.
- Safety footwear where heavy objects may cause injury to feet.

ii. Protective equipment

- Safety glasses and goggles where wind-blown debris may cause eye injuries, such as grinding or in the vicinity of grit blasting, or where injury may be caused to operators or other personnel nearby by-welding flash.
- Safety harnesses for those working at a height exceeding two metres.
- Life jackets for those in danger of falling into the water.
- Respirators where the atmosphere may be contaminated and where airline breathing apparatus is not appropriate.
- Breathing apparatus, either self-contained or preferably airline for toxic or oxygen-deficient atmospheres, hearing protectors, torchlight with battery kept charged if required to enter confined spaces.

Appropriate standards as referred to above should apply in the selection of PPE. This is necessary for:

- Instruction to workers and supervisors.
- Setting the terms of contracts to ensure the suitability of contractors' provision for their workers.

Selection of PPE

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

i. Type of hazards and risk involved

The type of PPE selected should be in accordance with the identified hazards and risks. Information on the characteristics such as concentration, energy level and power of the hazards must be available to select a PPE that provides the appropriate protection level.

ii. Standards specification

Selection of the type of PPE should be based on Singapore Standards or other reputable international standards. 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 PPE - Footwear

iii. Location of use

Clear instructions should be given to a person likely to be exposed to the hazards at the location where the hazards may be present.

Warning signs should be put up at conspicuous places where PPE is required.

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.

Maintenance of PPE

Users of PPE must be trained on proper maintenance of their PPE to ensure the effectiveness of use 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.

2.4.19 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 implemented should be developed.

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

2.4.20 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 obligations.

Evaluation of Contractors

The shipyard should establish procedures to evaluate the contractors' WSH performance and competency. The result of these evaluations should be used as a criterion in the selection of contractors. The procedures should include, but not be limited to evaluating the contractor based on the following criteria:

- Contractors' safety policy and management commitment to safety.
- WSH risk management capability.

- Attainment or certification such as bizSAFE.
- Availability and deployment of technology.
- Training, qualification and experience of managers, supervisors and workers.
- Robustness of control measures, including safe work procedures to be used for the job.
- WSH plan, targets and objectives.
- Maintenance and state of all machinery and equipment.
- Effectiveness in communications.
- WSH track records.

Selection of Contractors

The shipyard should establish procedures to select contractors based on their ability to meet WSH requirements.

The procedures should include:

- Maintaining a list of approved contractors.
- Selecting bidders who are competent to carry out the work on a particular contract.
- Checking on the quality and WSH aspects of their work before issuing an invitation to tender.
- Defining contract conditions, including WSH-related aspects of the work and the relationship of contract personnel to the company's personnel, particularly identifying the company's supervision team responsible for their work. The written contract or agreement should stipulate the specific WSH requirements for the contractors.
- Taking account of past WSH performance, in addition to cost and deliver capabilities.
- WSH induction training of successful bidders and their personnel.
- Monitoring safety performance.
- Applying consistent standards of discipline for contractors and employees.

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:

- Monitoring the overall WSH performance and management commitment of contractors.
- Conducting periodic inspections to ensure contractor's compliance with WSH requirements.
- Verifying WSH training records of contractors.
- Coordinating procurement processes with the contractors.
- Maintaining and monitoring incident statistics of contractors.
- Maintaining a list of approved contractors who have regularly complied with the WSH requirements.

2.4.21 Outsourcing Control

When outsourcing works activities, processes or functions, shipyards shall ensure that these arrangements meet the regulatory requirements such as commercial diving activities. 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.

2.4.22 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 for those persons to be at work in an environment which is safe, without risk to health, and adequate as regards facilities and arrangements for their welfare at work. 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 to operate or for use.

Hazards arising from maintenance may include the following:

Injury or damage from in service plant and equipment not adequately maintained.

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

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 used in the shipyard. This maintenance programme should apply to hand tools, machinery and equipment owned by all suppliers and contractors.

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

Establishment of Maintenance Regimes

- The shipyard should establish preventive maintenance procedures or programme to ensure safe and efficient operation of machinery and equipment owned and used in the shipyard.
- The maintenance programme should also ensure suppliers and contractors have a preventive maintenance programme for the equipment provided and used by them.
- 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.

- The development and documentation of the maintenance programme should include, but not be limited to the following:
    i. A list of the machinery and equipment.
    ii. Schedule of inspection and maintenance.
    iii. Procedure for breakdown repair.
    iv. 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.
- The maintenance programme should take into consideration that the materials used in the maintenance of equipment continue to meet design specifications, and any substitution of materials shall be appropriately reviewed before use.

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.

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.

Corrective Actions

After the maintenance operations, all faults and repairs that are required to be performed should be recorded with the appropriate follow-up actions and details of such actions to be taken to rectify the faults and repairs.

- The shipyard should establish a maintenance programme to ensure that hand tools, machinery and equipment, and working environment are kept in good conditions and safe during operation.
- Equipment such as boilers, furnaces, waste treatment and disposal facilities should be properly maintained to ensure efficient operation and avoidance of catastrophic failure for minimisation of pollution.
- Maintenance regime should also be applicable to suppliers and contractors. They should also have a preventive maintenance programme for the equipment provided and used by them.
- Risk assessment should be conducted and appropriate measures are to taken to control WSH risks during maintenance work. Measures such as lock-out/tag-out procedures, permit-to-work system, should be incorporated into the maintenance programmes.
- During maintenance, the Code of Practice for Lockout Procedure is applicable to prevent inadvertent turning on of energy sources.
- The materials used in the maintenance of equipment should continue to meet design specifications. Any substitution of materials should be appropriately reviewed and approved before use.
- The maintenance programme should include but not be limited to the following:

i. A list of machinery and equipment
ii. Schedule of inspection and maintenance
iii. Procedure for breakdown repair
iv. Record of inspection and maintenance

2.4.23 Control of Hazardous Materials

The main risks associated with materials encountered in shipyards are flammability (risk of injury or 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 (hydraulic oil, cargo oil and fuel oil).

2.4.23.1 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.

• Asbestos insulation or friction materials.

• Petroleum cargo and oil tanks are potentially hazardous when the residual oil trapped in the sludge or lying behind scale evaporates due to a rise in temperature 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.

The table below is a rough guide on the effects of various exposure duration to 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 irritations
	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

i. Fire and Explosion

The hazard of hydrocarbons is greatest with the more volatile petroleum products. 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.

ii. Sources of Ignition

Hot work due to direct or indirect heat penetration, sparks from welding, cutting and grinding, lighted cigarettes and cigarette butts.

iii. Skin Disease

Contact with some hydrocarbons can result in skin disease.

iv. Toxic Effects

Some substances which may be present in residues are toxic. The hazard of hydrogen sulphide is particularly serious. 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.

Mitigation

There must also be provision to deal with incidents:

- 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 confined spaces.
- Trained first aiders and access to medical services.
- Provision of suitable breathing apparatus, reviving apparatus and rescue equipment.

2.4.23.2 Hazardous Substances Used in Shipyards

Hazards

i. Chemical

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

ii. Physical

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

iii. 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.

- 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 yard, including materials required by ship's crew and to be used on board.
- Contract details, including the provision of a Safety Data Sheet.
- Receipt into the shipyard of hazardous materials.
- Transport.
- Storage.
- Handling.
- Use.
- Disposal.

2.4.23.3 Asbestos

Hazards

i. Lung Disease
Inhaling asbestos fibres can lead to serious and frequently terminal illness. It was widely used as an insulating material and also for friction surfaces like brake shoes and pads.

ii. Procedures
Where work has to be done with a risk of disturbing asbestos. For example, the company must have procedures for the work of 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.
- WSH (Asbestos) Regulations and WSH Guidelines on Management and Removal of Asbestos must be adhered to.
- Notification to Commissioner for WSH 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.
- All residual dust must be cleaned up by a suitable vacuum cleaner.

2.4.23.4 Mercury

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

Hazards

i. Mercury Poisoning
The results of inhaling mercury compounds include:

- Fever, chills, tiredness, breathlessness and chest pain.
- Burning pain in the mouth and stomach.
- Inflammation of the lungs.

- Diarrhoea.
- Vomiting, and ultimately collapse.
- Kidney damage leading to death.

Procedures

The following measures should be included in the procedures for companies in which workers are exposed to this risk:

- 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 for those conducting blasting operations.
- Wear particulate masks and disposable suits for those involved in 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.
- Carry out tests to ensure that the National Environmental Agency standards are complied with:
  - Leachate test of spent grit prior to disposal; and
  - Water analysis after hydro-washing to verify that contaminant levels meet disposal requirements.
- 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.
- Ensure worker who is exposed to mercury fumes or vapour undertakes statutory medical examination.

2.4.23.5 Lead in Paint

Similar precautions as section 2.4.23.4 should be taken when carrying out hot work on materials which have been treated with paint containing lead.

2.4.23.6 Establishment of Hazardous Material Control Programme

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

• 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.

- 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.

• Employees who handle hazardous materials or may be affected by them 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 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.

- 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 below:

Supervisor, Engineer Project Manager, Ship's Master	Request chemical with justification.
Safety Department	Assess need for this substance.
If risk is low or there is no satisfactory alternative,	
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, etc.
Gatehouse Security	Check goods agree with notification.
Gatehouse Security	Notify, Safety Department and user.
Safety Department	Check goods and approve if okay. Ensure all personnel affected know procedures, precautions and the means of storage, movement, use and disposal.
Safety Department	Include inspections to ensure hazards are properly controlled.

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

2.4.23.7 Safety Data Sheet

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

i. Identification
ii. Hazards identification
iii. Composition / information on ingredients
iv. First-aid measures
v. Fire-fighting measures
vi. Accidental release measures
vii. Handling and storage
viii. Exposure controls / personal protection
ix. Physical and chemical properties
x. Stability and reactivity
xi. Toxicological information
xii. Ecological information
xiii. Disposal considerations
xiv. Transport information
xv. Regulatory information
xvi. Other information

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

2.4.24 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, workplace environment as well as health surveillance of persons exposed to agents which may be injurious to health.

2.4.24.1 Types of Hazards and Control

i. Chemical

Fumes, gases, vapours, mists and liquids.

ii. Physical

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

iii. Biological

Bacteria, viruses, moulds and fungi.

iv. Ergonomic

Psychological - especially stress, and physiological-working position and conditions.

The hierarchy of control: Elimination, Substitution, Engineering Control, Administrative Control followed by PPE is also applicable here. The management of occupational health typically covers areas of worker health significance, including but not limited to the following subjects or areas:

Chemical Hazard Control

Where hazardous chemicals are used or produced, the occupier should appoint a designated person to coordinate a programme to control chemical hazards. The programme should cover the health and safety aspects of the transport, storage, handling and use of all hazardous chemicals within the company. The occupier should keep a register or a list of all hazardous chemicals used or produced in the company. This register should at least contain the inventory and location of use of the chemicals.

The occupier should obtain or prepare SDS for all the chemicals listed in the register. He should assess all relevant information in the SDS and take the necessary precautionary measures to ensure the protection of workers. He should also ensure that the SDS are readily accessible to all workers who are exposed or have the potential of exposure to the chemicals. Workers must be fully informed of the hazards and the precautionary measures.

The chemical hazard control programme should also cover the following:

- Selection and procurement procedures.
- Proper storage of chemicals.
- Proper labelling of containers.
- Safe handling procedures.
- Engineering control measures.
- Environmental monitoring.
- Medical surveillance.
- Personal protection equipment and appliances.
- Emergency and first aid procedures.

The procedures for the above should be in writing, and to maintain proper documentation. The responsibility for control of hazardous chemicals lies with the employer or the occupier of a factory. The occupier or employer should identify those exposed employees and access the risk of exposure. If the risk is significant, appropriate control measures should be implemented to reduce the risk of exposure to as low as a level as is practical. The control measures include the elimination of the use of the hazardous chemicals, substitution with less hazardous chemicals, process automation, isolation or enclosure, installation of local exhaust ventilation or applying dilution ventilation or other engineering controls.

2.4.24.2 Hearing Conversation

A Hearing Conversation 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 a 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 and exposed workers.
- 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.
- 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. Each component activity could be delegated to a particular person. Written procedures should be drawn up and relevant records should be kept. The programme should be evaluated from time to time and targets set.

2.4.24.3 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.

2.4.24.4 Quality of Breathing Air

The quality of breathing air requires:

- 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 CO and CO2.
- A maintenance programme to ensure that the filters continue to function efficiently; a carbon monoxide monitor and an alarm system to warn if CO is present 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 as follows:

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/m^3 *
Fungi Count	500 cfu/m^3 *
Suspended Particulate Matter	0.15 mg/m^3
Temperature	22.5 – 25.5 ^oC
Relative Humidity	<= 70%
Air Movement	<=0.25 m/s

Source: MOM Guidelines on Office Ergonomics

* cfu = colony forming unit

Table 7: Acceptable limits for indoor air contaminants and physical factors

2.4.24.5 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. This is also discussed in section 2.5.1.2 of this manual.

An industrial hygiene monitoring programme (IHMP) should be established to achieve the above objective. The scope of the IHMP should be defined in writing. The programme document should 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 WSH Council's *WSH Guidelines on Hearing Conversation 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.

2.4.24.6 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 to excessive noise or list of substance

stipulated therein 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 to undergo medical examination carried out by a designated workplace doctor to:

- Certify fit to work before employment.
- Undergo examination and investigation on a regular basis specified in The Schedule of the Regulations.
- Submit medical examination report 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.

• 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.

2.4.24.7 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. This is complementary to environmental control measures taken.

There are basically two categories of respirators: air-filtering type e.g. dust mask and chemical cartridge respirator and air supplied type e.g. air-line respirator and self-contain 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.

• Maintenance of respirators.

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

2.4.24.8 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.
- 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 a confined space work.

To minimise or eliminate these hazards, written procedures for confined space entry should be established in accordance to 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.
- Training of workers and supervisors on the health and safety aspects of confined space work.

2.4.24.9 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.
- Use tag lines instead of hands and feet to guide loads being lifted by crane, pulley block or hoist. ACOP SS569: Code of Practice for manual handling provided information and guidance on the identification of manual hazards, the assessment and control of risk arising from manual handling activities

2.4.24.10 Contract Work

Most companies engage contract workers to do maintenance work during shutdown or turnaround periods. Some companies engage contract workers to carry out routine unskilled work or other specialised projects.

Most contract work and projects are potentially hazardous. Due to the mobility of contract workers and the tight schedule of contracts, the safety and health aspects of

the work are often overlooked. Hence accidents involving contract workers are not uncommon. Management should set up a system to ensure that contract work is carried out safely within the company.

2.4.24.11 First Aid Facilities

First aid is provided to mitigate the severity of injury and to preserve human life. Refer to 2.4.25.6 First Aid for more detailed discussions.

2.4.24.12 Expert Advice

The company should have access when necessary to occupational health matters including the following:

- Review the conditions in the shipyard.
- Carry out industrial hygiene monitoring such as measurements of exposure to air-borne contaminants, exposure level and received doses for physical agents such as noise and radiation.
- Assess concentration, noise level, against tolerable limits.
- Recommend action if required.

2.4.25 Emergency Preparedness and Response

2.4.25.1 Principles of Emergency Planning and Response

The main principles of emergency response are:

- Procedures cannot be prescribed for all possible situations. The procedures are aimed at getting information quickly to the person 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 Singapore Civil Defence Force (SCDF) or Police to mobilise assistance, particularly fire-fighting, ambulance, crowd control, press.
  - Mobilisation of internal resources such as fire-fighting appliances, ambulance, first-aiders, stretcher parties and divers as appropriate.
- 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, danger of sinking or capsizing, and danger to adjacent facilities or ships.
- Emergency response is a combination of:
  - Physical action such as fire-fighting, rescue, recovery of property.
  - Local direction to mobilise assistance.
  - Management support to deal with major decisions, and with the outside authorities and interested parties.
- 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 testing 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, the company and the workers.

-Maintain a record of the plans for responding to the emergency situations.

2.4.25.2 Identification of Types of Emergency Situations

The company must identify the potential 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.

2.4.25.3 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 D-1.

Emergency response procedures may comprise the following:

a) 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.

The means of raising an alarm may include:

- Activating fire alarm at call point.
- Raising siren.

- Calling security or emergency response organisations.
- Shouting for help.

b) Actions on Specific Type of Incident

i) Fire or Explosion

The procedures for fire or explosion will depend on the extent to which the shipyard has available fire-fighting resources on site.

It should include:

- Liaising with and providing assistance to the emergency services, for example by providing escorts to the location of the incident.
- Treating any injured personnel.
- Shutting down affected operations.

ii) Gas Escape

The procedures for gas escape should include:

- Identification of the nature of the gas and its source.
- Isolation of the source.
- Shut down of all hot work in the vicinity.
- Ventilation of potentially affected confined spaces, using flameproof equipment.
- Gas testing to verify that the area is clear for work to re-commence.

iii) Oil or Chemical Spill

The procedures should include the following:

- Identification of the nature of the spill and its source.
- Assessment of the hazards associated with the substance spilled.
- Isolation of the source, taking care to protect personnel exposed to the hazard.
- Notification to the MPA.
- Mobilisation of limitation measures, including floating boom, dispersant or other means in consultation with the MPA.
- Notification of the environment authority if the spill is on land and particularly if it is likely to affect drains or water courses.

iv) Structural Collapse or Loss of Stability

On notification of potential or actual structural collapse or loss of stability, affecting a building, crane, vessel or other structure, the procedures should include:

- Making the area safe for personnel and placing barriers to prevent access to all but essential personnel.
- Treating the injured personnel.
- Assessing the situation and deciding the appropriate action.

- Informing the appropriate authorities and other bodies, particularly ship owner or agent.

v) Collision, Capsize or Sinking

An emergency afloat is a matter for the MPA who will take responsibility for the emergency response.

v) Transport Emergency

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

- Rescue and treatment of injured personnel.
- Assessment of damage.
- Notification of other parties involved, such as the owner of a vehicle.

vii) 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:

- A warning signal to both ship and yard personnel.
- An assessment of the reason for the flooding - failure of the structure or the valve systems or improper operation of the systems.
- An assessment of 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 of personnel, whether on board, on scaffolding or on the dock floor.
- Action to arrest the flooding.
- Action to make the vessel safe.

viii) Criminal Acts

Criminal acts include such events as:

- Personal attack.
- Unidentified object.
- Bomb threat.
- Attack from outside the yard.

The procedures should be compiled in consultation with the Police.

x) Man Overboard

Procedures should include:

- Continuous watch to keep the person in view.
- Separate search and rescue, probably from a small craft.
- Mobilisation of resuscitation and medical assistance.
- Notification to the MPA.

ix) Medical Emergency

Procedures should specify the action 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.
- 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.

xi) 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, analysis to identify the source and action to isolate that source, quarantine actions and notification to the Ministry of Health (MOH).

Companies should follow the recommendations and instruction for the actions to be taken during a flu pandemic from the MOH. The guide: “A Flu Pandemic Business Continuity Guide for SME” has been developed and is available for download at the Ministry of Information, Communication and the Arts. It was developed using principles in the Business Continuity Management Technical Reference TR 19:2005, which was initiated by the Singapore Business Federation and supported by Enterprise Singapore and the Economic Development Board. The Singapore 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.

2.4.25.4 Emergency Organisation

The organisation which would be mobilised in an emergency must be defined. Action should be taken to ensure that all the personnel involved are properly trained in their respective emergency response functions. This involves:

- Managing on-site action.
- Carrying out emergency response including notification of an incident, fire-fighting, first aid and rescue.
- Management support including reporting to the authorities, partners, clients, owners, and other interested parties as well as handling inquiries from the news media and relatives of persons possibly involved.
- Security who should control the access to the shipyard limiting this to the emergency services.

2.4.25.5 Emergency Response Resources

The extent to which a company invests in and maintains its own facilities for the combat of an emergency is largely a matter of policy, subject to legislation as outlined below:

i. First Aid and First Aiders

Section 2.4.25.6 on first aid contains guidance on the provisions for first aiders, first aid boxes and first aid rooms which are statutory requirements.

ii. 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. The use of a lifting cage has particular hazards such as injuries to hands if an occupant holds the outer rail or injuries resulting from swinging. The company should ensure that this type of operation is properly supervised and regulated.

iii. Rescue Operations

The resources available for rescue include:

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

iv. Fire-fighting

The company must make provisions for means of escape and effective warning devices in the case of fire.

The provision for fire protection and means of escape for fire should follow that as stipulated by the SCDF Fire Code and the Singapore Standards and Code of Practices mentioned therein. Please refer to the fire emergency-related Singapore Standards and Code of Practice.

Some shipyards provide mobile fire appliances as a first line of defence but in all cases, the reliance is on the SCDF.

Portable fire extinguishers and hose-reels are the basic resources for general fire-fighting response in the first instance.

v. 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.
- Workshop personnel for searches in their workplaces.

In the event of a bomb threat, the search may be a company's responsibility and should be carried out by personnel familiar with each area within the scope of the search, subject to guidance from the SCDF and the Police.

2.4.25.6 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 first aiders qualifications are kept up-to-date by retraining at intervals not longer than two years.

The requirements for trained first aiders, first aid boxes and a first aid room are as follows:

i. First Aiders

For a shipyard with 26 to 100 workers, there must be at least one first aider.

For every additional 100 workers or part thereof, there must be another one first aider.

The ratio of first aiders listed above 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.

ii. 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.

iii. First Aid for Exposure to Toxic or Corrosive Substances

In shipyards where there may be risks of exposure to toxic or corrosive substances, provisions must be made for the emergency treatment of the person if so required by the Commissioner. 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.

2.4.25.7 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.

Internal notification may include:

- Senior management
- Crisis management team
- Corporate management

External notification may include:

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

Table 6: Emergency notification to government agency

Requirements on incident reporting are also discussed in section 2.6.1 on Incident Report of this Manual.

2.5 Performance Evaluation

2.5.1 Monitoring, Measurement, Analysis and Performance Evaluation

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

These parameters may include:

- Having qualitative and quantitative measurements.
- Being proactive in measuring compliance, operation criteria and management programmes performances.
- Being reactive in measuring incident, accident and illness rates or other deficiencies in WSH performances.
- Monitoring the extent to which the WSH objectives are met.
- Monitoring measurements that facilitate preventive and corrective actions.

Equipment and instruments which are used for monitoring should be properly maintained and calibrated. Equipment and instruments brought by contractors to the shipyard 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.

2.5.1.1 Proactive and Reactive Monitoring

Proactive monitoring include:

i. Number of workers trained in WSH.
ii. Effectiveness of WSH training.
iii. Number of promotional campaigns done.
iv. Employees' participation in promotional campaigns and WSH programmes.
v. Number of risk assessments conducted.
vi. Extent to which risk control measures are complied with.
vii. Frequency of safety inspection and audits done.
viii. Frequency and effectiveness of WSH committees and group meetings.
ix. Frequency and effectiveness of WSH communications.
x. Number of WSH suggestions completed.
xi. Time taken to implement suggestions.
xii. 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.)
   = Number of workplace accidents x 1,000,000/Man-hours worked

ii. Accident Severity Rate (Refers to the number of man-days lost to workplace accidents per million man-hours worked.)
= Number of man-days lost to workplace accidents x 1,000,000/Man-hours worked

iii. Fatality Rate (Refers to the number of workplace fatalities per 100,000 persons employed. Figures used are victim based.)
= Number of workplace fatalities x 100,000/Number of persons employed

iv. Injury Rate (Refers to the number of fatal and non-fatal workplace injuries per 100,000 persons employed.)
= Number of fatal and non-fatal workplace injury x 100,000/Number of persons employed

v. Disease Incidence (Refers to the number of occupational diseases (chronic confirmed cases) per 100,000 persons employed.)
= Number of chronic confirmed occupational diseases cases x 100,000/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
Number of dangerous occurrences as defined in the First Schedule, WSH Act being reported.

vii. Regulatory Enforcement Actions
Number of regulatory enforcement action taken against the company in the period.

2.5.1.2 Inspection and Compliance Verification

- **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 works equipment to be done by competent person and the WSH (Scaffolds) Regulations specify the inspection to be done by a scaffold supervisor.

- **Work Conditions**
  Establish and document criteria in specifying the acceptable conditions at the shipyard.

  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.
  • 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.

- **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.

2.5.2 Internal Audit

2.5.2.1 Mandatory WSH Audit

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

2.5.2.2 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.

2.5.3 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 employees or the employees' representatives.

2.6 Improvement

2.6.1 Incident, Non-conformance, Corrective and Preventive Actions

2.6.1.1 Incident Reporting Requirements

Incidents including those resulting in reportable injuries and those which are classified as dangerous occurrences must be reported as detailed in this section.

The WSH (Incident Reporting) Regulations requires reporting to MOM on the following:

a. Dangerous Occurrences as defined in the First Schedule of the WSH Act.

b. Accident leading to injury or death as certified by a registered medical practitioner or registered dentist.

c. Occupational Diseases as specified in the Second Schedule of the WSH Act.

d. Notification to MOM
   - Immediate Notification
     For incidents such as dangerous occurrences and death cases, the Commissioner of WSH should be immediately notified. The information to be provided is available on MOM website.

   - For All Cases
     The incident report should be submitted to the Commissioner of WSH within 10 days via iReport.

e. Record Keeping
   Employers/occupiers are required to keep a record of any incident reports made for a period of 3 years from the time of report.

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

2.6.1.2 Incident Investigation and Analysis

The statutory requirements for reporting accidents and dangerous occurrences are concerned mainly with outcomes such as details of the injured person, data on his period of work, the nature and location of the injury. The company should investigate the history of events preceding any incident, verify that details are consistent with the incident and whether there are any potential situations that may cause 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.
- Improved safety performance.

• Actions recommended to correct the failure at source.

This involves:

• Recording of the circumstances of causes (in addition to outcomes).
• Having regular reviews of recurrent causes.
• Taking actions aimed specifically at these recurrent causes.
• Monitoring the effectiveness of those actions.

There are skills in incident investigation which should form part of the training of safety specialists and line supervisors. The shipyard should establish, as an element in its WSHMS, written procedures to identify, record, investigate and analyse all incidents, to maintain these procedures and implement specific corrective actions to prevent recurrence. The procedures should include the following:

a. Identification and Record of Incidents
   i. The shipyard should set up a system to identify and record all incidents (accidents and near misses) at work.
   ii. The incidents should be reported and recorded promptly and should include incidents by all personnel including contractors.

b. Investigation of Incidents
   i. The shipyard should establish procedures for the investigation of incidents.
   ii. The investigation of incidents should not be limited to the identification of unsafe conditions and unsafe acts but should probe into the underlying systemic cause and deficiencies of the WSHMS.
   iii. Incident investigation procedures should include, but not be 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.
      - Implementation of recommendations and corrective measures.
   iv. Ship-repair managers, line managers, supervisors, WSH personnel and WSH committee members should be included in the incident investigation team.
   v. The investigation team should not be part of the stakeholders involved in the incident.

c. Implementation and Review of Corrective Actions
   i. The shipyard should establish a system to ensure that recommendations arising from investigations and corrective actions are followed through and effectively implemented.

d. Analysis of Incident Statistics

i. The shipyard should establish procedures to monitor, analyse incident trends, and prescribe holistic preventive solutions.
ii. 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
iii. The report of analysis should be made available to all key relevant personnel in the shipyard and maintained for future reference.
iv. 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.

2.6.1.3 Corrective and Preventive Actions

Where non-conformances are found during the walk through, inspection, audit or arising from incident/accident investigation and performance analysis, corrective and preventive actions should be taken.

Corrective actions are actions taken to eliminate 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.
- 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, employees' 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.
- Initiating actions to ensure controls measures are effective.

The shipyard 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.

2.6.2 Continual Improvement

The shipyard should continually explore opportunities to improve the suitability, adequacy and effectiveness of the WSHMS. The action plans shall be implemented

with the participation of employees, with the outcome of the continual improvement communicated to all employees or the employees' representatives.

3. Annexes

Annex A-1: List of WSH Related Applicable Legal Requirements, Approved Code of Practices and Singapore Standards

S/No.	Authorising Act	Subsidiary Legislations
Safety and Health		
1	**Workplace Safety and Health Act (Chapter 354A)**	1. WSH (Abrasive Blasting) Regulations 2. WSH (Asbestos) Regulations 3. WSH (Composition of Offences) Regulations 4. WSH (Confined Space) Regulations 5. WSH (Exemption) Order 6. WSH (Explosive Powered Tools) Regulations 7. WSH (First Aid) Regulations 8. WSH (General Provisions) Regulations 9. WSH (Incident Reporting) Regulations 10. WSH (Learning Report) Regulations 11. WSH (Medical Examinations) Regulations 12. WSH (Noise) Regulations 13. Workplace Safety and Health (Offences and Penalties) (Subsidiary Legislation under section 66(14)) Regulations 14. WSH (Operation of Cranes) Regulations 15. WSH (Registration of Factories) Regulations 16. WSH (Risk Management) Regulations 17. WSH (Safety and Health Management System and Auditing) Regulations 18. WSH (Scaffolds) Regulations 19. WSH (Shipbuilding and Ship-repairing) Regulations 20. WSH (Transitional Provision) Regulations 21. WSH (Work at Heights) Regulations 22. WSH (Workplace Safety and Health Committees) Regulations 23. WSH (Workplace Safety and Health Officers) Regulations 24. WSH (Approved Codes of Practice) Notification 25. WSH (COVID 19 Safe Workplace) Regulations Regulations under the repealed Factories Act which are still applicable: 1. Factories (Registration and Other Services - Fees and Forms) Regulations 2. Factories (Safety Training Courses) Order 3. Factories (Work of Engineering Construction) Order
2	**Fire Safety Act (Chapter 109A)**	1. Fire Safety (Building and Pipeline Fire Safety) Regulations 2. Fire Safety (Company Emergency Response Team) Regulations 3. Fire Safety (Composition of Offences) Regulations 4. Fire Safety (Emergency Response Plan) Regulations 5. Fire Safety (Exemption) Order 6. Safety (Fire Certificate) (Designated Buildings) Order 7. Fire Safety (Fire Safety Engineers) (Code of Professional Conduct and Ethics) Regulations 8. Fire Safety (Fire Safety Engineers) Regulations 9. Fire Safety (Fire Safety Managers) Regulations 10. Fire Safety (Flammable Refrigerants — Exemption) Order 11. Fire Safety (Marine Fire-Fighting Fees) Regulations

S/No.	Authorising Act	Subsidiary Legislations
		12. Fire Safety (Petroleum and Flammable Materials – Exemption) Order 13. Fire Safety (Petroleum and Flammable Materials) Regulations 14. Fire Safety (Pipelines – Exemption) Order 15. Fire Safety (Premises Requiring Emergency Response Plan) Notification 16. Fire Safety (Premises Requiring Fire Safety Manager and Company Emergency Response Team) Notification 17. Fire Safety (Registered Inspectors) (Code of Professional Conduct and Ethics) Regulations 18. Fire Safety (Registered Inspectors) Regulations 19. Fire Safety (Regulated Fire Safety Products) Regulations 20. Fire Safety (Supplementary Enforcement Officers) Regulations
3	**Radiation Protection Act (Chapter 262)**	1. Radiation Protection (Exemption for Transit, Transhipment and Carriage of Conveyance Equipment) Regulations 2. Radiation Protection (Ionising Radiation) Regulations 3. Radiation Protection (Non-Ionising Radiation) Regulations 4. Radiation Protection (Transport of Radioactive Materials) Regulations
4	**Work Injury Compensation Act. (Chapter 354)**	1. Work Injury Compensation (Composition of Offences) Regulations 2. Work Injury Compensation Insurance Regulations 3. Work Injury Compensation (Saving and Transitional Provisions) Regulations 4. Work Injury Compensation (Workers' Fund) Regulations 5. Work Injury Compensation Regulations
5	**Electricity Act (Chapter 89A)**	1. Electricity (Cable Detection Workers) Regulations 2. Electricity (Composition of Offences) Regulations 3. Electricity (Electrical Installations) Regulations 4. Electricity (Electrical Workers) Regulations
6	**Road Traffic Act (Chapter 276)**	1. Road Traffic (Bicycle Crossing) Rules 2. Road Traffic (Bicycles) Rules 3. Road Traffic (Carriage of Persons in Goods Vehicles) Rules 4. Road Traffic (Carbon Emissions Tax) Rules 5. Road Traffic (Composition of Offences) Rules 6. Road Traffic (Driver Improvement Points System) Rules 7. Road Traffic (Exemption from Carbon Emissions Tax) Order 8. Road Traffic (Motor Vehicles, Compulsory Inspection) Rules 9. Road Traffic (Motor Vehicles, Driving Licences) Rules 10. Road Traffic (Motor Vehicles, Rear and Side Markings) Rules 11. Road Traffic (Motor Vehicles, Registration and Licensing) (Exemption) Order 12. Road Traffic (Motor Vehicles, Seat Belts) Rules 13. Road Traffic (Motor Vehicles, Speed Limiters) Rules 14. Road Traffic (Motor Vehicles, Test) Rules 15. Road Traffic (Motor Vehicles, Wearing of Seat Belts) Rules 16. Road Traffic (Pedestrian Crossings) Rules 17. Road Traffic (Prescribed Offences) Rules 18. Road Traffic (Regulation of Speed) Rules 19. Road Traffic (Traffic Signs) Rules 20. Road Traffic Rules
7	**Maritime and Port Authority of Singapore (Chapter 170A)**	1. Maritime and Port Authority of Singapore (Composition of Offences) Regulations 2. Maritime and Port Authority of Singapore (Dangerous Goods, Petroleum and Explosives) Regulations 3. Maritime and Port Authority of Singapore (Port Limits) Notification

S/No.	Authorising Act	Subsidiary Legislations
8	**Guns, Explosives and Weapons Control Act**	1. N/A
9	**Biological Agents and Toxins Act (Chapter 24A)**	1. Biological Agent and Toxins (Exemption) Regulations 2. Biological Agents and Toxins (Proficiency Testing) Regulations 2. Biological Agents and Toxins (Transportation) Regulations
10	**Gas Act** **(Chapter 116A)**	1. Gas (Supply) Regulations 2. Gas (Transporter's Licence) (Exemption) Order
11	**Poisons Act (Chapter 234)**	1. Poison Rules
12	**Explosive Substances Act (Chapter 100)**	1. N/A

Annex A-2: 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
• Maintenance of 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 B-1: Risk Register Cover Sheet

Risk Register Cover Sheet

Workplace Name						
RA Ref. No.	**Department**	**Process / Activity Location**	**RA Approval Date**	**Next Review Date**	**RA Leader & Designation**	**Remarks**
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Note:

Page __ of __ page(s)

Annex B-2: Risk Assessment Form

Risk Assessment Form

Department:	**RA Leader:**	**Approved by**	**Reference Number**
Process:	RA Member 1:		
Process/Activity Location:	RA Member 2:	Signature:	
Original Assessment date:	RA Member 3:	Name:	
Last review date:	RA Member 4:	Designation:	
Next review date:	RA Member 5:	Date:	

HAZARD IDENTIFICATION				RISK EVALUATION				RISK CONTROL						
Ref	**Work Activity**	**Hazard**	**Possible injury/ill-health**	**Existing risk controls**	**S**	**L**	**RPN**	**Additional Controls**	**S**	**L**	**RPN**	**Implementation Person**	**Due Date**	**Remarks**
1														
2														
3														
4														

Notes:

Annex B-3: Sample of Risk Assessment

Risk Assessment Form: Forklift Operation

Department:		**RA Leader:**	**Approved by**	**Reference Number**
Process:	Routine Forklift Operation	RA Member 1:		
Process/Activity Location:	Warehouse	RA Member 2:	Signature:	
Original Assessment date:		RA Member 3:	Name:	
Last review date:		RA Member 4:	Designation:	
Next review date:		RA Member 5:	Date:	

HAZARD IDENTIFICATION				RISK EVALUATION				RISK CONTROL						
Ref	**Work Activity**	**Hazards**	**Possible injury/ill-health**	**Existing risk controls**	**S**	**L**	**RPN**	**Additional Controls**	**S**	**L**	**RPN**	**Implementation Person**	**Due Date**	**Remarks**
1	Before commencement of Forklift Operation	Acute and chronic health conditions affecting safe operation	Operator unable to control the forklift operation and result in injury to self, personnel around the vehicle or damaged to property	Periodic health screening and medical assessment by medical centre for work deployability. Check for health and mental condition of operators daily during morning briefing. All forklift operators who are not feeling well shall not be allowed to operate forklift and report to medical centre for assessment.	3	1	3							
2		Dry and Hot Weather Conditions	Workers will be more prone to heat injuries like heat syncopy, heat exhaustion and heat stroke	Workers to drink plenty of water before commencing work and during work to avoid dehydration. Bring personal water bottles during operation. Personal water bottles to be brought along during operation. Workers to indicate 'WATER'	3	1	3							

				and their name on the water bottles.											
				Workers to take regular breaks. If possible, stay in the shade rather than in the sun.											
				Workers encouraged to urinate to cool down their body temperatures after consumption of water if necessary.											
3		Wet Weather Conditions	Workers will be more prone to slips and falls, especially when walking on steel materials. Workers will be more prone to falling sick due to the cold environment.	Workers to wear slip-resistance safety boots. During heavier rainfalls, workers to find shelter.	3	1	3								
4		Armed personnel attempt to attack personnel	Fatality	All operations to cease immediately.	5	1	5								
				All personnel to evacuate from site and do not confront the armed attacker.											
				Proceed to the nearest building and hide in the rooms with lockable doors.											
				Inform Security Personnel as soon as possible.											

Notes:

Risk Assessment Form: Heavy Vehicle Operation

Department:	**RA Leader:**	**Approved by**	**Reference Number**
Process: **Heavy Vehicle Operation**	RA Member 1:		
Process/Activity Location:	RA Member 2:	Signature:	
Original Assessment date:	RA Member 3:	Name:	
Last review date:	RA Member 4:	Designation:	
Next review date:	RA Member 5:	Date:	

HAZARD IDENTIFICATION				RISK EVALUATION				RISK CONTROL						
Ref	**Work Activity**	**Hazard**	**Possible injury/ill-health**	**Existing risk controls**	**S**	**L**	**RPN**	**Additional Controls**	**S**	**L**	**RPN**	**Implementation Person**	**Due Date**	**Remarks**
1	Vehicle Preparation -Pre-operational checks	Sharp edges, pinch points, hand caught in between	Hand injuries	Use proper hand gloves All personnel to be briefed on the procedures and operations by supervisor Newly trained personnel shall be supervised before entrusting to work alone	3	2	6							
2		Hydraulic system failure	Body injury/ fatality/ property damage	Keep unauthorised personnel away from work area Do not go under the heavy vehicle when vehicle is undergoing jacking operation	5	1	5							
3		Collision	Body injury/ fatality/ property damage	Keep unauthorised personnel away from work area Check the surrounding area before commencing pre-ops checks Horn to be sound prior to vehicle movement	5	1	5							

4		Acute and chronic health conditions affect safe judgement and performance during operation	Fatality, property damage, personnel injury	Operator should avoid operating vehicle if they are on medication that could cause drowsiness.	5	1	1								
				Supervisor to identify operators with health problem and pay extra attention to them. If operators are feeling unwell, supervisors to ask operators to stop work immediately.											
				Supervisor to check with operators on their medication. If any of the medication would pose a drowsy effect on them, stop them from operating the vehicle.											
				Operator to pass medical examination prior to licence renewal where required.											
5		Operating without valid licence / authorisation	Fatality, Property damage, personnel injury	All operator to be certified and to undergo licence renewal every 2 years	5	1	5								
				Supervisor to maintain a masterlist of operator licence/ authorisation											

Notes:

Annex C-1: 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

	S/N	DEPARTMENT	NAME	DESIGNATION	NO OF MAN	NAME	DESIGNATION	NO OF MAN
DIRECT EMPLOYEES	1	STAGING, PAINTING, CLEANING						
	2	HULL & JOINERY						
	3	MECHANICAL						
	4	PIPE & BOILER						
	5	ELECTRICAL & INSTRUMENTATION						
	6	OPERATIONS SUPPORT						
	7	OTHERS						
						TOTAL		

GRAND TOTAL OF MANPOWER	
ATTENDING VSCC	
WORKING ON BOARD	

SHIPSTAFF	PRESENT Y	N
SUPERINTENDENT		
MASTER		
CHIEF OFFICER		
CHIEF ENGINEER		
OTHERS		
TOTAL		

	S/N	TRADE	COMPANY	NAME OF REP	NO OF MAN	COMPANY	NAME OF REP	NO OF MAN	REMARKS
SUB-CONTRACTORS / OWNER CONTRACTORS	1	PAINTERS / BLASTERS							
	2	CLEANERS							
	3	SCAFFOLDERS							
	4	STEEL WORKERS							
	5	FITTERS							
	6	JOINERS							
	7	PIPE & BOILERS' WORKERS							
	8	ELECTRICAL & INSTRUMENTATIONS							
	9	OTHERS							
					TOTAL				

PART B - DOCUMENTS ATTACHMENT / LIST OF APPENDICES

S/N	NAME OF DOCUMENT	YES	NO	REMARKS
1	HOT WORK DAILY ENDORSEMENT LIST			
2	WORK AT HEIGHTS (WAH) ENDORSEMENT LIST			
3	VESSEL'S CONFINED SPACE REGISTER			
4	LOCATION OF HAZARDOUS WORK PROCESSES			
5	VESSEL'S DAILY WORK NOTIFICATION BY SHIP STAFF			
6	TOOLBOX BRIEFING ACKNOWLEDGEMENT BY CONTRACTORS			
7	FIREWATCH LIST			
8	ADDITIONAL ATTENDANCE SHEET			
9	OTHERS (PLEASE SPECIFY)			

PART C - HSE STATISTICS INFORMATION

S/N	HSE STATISTICS		CURRENT WEEK	PREVIOUS WEEK	CUMULATIVE
1	LTA/ WORK RELATED ACCIDENT (4 DAYS MC & ABOVE) (REPORTABLE TO MOM)				
2	SCM AY'S CLASSIFICATION TOTAL REPORTABLE CASE (TRC)	FAC			
		MTC/ RWDC			
		LWDC			
		LTI			
3	INCIDENT (ENVIRONMENTAL, NEAR MISS, FIRE, DO, ETC)				

MTC = 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

PART D - HOT WORK (PINK)

PERMIT-TO-WORK (PTW)

S/N	PERFORMED BY: DEPT.	PERFORMED BY: SUB-CONTRACTOR	LOCATION	TYPE OF WORK	REMARKS

PART E - INCOMPATIBLE WORK PROCESSES (YELLOW)

PERMIT-TO-WORK (PTW)

S/N	PROCESS		Y	N	LOCATIONS / TIME	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	DISMANTLING / BOXING UP / BLANKING / REMOVAL OF BLANK OF VALVES / STEAM LINES / PIPELINES					
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

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PERMIT-TO-WORK(PTW)

PART F - OTHER WORK PROCESSES (WHITE)

S/N	PROCESS	Y	N	LOCATIONS / TIME	REMARKS
1	SWITCHBOARD CLEANING / MAINTENANCE				
2	CARGO TANK INERTING				
3	GRIT BLASTING IN CONFINED SPACES				
4	WORK ACTIVITIES IN CO2 / HALON ROOM				
5	ASBESTOS WORK (DELAGGING)				
6	RADIOGRAPHY / MPI / UT / DYE CHECK WORK				
7	USE OF DRY ICE / LIQUID NITROGEN IN CONFINED SPACES				
8	DIVING OPERATIONS				
9	SPACES THAT REQUIRE ENTRY PERMIT NAME OF CSA:____________				
10	HAZARDOUS WORK AT HEIGHT				

CERTIFICATION / CHECKLIST

PART G - CERTIFICATION OF WORK PROCESSES

S/N	PROCESS		Y	N	LOCATIONS / TIME	REMARKS
1	SCAFFOLDING	ERECTION				
		MODIFICATION				
		DISMANTLING				
2	OPENING OF MANHOLE COVERS OF CONFINED SPACES					
3	CLOSING OF MANHOLE COVERS OF CONFINED SPACES					
4	REMOVAL OF DRAIN PLUGS					
5	LOCK OUT / TAG OUT					
6	WASTE OIL TRANSFERRING OPERATION (INCLUDE BILGE PUMPING)					

OTHERS

PART H - OTHER HAZARDOUS WORK PROCESSES

S/N	PROCESS		Y	N	LOCATIONS / TIME	REMARKS
1	ACTUATION OF HYDRAULIC SYSTEM (WINCH, CRANE, HATCH COVERS,ETC)					
2	DEGREASING					
3	USE OF THINNER / GLUE					
4	INSULATIONS WORK/ JOINERY WORK					
5	BASIN TRIAL (START-UP MAIN ENGINE, GENERATOR, ETC)					
6	FIRING / BLOWDOWN OF BOILER					
7	TURNING OF PROPELLER					
8	TURNING OF RUDDER					
9	HYDROJETTING / HIGH PRESSURE WASHING (SPECIFY PRESSURE LEVEL)					
10	OPENING OF GRATINGS / GUARDRAILS / PLATES/ SKYLIGHT					
11	POWER TOOLING / CHIPPING / DESANDING					
12	PRESSURE TEST OF TANK (AIR / WATER)					
13	INCLINATION TEST					
14	LIFTING (SPECIFY TONNAGE)	*ROUTINE/ GENERAL				
		*NON-ROUTINE (E.G. HEAVY, CRITICAL, ETC)				
15	STORAGE OF OIL DRUMS / PAINT DRUMS / CHEMICALS / OTHERS (SPECIFY)					
16	COMMISSIONING ACTIVITY	SYSTEM ENERGISE				
17	LOAD TEST (SPECIFY TONNAGE)					

A routine lift if it is repetitive in nature and involves loads that are similar in shape, size and weight, i.e., multiple lifts of similar items.

A non-routine lift refers to lifting operation that is complex, carried out for the first time or lifting close to the lifting capacity of the crane.

MISCELLANEOUS

PART I - OTHER WORK ACTIVITIES

S/N	PERFORMED BY		TYPE OF WORK	LOCATIONS / TIME	REMARKS
	DEPT.	OWNER'S CONTRACTOR			

Note: Delete the processes accordingly

PART J - LATE WORK / NIGHT SHIFT ACTIVITIES

S/N	PERFORMED BY		TYPE OF WORK	LOCATION	LATE WORK	NIGHT SHIFT
	DEPT.	SUB-CONTRACTOR				

PART K - HSE ISSUES RAISED IN TODAY'S MEETING

S/N	DESCRIPTION	ACTION BY

PART L - FOLLOW UP ON PREVIOUS DAY'S HSE ISSUES

S/N	DESCRIPTION	PENDING	ON GOING	CLOSED

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: ____________

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Annex C-2: Sample of Permit to Work Forms

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

☐ OIL ☐ GAS ☐ CHEMICAL ☐ STEAM

CONFINED ☐ OPEN ☐

S/NO (DISMANTLING/ TESTING SHALL NOT COMMENCE UNTIL STAGES I TO IIIA - IIIB FOR TENDER JOBS -
OTHERS 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. 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 :-

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 condoming 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 lighting 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 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 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 : _____ 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 : _____ 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 (See overleaf for explanatory notes)

Refer to overleaf for general requirements of Lockout-Tagout (i)(j)

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DISPLAY

PERMIT FOR ENTRY INTO CONFINED SPACES

S/NO
OTHERS

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

NAME OF VESSEL :	COMMENCEMENT DATE : / / TIME : HRS
NAME OF CONFINED SPACE :	COMPLETION DATE : / / TIME : HRS
PURPOSE OF ENTRY :	

DAILY ENDORSEMENT BY AUTHORIZED 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/ VESSEL REPRESENTATIVE

(1) **Potential atmospheric hazards:** _____

Potential non-atmospheric hazards: _____

(2) **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.

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

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 HIS 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

Oxygen (19.5% Vol to 23.5% Vol*)	Flammable gas (< 10% LEL*)		Toxic gas (<PEL values*)		
_____ %	Hydrocarbon (HC)		H_2S		(10 ppm)
			CO		(25 ppm)

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

NAME : _____ SIGNATURE : _____ DATE : ___/___/___ TIME : _____HRS

STAGE III : ISSUANCE / APPROVAL BY AUTHORIZED MANAGER

I am satisfied that:

(a) the work has been co-ordinated at the VSCC meeting (for vessels).
(b) the levels of oxygen, flammable gas and toxic substances are within the permissible range.
(c) the confined space is adequately ventilated and illuminated.
(d) effective steps have been taken to prevent any ingress of dangerous gases, vapours or any other dangerous substances into the confined space.
(e) 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/ VESSEL REPRESENTATIVE

I shall ensure that the copy of the entry permit, along with a sketch 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/ VESSEL REPRESENTATIVE

The permit has been removed for the 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.

(See overleaf for explanatory notes)

S/NO:

Department:

Company:

PERMIT FOR HAZARDOUS WORK AT HEIGHT

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 AUTHORIZED MANAGER

DAY 1

DAY 2

DAY 3

DAY 4

DAY 5

DAY 6

DAY 7

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
- ☐ 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

Working at Height Hazards \ * Fall Prevention Control Measures/ Precautions		Hard barricade/ guard rails	Cover/ grating over opening	Safe anchorage points	Lifelines/ Self Retract Lifeline	Toe board	Secured tools/ equipment	Secured object	Container/ tools bag	Safety belt	Full body harness with lanyard	Life buoy	Life jacket	Rope Grab					
Falls	from scaffold																		
	from opening/ skylight/ hatch opening																		
	from vertical ladder																		
	from top of machinery/ equipment																		
	from vehicle/ transporter																		
	from roof																		
	over edges																		
	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 : ISSUANCE/ APPROVAL BY WORK AT HEIGHT AUTHORIZED MANAGER

1. 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.
2. I have ensured that there is no incompatible work processes being carried out in the same vicinity at the same time.
3. 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

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DISPLAY

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)

VESSEL'S NAME :	COMMENCEMENT :	DATE : / /	
		TIME : HRS	
LOCATION OF WORK :	COMPLETION :	DATE : / /	
		TIME : HRS	
TYPE OF HOT-WORK : (gouging/ burning/ welding/ preheating/ brazing/ grinding) *			
DETAILS OF THE HOT-WORK TO BE CARRIED OUT :			

DAILY ENDORSEMENT BY PROJECT MGR

DAY 2

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 :-

DAY 3

- ☐ # 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

DAY 4

SKETCH

DAY 5

NAME : _____ DESIGNATION _____

SIGNATURE : _____

DATE : ____/____/____ TIME : _____ HRS

Please tick the applicable requirements in the appropriate boxes.

DAY 6

STAGE II : ENDORSEMENT BY SAFETY ASSESSOR

I have inspected and confirm that :

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

Additional safety precautions to be taken : _____

DAY 7

I hereby endorse the permit.

NAME : _____ SIGNATURE : _____ DATE : ____/____/____ TIME : _____ HRS

DAY 8

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.
3. 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.
4. I have ensured that there are no incompatible work processes being carried out in the same vicinity at the same time.
5. 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 approve the permit.

DAY 9

NAME : _____ SIGNATURE : _____ DATE : ____/____/____ TIME : _____ HRS

DAY 10

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.

DAY 11

NAME : _____ SIGNATURE : _____ DATE : ____/____/____ TIME : _____ HRS

DAY 12

STAGE IV : NOTIFICATION OF COMPLETION OF WORK BY TRADE FOREMAN/ SUPERVISOR

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

DAY 13

NAME : _____ SIGNATURE : _____ DATE : ____/____/____ TIME : _____ HRS

* Delete where not applicable (See overleaf for explanatory notes)

 # Refer to overleaf for general requirements of Lockout-Tagout (i)(j)

DAY 14

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DISPLAY

PERMIT FOR REPAIR/ MAINTENANCE WORK OF HYDRAULIC SYSTEM

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

S/NO
OTHERS

VESSEL'S NAME :	COMMENCEMENT :	DATE : ____/____/____ TIME : _____ HRS
LOCATION OF WORK :	COMPLETION :	DATE : ____/____/____ TIME : _____ HRS

STAGE IA : 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 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 : _____ 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 : _____ 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

(See overleaf for explanatory notes)

Refer to overleaf for general requirements of Lockout-Tagout (i)(j)

Annex D-1: 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! Fire! Fire!", 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. Oxy-cng hoses/other gas hoses from the 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 on arrival of EHS personnel who is taking charge of the operation.		
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 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 that of there men are 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 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, if necessary, instructs the security to sound the alarm.		
d.	Announce through 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 loud hailer.		

Review of Fire Drill	
Location:	
Date:	Time:
Ship duty officer	

SNO	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 E-1: Sample of Near miss Report

Near Miss/Accident/Incident Report

Report No:	Date of Near Miss/Accident/Incident:
Vessel:	Local Time:
Location:	

Type Of Near Miss/ Accident/ Incident ☐ Property Damage/Loss of Cargo ☐ Oil Spill ☐ Fire/Explosion ☐ Engines/Steering Failure	☐ Slip/Trip/Fall/Line of Fire/Body Position ☐ Elevated Works/Falling Objects ☐ Lifting/Crane Operation ☐ Others (Please State):
Type of injury: ☐ Fatality ☐ Loss Time Injury (LTI) ☐ Restricted Workdays Case (MC)	☐ Medical Treatment Case ☐ First Aid Case ☐ 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: ☐ Communication Failure ☐ Incompliance of Rules/Procedures (SOP)/ Industry Recommendations ☐ Incompatible Equipment/Tools ☐ Inadequate Supervision ☐ Inadequate Training	 ☐ Inadequate Personal Protective Equipment ☐ Fatigue ☐ Poor House Keeping ☐ Unsafe Working Environment ☐ Mishandling of Equipment/Tools ☐ 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: Signature:	 Designation: Date:
REVIEWED & CLOSED BY Name: Signature:	 Designation: Date:
APPROVED BY Name: Signature:	 Designation: Date:

Annex F-1: 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	**Identification of Noise Hazard** Risk assessment identifies noise as a hazard and controls are put in place to manage exposure	Yes	Supporting documents
	Noise monitoring successfully identifies work stations or tasks exposing workers to excessive noise.	Yes	Supporting documents
2	**Noise Control Plans** 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	**Audiometric Examinations** 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 conducted no later than three months of commencing work in the workplace.	Yes	Supporting documents
	Audiometric examinations are carried out by trained persons i.e., industrial audiometric technicians.	Yes	Supporting documents
4	**Training and Education** If any worker is exposed to excessive noise, he is included in the list of workers to be trained annually. Any new workers	Yes	Supporting documents

	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.		
	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	• Supporting documents • Evidence to support claims that warning signs are being posted in noisy areas.
5	**Provision of Personal Protective** Equipment 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 F-2: Hearing Conservation Program Evaluation Checklist

Sample Hearing Conservation Programme Evaluation Checklist

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	Yes	No	Remarks
Is a programme administrator appointed for the Hearing Conservation Programme (HCP)?			
Does the programme administrator have the relevant knowledge to coordinate all aspects of the programme? (Relevant knowledge includes: 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?			
3. Noise Control	Yes	No	Remarks
Are all practicable measures taken to reduce or control noise from any machinery, equipment or processes such that no employees 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 employees 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 employees' 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?			
4. Hearing Protectors	Yes	No	Remarks
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 employees 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 employees 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 employees wear hearing protectors correctly and consistently in designated areas?			
Is there an incentive or disincentive scheme in place to encourage employees to put on hearing protection?			
5. Training and Education	Yes	No	Remarks
Is a training programme implemented and conducted every year for all persons exposed to excessive noise?			
Is training provided to all new employees within three months of commencing work?			
Does the training programme include instructions in: - Relevant provisions of the WSH Act, WSH (Risk Management) Regulation, WSH (Noise) Regulations and WSH (Medical Examinations) Regulations; - Effects of noise on hearing; - Purpose of hearing protectors and its proper use and maintenance; and - Purpose and procedure of audiometric examinations?			
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?			
6. Audiometric Examinations	Yes	No	Remarks
Are all employees 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 employees?			
Is counselling provided to employees 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?			
7. Record Keeping	Yes	No	Remarks
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?			
8. Programme Evaluation	Yes	No	Remarks
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 employees 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?			

4. List of Tables