



Workplace Safety and Health Control Measures

WPH-WSH-4075-1.1

LEARNER'S GUIDE

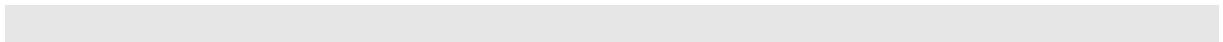
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Prepared By: Sivakolunthu Venkatesan

Approved By: Rosli Pitchay

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For Enquiries and feedback please email admin@efg.com.sg





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SECTION A: AN OVERVIEW

1. Competency Unit Title

Develop a risk management implementation plan

2. Course Objective

On completion of this unit, learners will acquire the knowledge and skills to be a RM Team Leader/Risk Management Champion for the organization in reducing risks at source by managing the risk management process at workplace. It involves developing a practical risk management implementation plan for the organization which identify specific actions to be taken, by whom and time for their completion. It also entails formation of risk management team, risk assessment, controlling and monitoring the risks, communicating these risks to all persons involved and in compliance with the Risk Management Code of Practice (RMCP).

3. Target Audience

The occupations that this unit would be relevant to include but not limited to:

Management, health & safety personnel, line supervisors, team leaders, RM team leaders and risk management champions.

4. Assumed Attitudes, Skills and Knowledge

Learners are assumed to have the following set of attitudes, skills and knowledge:

- have an in depth knowledge of their organizational products /services
- be self-directed and proactive towards problem-solving of safety and health issues
- have an in depth knowledge on sources of workplace hazards
- have good presentation skills
- be proficient in using project scheduling software (*e.g.*, Microsoft Project or equivalent)
- be able to apply effective communication and leadership skills in leading and managing project members at a proficiency level equivalent to the (Employability Skills) Communication and Relationship Management at supervisory level



- be able to apply effective problem-solving and decision-making skills at a proficiency level equivalent to the (Employability Skills) Problem-solving and Decision Making Skills at supervisory level
- be able to listen, read, speak and write English at a proficiency level equivalent to the Employability Skills (ES) Level 5
- be able to manipulate numbers at a proficiency level equivalent to Employability Skills (ES) Level 5

5. Performance Statements (PS)

A competent individual must be able to successfully perform this unit covering the following performance statements:

PS 1 - Verify the expectations of a risk management champion/RM team leader with relevant

person in accordance with organizational Workplace Safety and Health (WSH) policy

PS 2 - Form a risk management team based on organizational WSH policy and in compliance with WSH (Risk Management) Regulations requirements

PS 3 - Establish hazard identification methodology for the workplace to identify WSH hazards associated with any work activity or trade

PS 4 - Establish risk assessment methodology for the workplace to determine the risk levels of the identified hazards associated with any work activity or trade

PS 5 - Establish risk control measures methodology for the workplace to manage the identified risks to a level as low as reasonably practicable by following the principles of hierarchy of control

PS 6 - Develop a workplace risk management plan to implement the hazard identification, risk assessment, and risk control measures in accordance with organizational WSH policy

PS 7 - Present the risk management plan to relevant stakeholders for consideration in accordance with organizational procedures

PS 8 - Communicate the identified hazard, risk evaluated, and implemented risk control measures to the person concerned in accordance with risk management plan



6. Underpinning Knowledge (UK)

A competent individual is required to have the following knowledge on:

UK 1 - Organizational Workplace Safety and Health (WSH) policy (Comprehension)

UK 2 - Workplace Safety and Health (Risk Management Regulations) requirements

(Comprehension & Application)

UK 3 - Expectations of a Risk Management (RM) champion/RM team leader (Comprehension)

UK 4 - Risk management process (Application)

UK 5 - Risk assessment (Application)

UK 6 - Hazard identification methodology (Synthesis)

UK 7 - Classification of WSH hazards (Comprehension)

UK 8 - Hazards associated with tools, equipment, materials and machines (Comprehension)

UK 9 - Hazards associated with work processes/activities, workplace conditions and

Environment (Comprehension)

UK 10 - At-risk behavior (Analysis)

UK 11 - Concept of risk assessment (Application)

UK 12 - Risk assessment methodology (Application & Synthesis)

UK 13 - Risk control measures methodology (Application)

UK 14 - Concept of ALARP (As Low As Reasonably Practicable) (Application)

UK 15 - Development of risk management plan (Synthesis)

UK 16 - How to communicate the implemented risk control measures (Application)

7.

The specification of the RLH for **Competency Unit: Develop a Risk Management Implementation Plan** is **16 hours**.

Maximum class size is 20 pax.



INTRODUCTION

The bizSAFE is a five-step programme to assist companies build up their WSH capabilities in order to achieve quantum improvements in safety and health standards at the workplace. Companies are guided through a journey, starting from top management demonstrating their commitment towards WSH, to acquiring risk management capabilities and implementing a WSH Management System. In the process, participating companies gain recognition and benefits of having a comprehensive WSH system in place.

- **bizSAFE Level 1 – Top Management have to**
 - Attend the bizSAFE CEO course
 - Prepare a safety and health policy
 - Approve the policy
 - Show commitment to the policy
 - Communicate the policy
- **bizSAFE Level 2 – acquire Risk Management Capability**
 - Attend and pass a 2-day risk management training course conducted by an Accredited Training Organization
 - Understand risk assessment methodology
 - Develop skills on risk assessment
 - Get prepared for the risk assessment
- **bizSAFE Level 3 – conduct Risk Assessment and implement the Risk Management Plan**
 - Form a risk assessment plan
 - Establish a work inventory
 - Identify hazards and evaluate risks
 - Develop controls
 - Implement controls according to risk level
 - Update residual risks in the risk register
 - Arrange for risk communication
 - Arrange for an external audit
- **bizSAFE Level 4 – acquire capability in managing Workplace Safety and Health systematically**
 - Identify a workplace Safety and Health Management System (WSHMS) leader
 - The leader has to attend and pass a 4-day WSHMS course



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- Develop the WSHMS
- Arrange an external audit by an accredited bizSAFE audit firm

bizSAFE Star Level

- Deliver excellence in WSHMS
- Implement a Safety Management System; *e.g.* SS506
- Pass an independent third party audit – your company Workplace Safety and Health Management System (WSHMS) meets SS506 or similar international standards as assessed by a third party Certification Company.



RESOURCE 1: VERIFY THE EXPECTATIONS OF A RISK MANAGEMENT (RM) CHAMPION/RM TEAM LEADER

Resource 1.1 Organizational Workplace Safety and Health (WSH) policy

The WSH policy provides a sense of direction for the management of WSH. A good WSH policy well implemented will result in high standards of workplace health and safety.

Organizational Workplace Safety and Health (WSH) policy should include:

The organizational overall safety and health objectives

WSH objectives give the overall direction and long term goal of the company. Organisations should establish and maintain documented WSH objectives at each relevant function and level within the organization.

Commitment to compliance of relevant WSH legal and other requirements

The WSH Policy should include a commitment to comply with legal and other requirements. Regarding the applicable legislation, the main Acts are:

- Workplace Safety and Health Act and its Subsidiary Legislations
- Workplace Safety and Health (Risk Management) Regulations
- Workplace Safety and Health (General Provisions) Regulations

Commitment to continual improvement on the safety and health performance

Example: a statement of your commitment to an on-going review and, where required, revision of the policy and program.

Accountability of top management

Top management refers to the higher levels of the organization's management. *E.g.* CEO, COO, Vice president or General Managers in large organizations. Top management bears overall responsibility. Reviews should be carried out by top management on a regular basis.

State the roles and responsibility at all levels

Clear definition and assignment of responsibilities is the critical for an effective health and safety policy as it will help ensure that:



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- Responsibilities for carrying out policy objectives are clearly assigned, communicated, and understood by employees;
- Accountability systems are established; and
- Actual and potential health and safety problems are reported and resolved, etc.

Organizations should note that responsibilities may vary according to the structure and size of the organization.

System to document, implement and maintain the risk control measures

Organization should ensure that RA records, including but not limited to RA forms and control measure records, are kept for at least three years.

System to communicate to all personnel including contractors and visitors

Apart from employees and contractors on site who are likely to be affected by hazards, organization should ensure that the outcomes of risk management will be communicated to: supervisory staff, the engineering department, the personnel department and record keepers. There may also be a need to communicate the outcome of the risk management program to the local regulatory authorities and, in some situations, to the emergency services.

Periodic review to ensure that it remains relevant and appropriate to the organization.

The policy must be reviewed and revised (if necessary) on a regular basis and the date(s) of review and revision stated. The purpose of reviewing is to evaluate the relevancy of the existing WSH Policy and its elements in respect to the organization.



Resource 1.2 Verify the expectations of a risk management champion/RM team leader

RM Team Leader and RM Champion/RM Team leader should:

- have direct access to the Employer or be at least a senior member of the Workplace
- good knowledge of work activity
- competent in RM
- attended a RM course

Have adequate knowledge of RA methods

A company must nominate a risk management (RM) champion /RM team leader to attend the bizSAFE risk management course.

Formulate a RM Plan for the “organization” At the end of the course, the RM champion/RM team leader must chart out the RM implementation Plan for the enterprise.

Forming a RM Team

a. Appoint of RM team

- Employer
- RM Leader
- RM Members

b. Appoint of RA team

- RA Leader
- RA Members

c. Relationship between RM Team and RA Team

- RA Leader who is also a RM Member
- A RM Member is not necessary a RA Leader

Chairing / Facilitating RA sessions

RM champion/RM team leader need to identify work tasks of each process

a. RM Team to set RA scope

- Divide the workplace into few a distinct areas
- Assign RA Team for each distinct area

b. RA Team to prepare Inventory of Work Activity (Appendix 1)

- Prepare Inventory Work Activity form assigned by RM Team



- Inventory Work Activity form to include activity inventory, location, process, and activity **Recommend appropriate risk control measures to reduce or eliminate identified risks**

Risk controls should be developed to eliminate/reduce the risk level to an acceptable level. When the risk level is Medium/High, effective and practicable risk controls must be implemented to reduce them to a low level within a defined time period.

Prepare a record of RA after completion of assessment

- Ensure that RA records (RA forms and control measure records) are kept for at least three years.
- ensure that the Risk Register (Appendix 2) is readily available for review

Assist in monitoring the effectiveness of risk control measures after their implementation

The final step is "Effective Supervision" to ensure the effectiveness of risk controls. RM champion/RM team leader is responsible for enforcing the control measures and will have to be vigilant at all times.

RESOURCE 2: FORM A RISK MANAGEMENT TEAM

Resource 2.1 WSH legal and other requirements

Regulations

Workplace Safety and Health Act

The Workplace Safety and Health Act came into effect on 1 March 2006, and by September 2011 it covers all workplaces. The WSHA aims to cultivate good safety habits in all individuals to engender a strong safety culture in our workplace, and emphasizes the importance of managing workplace safety and health proactively.

Every person is required to take reasonably practicable measures to ensure the safety and health of every workplace and worker. The legislation is based on the three guiding principles below:

- a. Reducing risks at source by requiring all stakeholders to eliminate or minimize the risks they create;
- b. Instilling greater ownership of safety and health outcomes by industry; and



- c. Preventing accidents through higher penalties for poor safety and health management

The Workplace Safety and Health Act states a general maximum penalty for offences. The penalties

are shown in the tables (Table 1 and Table 2) below.

Category of offender	Maximum fine	Maximum Jail	Conditions
Individual persons	\$200,000	2 years	Either or both
Corporate body	\$500,000		
Workers For failure to use personal protective equipment or misuse of any safety appliance.	a) 1 st conviction - \$1,000 b) 2 nd or subsequent conviction - \$		
Repeat offenders For a 2 nd or subsequent conviction for the same offences that causes the death of another person.			
a. Individual	\$400,000	2 years	Either or both
b. Corporate body	\$1 million		

Table 1 General Penalties For Offences For Which No Penalty Is Prescribed Under The Act

Category of offender	Maximum fine	Maximum Jail	Conditions
Person who fails to comply with a Remedial Order	\$50,000	12 months	Either or both
If offence is continued after	Additional fine of \$5,000 for each day the offence		
Person who fails to comply with a Stop Work Order	\$500,000	12 months	Either or both
If the offence is continued after	\$20,000 for each day the offence continues		

Table 2 Failure To Comply With Remedial Order Or Stop Work Order

Workplace Safety and Health (Risk Management) Regulations

Every employer, self-employed, or principal shall:

- Conduct a risk assessment for the workplace.
- Take reasonably practicable measures to eliminate or reduce safety and health risks.





- Establish safe work procedures if the risks cannot be eliminated
- Specify the roles and responsibilities of persons involved in the implementation of risk control measures and safe work procedures
- Inform employees of the nature of the risks involved and any risk control measures or safe work procedures implemented
- Keep records of risk assessment
- Review or revise risk assessment at least once every 3 years. It must be reviewed in the event of the following:
 - After an accident as a result of exposure to a hazard,
 - When there is a significant change in work processes that could affect the safety and health of the workers, for example, the introduction of new machinery or chemicals.

Failure to conduct risk assessment and implement measures to eliminate or control the risk:

- First offence, a fine of not exceeding \$10 000
- Second or subsequent offence, a fine of not exceeding \$20 000 or imprisonment not exceeding 12 months or both

Workplace Safety and Health (General Provisions) Regulations

Covering wide-ranging provisions:

- General provision relating to health
 - Biohazardous material, Ventilation, Sanitary conveniences, Reduction of vibration, and Protection against excessive heat or cold and harmful radiations ...
- General provision relating to safety
 - Construction and maintenance of fencing or other safeguards, Lifting appliances and lifting machines, Measures to be taken to prevent falls, Storage of goods, Air receivers, Gas plant, and Safety provisions in case of fire ...
- Special provisions relating to health, safety and welfare
 - Toxic dust, fumes, or others contaminants
 - Permissible exposure levels of toxic substance
 - Hazardous substances
 - Warning labels
 - Safety data sheet





- Part 1: Requirements
- Part 2: Guidelines for the implementation of SS506:Part 1:2009
- Part 3: Requirements for the chemistry industry

Code of Practice on Workplace Safety and Health (WSH) Risk Management

The purpose of CP on WSH Risk Management is to establish minimum requirements and duties for implementing workplace RM in Singapore, and to provide guidance on its implementation. The main components of RM are Preparation, Risk Assessment, Implementation, and Record-keeping. RA is one component of RM. The three main parts of RA are: Hazard Identification, Risk Evaluation, and Risk Control.

Other Approved Code of Practice (ACOP) as gazetted by WSHC

- Code of Practice for Working Safely at Height 2009
- Code of Practice on WSH Risk Management 2011
- SS 98: Industrial safety helmets 2005
- SS 473: Personal eye-protectors, Part 1- General requirements
- SS 473: Personal eye-protectors, Part 2 - Selection, use and maintenance
- SS 508: Graphical symbols - Safety colours and safety signs, Part 1: Design principles for safety signs in workplaces and public areas
- SS 508: Graphical symbols - Safety colours and safety signs, Part 3: Safety signs used in workplaces and public areas
- SS 510: Code of Practice for Safety in welding and cutting (and other operations involving the use of heat) (Formerly CP 50)
- SS 511: Code of Practice for Diving at work
- SS 513: Personal protective equipment – Footwear, Part 1: Safety footwear
- SS 513: Personal protective equipment – Footwear, Part 2: Test methods for footwear
- SS 531: Code of Practice for Lighting of work places, Part 1: Indoor
- SS 531: Code of Practice for Lighting of work places, Part 2: Outdoor
- SS 531: Code of Practice for Lighting of work places, Part 3: Lighting requirements for safety and security of outdoor work places
- SS 536: Code of Practice for The safe use of mobile cranes (Formerly CP 37:2000)
- SS 537: Code of Practice for Safe use of machinery, Part 1: General requirements
- SS 537: Code of Practice for Safe use of machinery, Part 2: Woodworking machinery





- SS 548: Code of Practice for Selection, use, and maintenance of respiratory protective devices (Formerly CP 74)
- SS 549: Code of Practice for Selection, use, care and maintenance of hearing protectors (Formerly CP 76)
- SS 550: Code of Practice for Installation, operation and maintenance of electric passenger and goods lifts (Formerly CP 2)
- SS 553: Code of Practice for Air-conditioning and mechanical ventilation in Buildings (Formerly CP 13)
- SS 554: Code of Practice for Indoor air quality for air-conditioned buildings
- SS 557: Code of Practice for Demolition (Formerly CP 11)
- SS 559: Code of Practice for Safe use of tower cranes (Formerly CP 62)
- SS 562: Code of Practice for Safety in trenches, pits and other excavated areas
- SS 586 : Hazard communication for hazardous chemicals and dangerous goods, Part 1: Transport and storage of dangerous goods
- SS 586 : Hazard communication for hazardous chemicals and dangerous goods, Part 2: Globally harmonised system of classification and labelling of chemicals — Singapore's adaptations
- SS 586: Hazard communication for hazardous chemicals and dangerous goods, Part 3: Preparation of safety data sheets (SDS)
- CP 14: Code of Practice for Scaffolds 1996
- CP 20: Code of Practice for Suspended scaffolds 1999
- CP 23: Code of Practice for Formwork 2000
- CP 27: Code of Practice for Factory layout — Safety, health and welfare considerations
- CP 63: Code of Practice for The lifting of persons in work platforms suspended from cranes
- CP 79: Code of Practice for Safety management system for construction worksites
- CP 84: Code of Practice for Entry into and safe working in confined spaces
- CP 88: Code of Practice for Temporary electrical installations, Part 1: Construction and building sites
- CP 88: Code of Practice for Temporary electrical installations, Part 3: Shipbuilding and ship-repairing yards
- CP 91: Code of Practice for Lockout procedure 2001
- CP 101: Code of Practice for Safe use of powered counterbalanced forklifts



Organisational policies and procedures

A Policy: A statement of agreed intent that clearly and unequivocally sets out an organisation's views with respect to workplace safety and health.

A Procedure/Practice: a clear step-by-step method for implementing an organisation's policy or responsibility.

Standard operating procedures

A documented method to perform a specific operation or task

Safety management manual

SS506:2009

4.2 Policy

4.3 Planning

4.3.1 Hazard identification, risk assessment and determining controls

4.3.2 Legal and other requirements

4.3.3 Objectives and programme(s)

4.4 Implementation and operation

4.4.1 Resources, roles, responsibilities, accountability and authority

4.4.2 Competence, training and awareness

4.4.3 Communication, participation and consultation

4.4.4 Documentation

4.4.5 Control of documents

4.4.6 Operational control

4.4.7 Emergency preparedness and response

4.5 Checking

4.5.1 Performance measurement and monitoring

4.5.2 Evaluation of compliance

4.5.3 Incident investigation, nonconformity, corrective action and preventive action

4.5.4 Control of records

4.5.5 Internal audit

4.6 Management review



Safety checklist

Checklists are lists of known hazards or hazard causes that have been derived from past experience. The past experience could be previous risk assessments of similar systems or operations, or from actual incidents that have occurred in the past. This technique involves the systematic use of an appropriate checklist and the consideration of each item on the checklist for possible applicability to a particular system.

E.g. Safety Checklist for Ladders

- ☐ Is a ladder, step-ladder etc. the right equipment for the work?
- ☐ If so, is the equipment in good condition and free from slippery substances?
- ☐ Can the leaning ladder be secured at the top?
- ☐ If not, can it be secured at the bottom? etc.

Resource 2.2 Form a risk management team

Large companies tend to have one Risk Management Team (RM Team) to oversee the coherent deployment of Risk Management throughout the company. At the same time, it is not unusual for these companies to have many Risk Assessment Teams (RA Team) to assess specific risks.

Define roles and responsibilities

It is important to define roles and responsibilities for successful implementation of risk management. Authority, accountability, and resource allocation should be clearly identified, defined and communicated.

☐ Employer

- Ensure that RA is conducted on WSH risks associated with any activity in the workplace.
- Require its workplace to take measures to control the risk and support the implementation of risk control measures
- Require the RM Leader to provide regular updates of the RA done and risk control measures



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- Ensure that a Risk Register (Appendix 2) is available and maintained at the workplace
- Ensure that RA records, including but not limited to RA forms and control measures records, are kept for at least three years from RA approval date



- Review and, if necessary, revise the RA
- Monitor the effectiveness of the risk control measures
- Manager
 - Ensures that RA is carried out and risk control measures are implemented
 - Approve the RA conducted for the area he /she manages
 - Ensures that:
 - No “High Risk” activity is approved
 - Risk control measures are implemented without delay
 - All operations have established SWPs, where applicable
 - All persons affected by the risks are informed of the nature of the risk and control measures
 - Effectiveness of the risk control measures is monitored
 - Revise the RA if the risk control is inadequate and ineffective after the implementation
 - Maintain RA documentation with measures and SWP implemented.
- Employees
 - Adhere measures stipulated in RA, e.g. safe work procedures (SWP)
 - Inform supervisors of any shortcoming in SWP or risk control measures
- Contractors/suppliers
 - Whenever necessary, work with Company RM/RA Team to conduct RA
 - Before commencement of work Conduct RA on their own work, take measures to control risks, submit RA to Company person-in-charge for review
 - Inform Company of any changes that may affect the RA
 - Report accident / incident

Appointment of RM Team

- The Employer shall:
 - Appoint a RM Team Leader (“RM Leader”)
 - Appoint RM Team members (“RM Members”)
 - Ensure that RM Team is trained and competent in risk management
 - Engage RM Consultant to assist RM Team if further assistance is required
- The RM or RA Leader shall
 - Lead and coordinate RM implementation



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- Provide regular updates to the Employer, preferably monthly but no less than once a year, regarding appropriate risk control measures implemented to reduce or eliminate risks identified.
- Obtain approval from the Employer or the designated Manager for the implementation of risk control measures.
- Assist the Employer to ensure that the Risk Register (Appendix 2) and risk register cover sheet (Appendix 3) is prepared.
- RM Members
 - With good knowledge of work activities
 - Competent in RM
 - Attended RM course
 - Comprise staff/workers from different levels, discipline and work areas
 - *E.g.* Management staff, area manager, engineers, RA Leaders, supervisors, production operators, etc.
- Main function of RM Team
 - Understand the workplace processes
 - Set RM objectives
 - Set RA boundaries, *e.g.* by department, function and work activities.
 - Assign RA Team s to conduct RA for specific areas
 - Decide on hazards review period

Appointment of RA Team

- RM Team to
 - Appoint RA Leaders among RM Members
 - Assist RA Leaders if further assistance is needed
- RA Leader
 - A member of RM Team
 - Form RA Team
 - Lead and coordinate RA implementation
 - Provide updates to RM Team on RA implementation and risk control measures
- RA Members
 - Good knowledge of the work activities
 - Comprise staff/workers involved in the work, as well as contractors, suppliers and other persons who are familiar with the work



E



- Main function of RA Team
 - Conduct RA within the areas assigned by RM Team
 - Determine if the hazards could bring harm beyond their work area
 - Prepare inventory of Work Activities

RA Teams are responsible for conducting RAs within the scope defined by the RM Team. Where RA experience or expertise is lacking, a WSH Officer, WSH Auditor or Approved Risk Consultant who is trained and has experience in conducting RA should be engaged to assist the RM/ RA leader in the conduct of the RA.

Resource 2.3 Risk management process

Preparation for risk assessment

- a. Form a Team
- b. Identify tasks of each process
 - a) Set Risk Assessment scope
 - Divide the workplace into few a distinct areas
 - Assign Risk Assessment Team for each distinct area
 - b) Risk Assessment Team to prepare Inventory of Work Activity (Appendix 1)
 - Prepare Inventory of Work Activity form for areas assigned by RM Team
 - Inventory of Work Activity form to include activity inventory, location, process and activity
- c. Gather relevant information

These sources of information may include, but not limited to:

- Workplace layout plan
- Process or work flowchart
- List of work activities in the process
- List of chemicals, machinery and/ or tools used
- Records of past incidents and accidents
- Relevant legislation, CPs or specifications



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- Observations and interviews
- WSH Inspection records
- Details of existing risk controls
- Health and safety audit reports
- Feedback from employees, clients, suppliers or other stakeholders
- Safe work Procedures
E.g., Permit-To-Work, lockout procedure, and startup procedure
- Other information such as Safety Data Sheets (SDS), manufacturer's instruction manual
- Copies of any relevant previous RAs
- Medical condition (*e.g., allergy*) of workers in the workplace or activity being assessed
- Others

Risk Assessment

- a. Identifying and analysing safety and health hazards associated with work – Hazard Identification

Hazard is anything with the potential to cause harm or bodily injury. The Team Leader is to determine the most appropriate way(s) of identifying the hazards.

- b. Assessing the risks involved - Risk Evaluation.

Risk is the likelihood that a hazard will cause a specific bodily injury to any person.

Various Risk Evaluation methods and matrices practiced and preferred by workplaces.

- c. Prioritising measures to control the hazards and reduce the risks - Risk Control.

The process by which the risks associated with each of the hazards identified is controlled.

Risk Assessment must be available for all activities.

Implementation and review

- a. Obtain Employer or Management approval. Completed Risk Assessment forms must be approved by the Manager of the area, function or activity where the risk is being assessed.
- b. Implement Control Measures. As far as is practicable, the Manager is to implement the recommended risk control measures as soon as possible.
- c. Communicate the hazards identified and their controls. All persons exposed to the risks are informed of:





- The nature of risks;
 - Any measures or SWP implemented; and
 - The means to minimise or eliminate the risks.
- d. Audit or Regular Inspections. The manager is to ensure regular inspection and audits are carried out so that the risk control measures are implemented and effective.
- e. Review RA on a regular basis. The manager is to review / revise Risk Assessment at least once every 3 years, or
- Introduction of new process , material, equipment, method of work
 - Modification of process, equipment, method
 - Changes in type of materials / chemical used, layout, working hours, schedules / sequence of work, personnel
 - Temporary adoption due to contingency / abnormal / unexpected work activities

Record-keeping

- a. Must be available upon request
- b. Keep for at least 3 years

Resource 2.4 Risk assessment

Risk assessment team

Refer to resource 2.2

Risk assessment methods

Risk assessment methods are:

- Activities-based assessment

Activities-based assessment involves the steps of identifying the hazards in each work activity in a work process. *E.g.*, loading raw material to machine, dismantle parts

It Inspects all workplace activities carried out, and break the workplace down into work sections and zones. Activities-based assessment also needs to consider future



tasks or situations that involved a change to the existing premises or process, or those that are non-routine or “one-off”. Once the activities inventory is completed,

- Each activity must be analyzed to identified all of the hazard involved
- Evaluate risk by outlining the any existing risk control before determining the severity and likelihood of hazard occurrence to rank the risk level
- List possible additional risk control measures as well as indicating the action officer and follow-up date

. Trade-based assessment

Involves identification of common hazards associated with a particular trade and determines existing or non-existing possible measures to eliminate or reduce the risks

- The risk evaluation step essentially involves a “Yes” or “No” assessment
- “Yes” indicates that a risk is present regardless of whether the risk level
- “No” means that there is no risk present
- As long as a hazard is identified, it is considered a risk, regardless of its severity or likelihood

. Hazard-based assessment

- Start with a list of potential hazard types
- Identify all of the areas in the workplace and work activities

. Location assessment

The workplace is broken into work sectors and zones and all the hazards present in each zone are identified. However, this method is normally combined with the activity-based identification.

Hazards and risks communication

The success of the risk management program is determined to a large extent by the effective communication of its conclusions in order to secure the involvement and commitment of both management and employees; and



In addition, employers have a legal duty to provide employees with information relating to risk management arrangements in the workplace.

Review of hazard identification and risk assessment programmes

- Enforcing the control measures and
- Monitoring and modifying the control measures where appropriate.



Resource 3.1 Establish hazard identification methodology

Select the appropriate hazard identification method in accordance with the nature of organisation, which may include:

- Size
- Activities
- Complexities of operations
- Risk profiles
- Resources available

Systematic approaches

a. Safety audits

The safety audits will monitor all activities performed on site, and in particular:

- The basic safety policy and organisation of the company.
- Management commitment and example on safety matters.
- Administration and safety activity.
- Accident reporting and investigation.
- Opportunity of injury – and record of every injury.
- Safety committees.
- Working rules and practices for each company location, including visitors and contractors.
- Compliance with statutory regulations and company standards.
- Behaviour and unsafe acts of personnel and their relationship to compliance with safety rules.
- Activity related certification of employees.
- First Aid certified employees.
- Training needs and activities.
- Hazards review of process equipment for either new or existing facilities.
- Operating procedures.
- Safety work permits.
- Emergency procedures.



b. Workplace inspections - Equipment WSH checklist, WSH Inspection checklist ...

Workplace inspections should involve: listening to the concerns of workers and supervisors; gaining a thorough understanding of jobs and tasks; identifying existing and potential hazards; and determining the underlying causes of hazards etc.

Workplace inspections help companies to meet legal requirements on safety and health. The inspections also enable companies to improve operations efficiency, productivity and worker morale through an accident and injury-free workplace.

c. Job Safety Analysis (JSA) / Job Hazard Analysis (JHA)

JHA is a process that enables us to analyse and identify specific hazards associated with a task and control measures required in a systematic and structured manner. It aims to look for all of the hazards associated with a job/action that may affect the workers or people's safety and health as well as the environment.

Four basic steps of JSA:

- Job Selection - Select the job to be analysed
- Job Breakdown - Break down the job into successive steps
- Hazard Identification - Identify the hazards and potential accidents
- Hazard Control - Develop ways to eliminate hazards & potential accidents

d. FMEA (Failure Modes Effects and Analysis)

FMEA is a method to evaluate potential failure modes capable of producing problems. Features are effects, causes, indications, safeguards, and recommendations/remarks of interest.

FMEA is probably the most commonly used techniques in embedded system design. It looks for consequences of component failures, and uses Risk Prioritisation Number (RPN) to prioritize the control actions

The limitation of FMEA is that it requires expert analysis to decide what to analyse.

e. Analysis of Incident/accident reports and Injury and illness records

Checking incident /accident report is to find out the previous records, including hazardous areas and unsafe behaviour conditions etc.

f. Occupational and health surveillance





- Air monitoring
- Noise monitoring
- Health check

g. Consultation with WSH committee, safety consultants

- Consulting from experts

h. Safety Data Sheets (SDS).

Safety Data Sheets (SDS) is for each hazardous chemical to downstream users to communicate information on these hazards. SDSs are required to be presented in a consistent user-friendly, 16-section format.

The SDS includes information such as the properties of each chemical; the physical, health, and environmental health hazards; protective measures; and safety precautions for handling, storing, and transporting the chemical. The information contained in the SDS must be in English (although it may be in other languages as well).

A description of all 16 sections of the SDS, along with their contents, is presented below:

Section 1 Identification

Section 2 Hazard(s) Identification

Section 3 Composition/Information on Ingredients

Section 4 First-Aid Measures

Section 5 Fire-Fighting Measures

Section 6 Accidental Release Measures

Section 7 Handling and Storage

Section 8 Exposure Controls/Personal Protection

Section 9 Physical and Chemical Properties

Section 10 Stability and Reactivity

Section 11 Toxicological Information

Section 12 Ecological Information (non-mandatory)

Section 13 Disposal Considerations (non-mandatory)

Section 14 Transport Information (non-mandatory)

Section 15 Regulatory Information (non-mandatory)

Section 16 Other Information

Incidental-based approaches



a. Accidents/incidents investigation reports

Any incident investigation is to find out what happened and why, and the ultimate goal is to make sure it never happens again. We can learn lessons directly from the investigation reports.

b. Complaints or feedback

From the complaints or feedback, the unsafe conditions are easily spotted.

c. Observations

Using simple but effective observation techniques, co-workers observe each other and unsafe conditions to give constructive one-on-one feedback to reinforce safe work behaviours and conditions, while discourage at-risk behaviours and unsafe conditions.

Resource 3.2 Classification of WSH hazards

Physical hazards

a. Noise

Noise are unwanted or unpleasant sound. Certain activities inherently produce sound levels or sound characteristics that have the potential to create noise, such as piling work and noisy machineries.

Exposure to excessive noise can cause “Noise Induced Deafness (NID)”. NID is a permanent loss in hearing sensitivity due to prolonged exposure to excessive noise, over a few years. Initial effect of NID is usually temporary and prolonged exposure can cause permanent hearing loss. The damage occurs slowly and we may not be aware of it. The total daily noise exposure level does not exceed $L_{Aeq,8h}$ 85dB(A).

b. Temperature

Problems of heat stress are more common throughout industry than those presented by a very cold environment. If the external temperature is too hot, it will exacerbate the metabolic rate-of-work thermal stressor causing a net gain in heat load and possibly increasing the core body



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temperature. If too cold, the external temperature could cause a net loss in heat load leading to a decrease in the core body temperature.

Excessive exposure to heat, which can result in heat disorders ranging from simple postural Heat Syncope (fainting) to the complexities of Heat stroke. Other heat disorders include heat cramps and heat exhaustion. Cold stress may include frostbite and Hypothermia.

The risk factors are body size & physical work capability, susceptible individuals, un-acclimatization persons and clothing. Susceptible individuals are person with cardiovascular diseases, impaired renal function, obesity etc.

c. Vibration

Constant exposure to vibration has been known to cause serious health problems such as back pain, carpal tunnel syndrome, and vascular disorders. There are two classifications for vibration exposure:

- Whole-body vibration. *E.g.*, near power presses in a stamping plant or near shakeout equipment in a foundry
- Hand and arm vibration. *E.g.*, screwdrivers, grinders, jackhammers, and chippers

d. Radiation

- ionizing radiation
Beta particles, x rays, and gamma rays
- Non-ionizing radiation
Ultraviolet (UV), visible light, infrared (IR), microwave (MW), radio frequency (RF), and extremely low frequency (ELF)

Mechanical hazards

a. Shear points.

Shearing action involves applying power to a slide, knife or rotating wheel sharp in order to trim or shear paper or other materials.

A hazard occurs at the point of operation where the paper stock is actually inserted, held, and withdrawn. *Example:* if a hand or arm is placed in the space between the spokes of the flywheel, that part of the body may be shorn off.



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b. Pinch points

This occurs when the open space between two moving parts or one moving and one stationary part becomes so small that the body part- usually the fingers- are caught in pinching motion and injured. This is very common with belts and pulleys, wheels and chains, calendar and printing rolls and gears.

c. Crush points

A part of the body is crushed between two moving machine parts or a moving and a fixed part. *Example:* A power press illustrates this well, with the crushing taking place at the point of operation. The reciprocating motion of the shaper is an additional illustration. If a person is standing behind the shaper slide, he may be crushed by the slide against the wall.

Electrical hazards

a. Electric currents

Current is a flow of electricity. If electricity is flowing in a circuit then we say we have an electrical current.

📌 Fundamental Rules of Electricity

- Rule 1: Electricity will only travel in a circuit
- Rule 2: Electricity will always travel in the path of least resistance
- Rule 3: Electricity will always try to travel to the ground

1 mA	A slight tingling sensation.
2 to 9 mA	A small shock.
10 to 24 mA	Your muscles can contract and cause you to 'freeze'. Burns are often apparent at the point of electrical contact.
25 to 74 mA	Respiratory muscles can become paralyzed. Entry and exit burns are often visible.
75 to 300 mA	Ventricular fibrillation. Shock is usually fatal.
Greater than 300 mA	Death is almost certain. Survivals will have severe burns to the skin, limbs and internal organs. Severely burnt limbs often need to be amputated.

Table 3 Effect of Current on Human Body





b. Earth faults

In an electric power system, a fault is any abnormal flow of electric current. In a "ground fault" or "earth fault", current flows into the earth. The prospective short circuit current of a fault can be calculated for power systems. In power systems, protective devices detect fault conditions and operate circuit breakers and other devices to limit the loss of service due to a failure.

c. Electric shock

Contact with live electrical components can also cause serious burns arising from the discharge of electrical energy. Health effects can include muscle spasm, shock, burns, palpitations, nausea and vomiting, collapse, fibrillation, unconsciousness, or death. Other risks include fires and explosions. Low voltage does not mean low hazard!

The severity of the shock depends on the following factors:

- Path of current through the body
- Amount of current flowing through the body
- Length of time the body is in the circuit, which results in:
 - Small to major burns of the skin & body tissue
 - Kidney failure
 - Brain damage
 - Ventricular fibrillation, and
 - Respiratory paralysis

Chemical hazards

a. Acids and bases

- Solutions with pH lesser than 7 is defined as acidic. *Examples:*
 - Nitric acid
 - Hydrochloric Acid: HCl
 - Hydrofluoric Acid: HF
 - Sulfuric Acid: H₂SO₄
 - Some batteries (acid batteries-sulphuric acid)
 - Rosin fluxes
- Solutions with pH greater than 7 are termed as alkaline. *Examples:*
 - Sodium Hydroxide: NaOH
 - Potassium Hydroxide: KOH





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- Ammonium Hydroxide: NH_4OH (ammonia is corrosive in itself)
- Some batteries (alkaline & NiCad batteries contain hydroxides)

b. Corrosive chemicals

Accidents involving splashes of corrosive substances are relatively common in workplaces. Corrosive substances are chemicals that cause local injury to living tissues. Corrosive chemicals can be found in the basic 3 forms:

- Solids. *e.g.* sodium hydroxide
- Liquids. *e.g.* hypochlorite solution or
- Gases. *e.g.* chlorine and ammonia

Ergonomic hazards

Ergonomics is matching the job to the worker and product to the user. Benefits include prevent injuries, improve employee comfort, improve production/efficiency, and reduce costs.

a. Manual handling

- Lifting/lowering

In lifting and lowering, force is the risk factor that most often needs to be addressed.

- Pushing/pulling

When pushing and pulling objects, the weight of the object or conveyance, including its contents, affects the force required of the worker. Generally pushing is better than pulling, and greater force can be applied when pushing.

- Twisting

Twisting can take place while the entire body is in a state of motion.

b. Improper task or workplace design

Ergonomic hazards due to improper task or workplace design, which include:

- Poor posture
- Use of excessive force
- Repetitive motion



Biological hazards

a. Bacteria



Microscopic single-celled organisms are found in the air, water and soil and in living or dead animals and plants. They are responsible for diseases ranging from typhoid, plague, cholera, meningococcal meningitis, tuberculosis, tetanus, gonorrhea, and syphilis, to the more mundane urinary tract infections, boils, and acne. They are killed by antiseptics and by boiling, although they may produce toxins which are not destroyed.

b. Viruses

Viruses are micro-organisms that can reproduce only by coming into contact with living cells. They are found only in living animal and plant matter. The most high-profile virus of recent years has been the human immunodeficiency virus, HIV causes AIDS. Other viral illnesses include influenza, the common cold, Lassa fever, and Ebola. There have been few anti-viral drugs available, and the main line of defence has been vaccination.

c. Toxins

Toxins produced by microorganisms are important virulence determinants responsible for microbial pathogenicity and/or evasion of the host immune response. Toxins vary greatly in purpose and mechanism, and can be highly complex or relatively small protein.

Fire hazards

For a fire to start three conditions must be present at the same time:

- FUEL. Fuels are materials that burn. *E.g.* solvents, gases, and solids.
- OXIDIZER. Oxygen or other substances capable of releasing oxygen to a fire.
- IGNITION SOURCE. *E.g.* electricity, refuse/rubbish, smoking, and arson.

Types of fire: pool fire, flash fire, jet fire, fireball, and boiling liquid expanding vapour explosion (BLEVE).

A typical indoor fire progresses through three main stages:

- Stage One – Initiation
- Stage Two - Rapid Fire Growth
- Stage Three - Decelerating growth

Causes for fire in workplace:

- Poor housekeeping



- Faulty electrical wiring, plugs and sockets
- Smoking and the careless disposal of smoking materials
- Accumulations of rubbish, paper or other materials that are easily ignitable
- Open flame sources left unattended
- Obstructions
 - Obstruction to the ventilation of heaters, machinery or office equipment
- Flammable materials
 - Careless use and disposal of flammable liquids
 - Combustible materials left too close to sources of heat

Resource 3.3 Hazards associated with tools, equipment, materials and machines

Nip points (contact points)

This occurs when the open space between two moving parts or one moving and one stationary part becomes so small that the body part - usually the fingers- are caught in pinching motion and injured. This is very common with belts and pulleys, wheels and chains, calendar and printing rolls and gears.

Sharp or cutting edges

Contact with sharp edges is routine in many engineering jobs. Injuries are common:

- where people are involved in handling sheet or strip metal;
- during work at presses, where small pieces of metal with sharp edges are handled frequently;
- following accidental contact with scrap metal, banding or swarf, principally during cleaning and disposal;
- By contact with machinery blades, cutters or tools (for example when fitting, removing, cleaning or storing).

Those most at risk include:

- Stores and warehouse staff;
- Tool setters;





- Operators of machines such as presses, guillotines, and steel-slitting lines where sheet steel is often manipulated by hand; and
- Welders who have to move or hold items being worked on.

Working practices of these employees should be examined carefully to determine the level of risk. **Protruded objects**

Things like a protruding nail, cluttered aisles, these are things that occur all the time, without much thought as to the consequences, until you happen to stand up and hit your head on that protruding nail. *E.g.* Protruded by nails protruding from wood, especially on construction sites

Stamping

Typical high noise works include machine stamping.

Hot surfaces

A serious burn is about the worst kind of injury you can receive. It could be incredibly painful and can take years of rehabilitation.

[Resource 3.4 Hazards associated with work processes/activities, workplace conditions and environment](#)

Hazardous conditions

a. Excessive noise

Exposure to excessive noise can cause Noise Induced Deafness (NID) - a condition where there is permanent loss in hearing sensitivity, which can lead to communication difficulties, social isolation and degradation in the quality of life. NID is permanent but preventable.

It is caused by prolonged exposure to excessive noise, which is generated by many industrial processes and work activities. No person shall be exposed to an equivalent sound pressure level of 85dBA over an 8-hour workday.

b. Slippery floors





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This is a common work hazard in many workplaces. Factors which increase this risk include insufficient lighting, poor housekeeping, wet and slippery floors, and lack of guardrails or handrails on platforms or staircases, and carelessness.

c. Working at heights

Work at Heights is defined as working at any place that is above, at or below ground level, and from which a person could fall (i.e. fall from height). Some examples of work platforms that workers may fall off/into are: boom lifts, excavation ditches, floor openings, hanging scaffolds, mast climbing work platforms, open sides and roofs.

Working at Heights is one of the highest risks of workplace accidents and fatalities. In 2011, 26 workers died from such falls, accounting for 43% of all work fatalities in Singapore.

The National Work at Heights Safety Taskforce made three key recommendations in its Safety Analysis Review of Work at Height.

- Recommendation 1 – Building Strong Capabilities
 - Implement Fall Prevention Plan, provide practical assistance and develop national competency.
- Recommendation 2 – Promoting the benefits of WAH Safety
 - Outreach and education, certification and recognition and information dissemination and hazards communication.
- Recommendation 3 – Enhancing the Intervention Framework WAH
 - Strategic intervention and legislation review (WAH Regulations) and extending enforcement reach.

d. Working in confined spaces

A confined space is defined as an enclosed space where the following situations are possible:

- Dangerous fumes are liable to be present to such an extent as to involve risk of fire or explosion or persons being overcome by fumes
- The supply of air is inadequate, or is likely to be reduced to be inadequate for sustaining life. Characteristics of Confined Spaces:
 - Poor natural ventilation



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- Poor natural lighting
- Limited access
- Space constraint
- Not designed for continuous work

Main hazards associated with confined space:

- Oxygen deficiency
- Oxygen enrichment
- Fire/Explosion
- Toxic atmosphere

Toxic atmosphere can accumulate through some manufacturing, biological, or chemical reactions. The effects of exposure to toxic substances include:

- Chemical asphyxiation. Carbon monoxide is released during combustion processes as a result of incomplete combustion. For example, hot work and internal combustion engines;
- Narcotic effects like headache, dizziness, nausea. For example, hydrocarbon vapours from spray painting or sludge removal;
- Cancer. For example, benzene and vinyl chloride monomer from cargo tanks; or
- Systemic poisoning. For example, lead from welding fumes, mercury from crude oil coated onto cargo tank walls and released during cutting.
- Others:
 - Heat
 - Noise
 - Ergonomic hazards
 - Poor lighting
 - Mechanical hazards
 - Electrical hazards
 - Skin contact with chemicals/absorption

There are all kinds of confined spaces. Here are few examples: manhole, storage tank, silo, reactor tanks, pipes, trench, sewer, basement, covered drain

e. Unguarded machine

Many serious accidents at work involve machinery and occur for several reasons, including:





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- Badly designed machine guards (e.g. those that can be removed);
- Poor maintenance of machines and guards;
- Guards are not provided;
- No supervisory system to ensure that guards are used;
- Payment/bonus systems that encourage “shortcuts” (e.g. guards can be removed if they restrict production);
- Lack of adequate training for workers on the safe use of machines.

Machine guards are essential for protecting workers from needless and preventable injuries. A good rule of thumb to remember is that any machine part, function, or process which may cause injury must be guarded. Where the operation of a machine, or accidental contact with it, can injure the operator or other workers in the immediate area, the machine must be guarded.

f. Poor housekeeping

Poor housekeeping increases the chance of objects falling, especially when objects are removed from the rack. Another example is wet work area when using electrical tools. Good housekeeping practices help reduce accidents. A simple yet effective way of preventing such accidents is to carry out good housekeeping regularly.

g. Storage of incompatible materials such as:

- Acids and bases
- Flammables with oxidizers

h. Incompatible work such as:

- Hot work with other work that involve use of flammable substances
- Washing and electrical work

Hazardous atmosphere

a. Presence of mist, fume or dust

The mist could cause serious damage to the eyes, and respiratory tract and even death if inhaled. *E.g.* Inhalation of acid or alkali mists may cause damage to inner lining of windpipe and lungs. Prolonged exposure to acid mist increases the risk of tooth erosion.



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Fumes can be a particular problem because health effects may become evident months or years after exposure. These fumes irritate the eyes, ear, nose, throat, and lungs and can damage the lungs.

There are many different types of dusts: flour, grain, wood, coal, metal and cotton. Some dusts can be poisonous and some are explosive. There are some irritant dusts that can cause some minor problems and there are respirable dusts that can damage the lung tissue. Most dusts are too small for the naked eye but all are either avoidable or can be controlled by precautions taken to ensure worker safety.

b. Presence of chemicals

The atmosphere in a confined space can be hazardous due to the presence of chemicals that are either man-made, such as toxic fumes from welding operations, or naturally occurring, such as hydrogen sulphide or methane that can result from decomposing organic material. In addition, the presence of flammable liquids or gases in a confined space presents a fire or explosion hazard.

c. Lack of oxygen

Confined spaces may contain hazardous air contaminants that may be colourless, odourless gases that can only be detected with testing. Sometimes inert gases (such as nitrogen) displace oxygen so that the confined space is oxygen-deficient. Lack of oxygen is a leading cause of death among workers entering confined spaces. Low oxygen levels cannot be detected by sight or smell. You must test the air for this hazardous condition. A very low level of oxygen can damage the brain and cause the heart to stop after a few minutes.

d. Poor air quality

Outdoor air pollution is an obvious danger because it's hard to miss: auto exhausts, industrial waste, and city smog. But there's another threat just as perilous - a hidden threat because we're immersed in it, and therefore usually unaware of it - indoor air pollution.

Factors affecting indoor air which can give rise to poor air quality are: the presence of indoor pollution sources; poorly designed, maintained or operated ACMV systems; and uses of the building that were unplanned for when the building was designed or renovated.



Conditions that expose a person to risks of

a. Struck by or against objectives injuries are the most under rated workplace and off the job injury category.

- Struck By: car, truck, bus, train, boat, forklift, crane, mobile platform, garage door, door opening, another person, falling objects, motorcycle, stock items, batted ball, scaffolding, hammer head etc.

- Struck Against: car door, wall, door, flower pot, office equipment, ladders, piping, hoses, machinery etc.

b. Trip and fall on same level

- Trips happen when your foot collides (strikes, hits) an object causing you to lose the balance and, eventually fall. Common causes of tripping are:

- o obstructed view
- o poor lighting
- o clutter in your way
- o wrinkled carpeting
- o uncovered cables
- o bottom drawers not being closed
- o uneven (steps, thresholds) walking surfaces

c. Falling from height



Falls from height is the largest cause of death at workplaces in Singapore in recent years.

Work at Heights is defined as working at any place that is above, at or below ground level, and from which a person could fall (i.e. fall from height). Main falling hazards:

- Raised work surfaces such as slopes;
- Slippery work surfaces (wet, oily, dusty or glazed);
- Uneven work surfaces
- Cramped work surfaces;
- Work surfaces cluttered with tools, work materials and debris;
- Workers working in adverse weather conditions Unprotected edges;
- Building materials, large tools, or equipment that need to be manually carried;
- Overloading of working platform, which may lead to collapse;
- Struck by moving object or equipment

d. Drowning Struck by or struck against objects



Marine workers are predisposed to working in an unstable environment with unpredictable changes brought about by waves and tides. As such, operations such as the construction of wharves, marine piling operations, dredging and other seabed-related work, pose some unique concerns as follow:

- Drowning becomes a hazard when marine workers fall into the water;
- Workers tend to have the mentality that the ability to swim is enough to safeguard themselves against the possibility of drowning; and
- Fail to realise that the ability to swim is of no use if they are struck unconscious by an object before falling into the water.

e. Scalds and burns

Burns and scalds are damage to the skin caused by heat, and treated in the same way. Burn is caused by dry heat, from an iron or fire for example. Scald is caused by something wet, such as hot water or steam. Burns can be very painful and can cause blisters and charred, black or red skin.

f. Lightning strikes

A lightning flash can carry 30K to 300K amperes at 15 million to 125 million volts. Direct lightning or side flash strike to a person may be fatal. During lightning conditions, workers should come down from tank roofs, high columns; flare structure and furnace stack and take shelter.

Resource 3.5 At-risk behaviours

Violating procedures

Violations are any deliberate deviations from the rules, procedures, instructions and regulations drawn up for the safe or efficient operation and maintenance of plant or equipment. Breaches in these rules could be accidental, unintentional or deliberate. Violations occur for many reasons, and are seldom willful acts of sabotage or vandalism. Most stem from a genuine desire to perform work satisfactorily given the constraints and expectations that exist.



Violations of safety procedures are a significant cause of many industrial accidents. Not following established safety procedures can jeopardize the health, or even the lives of other employees. Even something as simple as not wearing a hard hat or other safety gear can result in worker injury.

Taking short-cuts

When performing an unsafe act, a worker is generally seeking to take a shortcut – an action that the worker assumes will save time and/or effort at the risk of being injured. The worker is willing to take the risk for the perceived or derived benefit without regard to the overall consequences.

Not using or misuse of Personal Protective Equipment

The type of personal protection depends on the hazards to which the worker is exposed. PPE must always be regarded as a “last resort” to protect against risks to safety and health. Therefore, the proper use of PPE can help to keep the workers safe at work. PPE can also be considered for short term contingency such as for emergencies, infrequent maintenance or repair works.

For PPE to be effective, it must be worn properly at all times when exposed to the hazards and must be the correct fit for the user. PPE must also be cleaned and maintained regularly and stored in an appropriate place when not in use. Never misuse, interfere with or modify any of these devices or equipment.

Unauthorised use of equipment

Operation by personnel who are not trained in its use may cause serious injury. Equipment which are deemed unsafe for use, need to be labelled as such to prevent unauthorised usage. *E.g.*, workers should be trained to identify damaged or faulty equipment and report such findings to their supervisors. They must not use such equipment nor carry out unauthorised repair.

Misuse of equipment

Example: Portable electrical tools often present a high risk of injury, which is frequently caused by the conditions under which they are used including the use of defective or unsuitable equipment and the misuse of equipment.



Horseplay

In the workplace, horseplay can pose a serious threat to safety and is an on-going, hard-to-control part of the everyday working environment. Employees get a little bored with their jobs late in their shift. However, horseplay is never fun and in fact can be hard to distinguish from harassment,

Discrimination, and even workplace violence. Horseplay at work is closely linked to bullying behaviour, when jokes are actually harassment targeting new workers or others who, in someone's opinion, do not yet fit in with the crew.



RESOURCE 4: ESTABLISH RISK ASSESSMENT METHODOLOGY

Resource 4.1 Concept of risk assessment

Risk Assessment is the process of evaluating the severities and probability of injury or illness arising from exposure to an identified hazard, and determining the appropriate measures for risk control. Every workplace should conduct risk assessments for all routine and non-routine work undertaken.

Severity and likelihood

a. Severity

Severity is the degree or extent of injury or harm caused by accidents/incidents arising from workplace hazards.

As the severity of the hazard refers to the intrinsic or inherent nature of the adverse effect (e.g. cancer, amputation or fatal injury) that may result from the hazard, it does not depend on the controls in place. Therefore, in assigning the severity level, the existing controls should not be taken into account.

Severity is classified into five categories: Catastrophic, Major, Moderate, Minor, and Negligible. (Table 4)

Level	Score	Severity	Description
5	5	Catastrophic	Fatality, fatal diseases or multiple major injuries
4	4	Major	Serious injuries or life-threatening occupational disease (includes amputations, major fractures, multiple injuries, occupational cancer, acute
3	3	Moderate	Injury requiring medical treatment or ill-health leading to disability (includes lacerations, burns, sprains, minor fractures, dermatitis, deafness, work-related upper limb disorders)



2	2	Minor	Injury or ill-health requiring first-aid only (includes minor cuts and bruises, irritation, ill-health with temporary discomfort)
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1	1	Negligible	Not likely to cause injury or ill-health
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Table 4: Severity rating and scoring

b. Likelihood

Likelihood should be based on how work is actually carried out in the workplace and to base the evaluation on this, rather than evaluation likelihood based on how the work is supposed to be carried out.

LIKELIHOOD of occurrence of an accident, incident or ill health is also classified into five categories: Rare, Remote, Occasional, Frequent, and Almost Certain (Table 5)

Level	Score	Likelihood	Description
1	1	Rare	Not expected to occur but still possible
2	2	Remote	Not likely to occur under normal circumstances
3	3	Occasional	Possible or known to occur
4	4	Frequent	Common occurrence
5	5	Almost Certain	Continual or repeating experience

Table 5: Likelihood rating and scoring

Risk ranking and risk matrix

Assessing risk levels based on the severity and likelihood. Once severity and likelihood have been established, the risk level is determined using a risk matrix. Common risk matrices include the 3x3 matrix, 5x4 matrix, 5x5 matrix and the 7x7 matrix. Organisations may develop matrices that are suitable and relevant to their operations. Table 6 is a 5 X 5 risk matrix with numeric ratings.

Obtain the Risk Prioritisation Number (RPN) by multiplying the “S” and “L” columns and entering the score in column “RPN” (i.e., $RPN = S \times L$). Decimal numbers are acceptable.

Likelihood Severity	Rare - 1	Remote - 2	Occasional - 3	Frequent - 4	Almost Certain - 5
Catastrophic - 5	5	10	15	20	25
Major - 4	4	8	12	16	20
Moderate - 3	3	6	9	12	15





Minor -2	2	4	6	8	10
Negligible - 1	1	2	3	4	5

Table 6: 5 x 5 Risk matrix with numeric ratings

Acceptability of risk levels

a. Compare the RPN against this Risk Matrix given in Table 7

Risk Level	Risk Acceptable
Low Risk (1 – 3)	Acceptable
Medium Risk (4 – 12)	Tolerable
High Risk (15-25)	Not acceptable

Table 7: Recommended action for risk levels

b. Recommendation actions

- Medium Risk
 - A careful evaluation of the hazards should be carried out to ensure that the risk level is reduced to as low as reasonably practicable (ALARP) within a defined time period.
 - Interim risk control measures, such as administrative controls or PPE, may be implemented while longer term measures are being established.
 - Management attention is required.
- High Risk
 - High Risk level must be reduced to at least Medium Risk before work commences.
 - There should not be any interim risk control measures. Risk control measures should not be overly dependent on PPE or appliances.
 - If practicable, the hazard should be eliminated before work commences.
 - Management review is required before work commences.

c. Additional Risk Controls must be implemented such that the hazards are no longer in the red zone ("High Risk") before work commences. Additional Risk Controls should be implemented after:

- Risk Controls for the hazard in the yellow zone ("Medium Risk") are already As Low As Reasonably Practicable (ALARP); or
- The hazard is in the green zone ("Low Risk").



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Risk assessment approaches

a. Activities-based risk assessment

The Activities-based Risk Assessment Form (Appendix 2) will help to facilitate the risk assessment process and enable you to record the findings of risk assessments based on a particular work activity.

E.g. load raw material to machine, dismantle parts.

Refer to Resource 2.4

b. Trade-based risk assessment

The Trade-based Risk Assessment Form (Appendix 4) will help you to identify common hazards associated with a particular trade and determine existing or non-existing possible measures to eliminate or reduce the risks. It includes prompts to guide you in considering if these hazards are present in your work situation.

E.g. As long as a hazard is identified, it is considered a risk, regardless of its severity or

likelihood Refer to Resource 2.4

c. Hazard-based assessment

- Start with a list of potential hazard types
- Identify all of the areas in the workplace and work activities

d. Location assessment

- Broken the workplace into work sectors and zones
- Identify all the hazards present in each zone
- Combine with the activity-based identification

Hazard identification tools

a. Hazard and Operability Study (HAZOP)

A hazard and operability study (HAZOP) can be used at varying times during the life cycle of the process, from process development through to the closure of the plant, including hazard assessment of any modifications proposed during its operational life span. The degree of detail produced by the study increases as the process is developed, requiring drawings, flow charts,



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process description, and for batch/semi-batch processes an operating guide, to produce the maximum detail.

b. Failure Mode Effect Analysis (FMEA)

The purpose of FMEA is to identify potential hazards associated with a process by investigating the failure modes for each process item. FMEA has difficulty in identifying hazards that require the failure of more than one process item, due to the complex interaction of the failures.

The following steps are performed during the analysis:

- Describe the system.
- Establish the basic principles and purposes of the study.
- Carry out the study.
- Report the results.

c. What-if Analysis

What-if Analysis is creative, brainstorming examination of process or operation. Hazard analysts review process/activity in meetings that revolve around potential safety issues. It is a powerful technique if analysis team is experienced.

Example: what if raw material is of wrong concentration?

Answer: if the concentration of acid is doubled, then reaction cannot be controlled and exotherm would result.

Result: install emergency shutdown system or special precautions when charging raw material to reactor.

d. Fault Tree Analysis

Fault tree analysis is a graphical representation of the combination of faults leading to a predefined undesired event. The methodology uses logic gates to show all credible paths from which the undesired event could occur.

The fault tree is developed from the top down and the logic gates indicate the passage of the fault logic up the tree. The event should be traced back until it cannot be developed further, either due to lack of knowledge or because no other causes can be identified.



The logic gates predominantly consist of AND and OR gates to indicate if the preceding event requires either one or a number of failures to occur. Once the fault tree has been fully developed frequencies/probabilities can be designated to each primary event, and by following the logic in the diagram the risk associated with the top event can be calculated.

The assessment is usually completed in six stages:

- Definition of the scope of the analysis
- Familiarization with the design, functions, and operations of the process
- Identification of the top event
- Construction of the fault tree
- Analysis of the fault tree
- Documentation of the results

e. Event Tree Analysis

They are used to evaluate the potential for an accident that is a result of an initiating event. Begins with an initiating event and works inductively towards a result. Starting from an equipment failure or process upset, we develop possible sequence of events that lead to potential accidents, accounting for both the success and failure of any associated safety functions as the accident progresses.

Analysis procedure:

- Identify the initiating event of interest
- Identify the safety functions design to mitigate the initiating event
- Construct event tree
- Describe resulting outcomes
- Determine accident minimal cut sets
- Document results

Applying risk ranking and risk

matrix refer to resource 4.1

RESOURCE 5: ESTABLISH RISK CONTROL MEASURES METHODOLOGY

Resource 5.1 Applying the principles of hierarchy of control measures

The control of hazards and reduction of risks can be accomplished by following the Hierarchy of Control Measures (Figure 1). These control measures are not usually mutually exclusive. e.g., engineering controls can be implemented together with administrative controls like training and Safe Work Procedures (SWPs).

Elimination

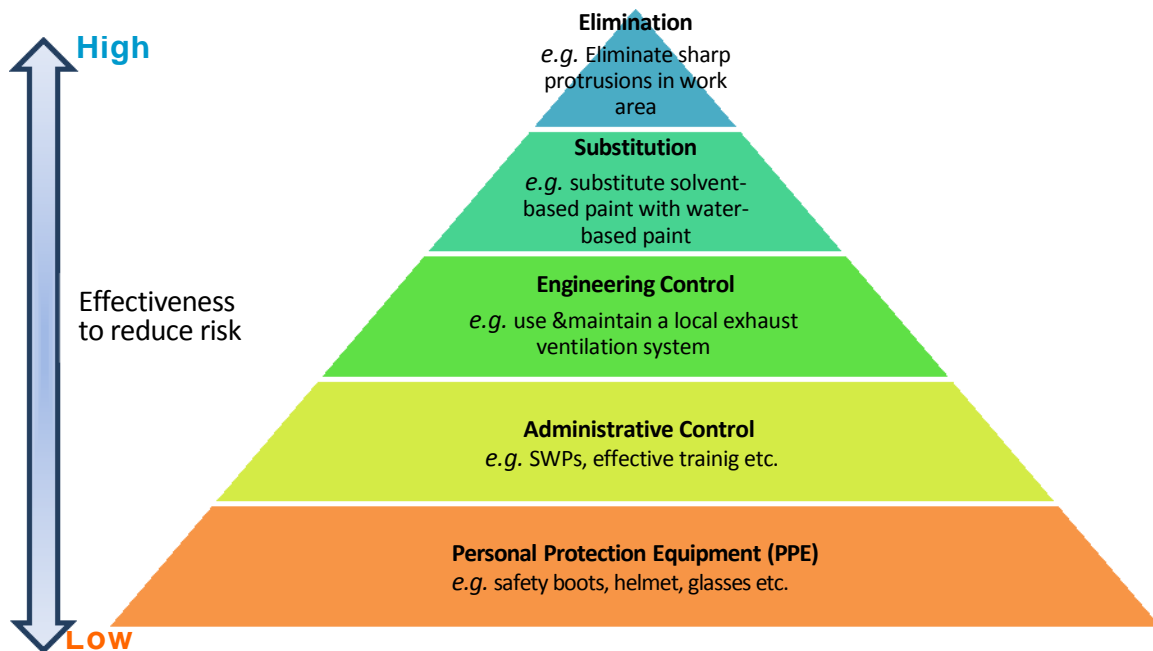


Figure 1 Hierarchy of Control Measure

Elimination of hazards refers to the total removal of the hazards and hence effectively making all the identified possible accidents, incidents and ill health impossible. This is a permanent solution and should be attempted in the first instance. If the hazard is eliminated, the risk associated of the hazard will be eliminated.

E.g. The canteen committee identifies that a particular item on the lunch menu contains an ingredient with a short shelf life. The committee is concerned that the item may become unfit for



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Consumption prior to sale. To avoid the risk of a food poisoning incident, the item is removed from the menu.

Substitution

This involves replacing the hazard by one that presents a lower risk. *E.g.*, Asbestos can be substituted with non-asbestos materials; replacing alcohol by aqueous detergent which is much safer, less flammable

Engineering control

Engineering controls are physical means that limit the hazard. These include structural changes to the work environment or work processes, erecting a barrier to interrupt the transmission path between the worker and the hazard.

E.g., Isolation or containment of hazards, machine guarding, and manual handling devices/ equipment etc.; In making a frame for storage, elements of a structure need to be welded. Instead of welding on site which is full of combustible materials and is congested, contractor asked to weld elements possible at their workshop, leaving only necessary assembly works on site. This eliminates /minimise the hazard from welding on site.

Administrative control

These reduce or eliminate exposure to a hazard by adherence to procedures or instructions. Documentation should emphasize all the steps to be taken and the controls to be used in carrying out the activity safely.

E.g., Permit-to-work systems, scheduling of incompatible works, safe work procedures (SWP), training, supervision, warning signs, access control, work-rest pattern, and worker selection

Use of Personal Protective Equipment (PPE)

This should be used only as a last resort, after all other control measures have been considered, or as a short term contingency during emergency / maintenance / repair or as an additional protective measure.

The success of this control depends critically on the protective equipment being chosen correctly, fitted correctly, worn at all times and maintained properly.



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Resource 5.2 Managing the risks level to a level “As Low As Reasonably Practicable” (ALARP)

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).

Core concept of “reasonably practicable”: weighing a risk against the sacrifice (trouble, time and money) needed to control it. The duty-holder must be able to show that it would be grossly disproportionate to the benefits of risk reduction that would be achieved by sacrifices. Thus, the process is not one of balancing the costs and benefits of measures but, rather, of adopting measures except where they are ruled out because they involve grossly disproportionate sacrifices.

The following factors are likely to be considered when deciding whether a risk is tolerable.

- Health and safety guidelines
- The specification
- International standards and laws
- Suggestions from advisory bodies
- Comparison with similar hazardous events in other industries

How may ALARP be decided?

In essence, it involves comparison of control measures a duty-holder has in place or is proposing and the measures that would normally be expected in such circumstances i.e. relevant good practice, *e.g.*: Singapore Standards & Code of Practice, Industrial practices. Risk with sacrifices involved in reducing it. Sacrifices: time, money, trouble (of control measures)

- a. Good practices standards for controlling risk that is judged and recognized as satisfying the law, when applied to a particular relevant case, in an appropriate manner.
- b. Relevance of good practices
- c. How effectively control measures have been (or will be) implemented.

Example: To move material for storage at the mezzanine, a forklift truck is required. Existing controls include training, authorization of operators. New measures were taken to install mirrors at corners and strategic locations. The risk level was reduced accordingly. In further analyzing the risk treated, the lab manager identifies that an additional way of reducing the residual risk is to build a proper walkway for staff. He noted that the further treatment is



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practical and found that the cost of the treatment is about \$10000. The Manager also expects that the annual cost of handling/follow-up



cost of incident that might be involved in forklift truck is more than \$30000. As the benefit is higher than the cost of additional treatment, the Manager decided to build the walkway to address this residual risk.

Resource 5.3 Managing the residual risks

Residual risks are the remaining risks after implementation of risk controls. The risk assessment team should ensure that residual risks are acceptable and manageable; and highlight the residual risks of each of the controls.

For example, if the risk control involves the use of safety harnesses and lanyards (a type of PPE), one of the residual risks is that the workers may not anchor the lanyards to protect themselves. In this case, the risk assessment team may highlight training (administrative control) as a further measure to ensure that residual risks are further minimized.

Once all the risk controls are selected and their residual risks highlighted, the risk assessment team needs to identify the action officers and follow-up dates. In this way, the specific action officers to implement the controls can be clearly identified, and the follow-up dates will help to ensure timeliness in implementation.

Resource 5.4 Developing safe work procedures

Safe work procedures are sequence of plan of actions, in consistent with the generally accepted safety and sound practice, established for the purpose of carrying out work safely. Such safe work procedures should be made readily available at the workplace.

Arising from the risk assessment, SWPs for work that may pose safety and health risks should be established and implemented. The SWPs should include the safety precautions to be taken in the course of work and during an emergency, as well as the provision of PPE. Safe work procedures should also be treated as part of the risk assessment records and subjected to record retention period of 3 years.



Resource 5.5 Establishing training for risk control

All affected person should be provided information:

- The nature of risks involved
- The control measures

People at work should be trained and competent. One best way to communicate the identified Hazard/Risk and the corresponding Controls is to establish regular briefings with the employees / contractors to:

- Identify expectations and training requirements for these control measures
- Raise awareness of the Risk identified

Any changes in work procedures, work systems and control measures will need to be communicated to those involved.

This may involve training and instruction. Supervision will also be needed to ensure that the message has been received and understand. It is also important to ensure Risk Control measures are applied properly.

Resource 5.6 Tracking progress of risk control measures

Risk Control Implementation Schedule is a plan which indicates:

- The chosen strategy for treatment of an identified risk
- Provide means to monitoring the progress

A Typical Risk Control Implementation Schedule contains the following:

- Risk identified
- Level of risk
- The planned strategy
- The timeframe for implementing the strategy
- Resources required and
- Staff responsible for ensuring strategy is implemented



Monitoring of risk control

Once the risk controls were identified and implemented, we will know those controls which are effective and those are inappropriate. The existing safe work procedures for work can be fine-tuned. Checking with legislation requirements and best practices, new procedures can be established and implemented.

Management of Change

When work process and control measures changes, including temporary changes, the change must be properly managed. Organisation should establish, implement and maintain procedures that include:

- Means and methods to detect changes in process;
- Identification of the process and technical design basis for the proposed change;
- Risk assessment to identify potential hazards and the risk controls required as a consequence of the change;
- The necessary modification to the current operating procedures;
- The necessary documentation for the proposed change;
- Duration of the change; and
- Authorisation requirement and ensuring that appropriate measures are in-place before approving the change.



Resource 6.1 Develop a workplace risk management plan

A. Scope of the risk management

First step is identifying a convenient unit (or "Boundary") for risk management at the Workplace. It may be as simple as dividing a Workplace or project into its distinct parts (e.g., divisions, departments, functional areas or work activities), and then sub-dividing each part into self-contained jobs or areas, each representing the unit for the RA. Risk Management entails:

- Risk assessment of any work activity;
- Control and monitoring of such risks; and
- Communicating these risks to all persons involved.

Risk Management Process (Appendix 5):

a. Preparation

- Establish RA Team
- Identify RA Champion
- acquire knowledge of business
- Gather relevant information
- Identify exposures
- Obtain loss history

b. Hazard Identification

Determine the nature and magnitude of loss issues through risk mapping

c. Risk Evaluation

The results yield from this evaluation will enable us to prioritize our resources to mitigate the risk

d. Risk Control

The hierarchy of control measures

e. Record Keeping

- Risk level for each hazard





- Recommendation on additional risk control required
- Persons involved in implementing the measures on risk reduction
- Signature, date, and designation of the persons conducting risk assessment
- Signature, date and designation of management approving or endorsing the risk assessment
- Records must be kept for 3 years

f. Implementation and Review

Introduce control measures to the workplace

B. Listing of the company's job function

Risk management duties are imposed on every employer, self-employed person and principal. These parties must take all reasonably practicable measures to ensure that the workplace is safe to every person within its premises.

a. Risk assessment organization structure

Swim lane Process Map shows the structure of risk assessment organization. They arrange map on a table where the rows indicate the “who” does the process step, and where the “who” can be specified as an individual, a department, or an organization.

b. Risk Assessment Team

Team members should include management staff, process or facility engineers, technical personnel, supervisors, production operators, maintenance staff and safety personnel if available. The risk assessment team should also include contractors/suppliers personnel who are involved with the work, whenever necessary.

c. Listing of work activities (Work activity inventory)

For the identified departments, functional areas and work activities to be assessed, the “Work activity Inventory” form should be used (see Appendix 1). The following information is to be completed in the form:

- State the department or activity to be assessed in “Activity or Trade Assessed”.
- Complete the Location, Process and Work Activity.
- List the Work Activity in sequential steps.

C. Hazard identification and risk assessment/evaluation methodology





- a. List the “Work Activities” from “Work Activity inventory” form (Appendix 1) to the first available cell of “Work Activities” in the “Risk Assessment Form” (Appendix 2), according to the RMCP, it requires all the information from the form to be available.
- b. Identify the hazard and record it in the “Hazard” column
- c. Should there be more than one hazard for the work activity, different hazards should be recorded in separate lines
- d. The following categories of hazards should be considered:
 - Physical (e.g., fire, noise, ergonomics, heat, radiation and manual handling)
 - Mechanical (e.g., moving parts, rotating parts)
 - Electrical (e.g., voltage, current, static charge, magnetic fields)
 - Chemical (e.g., flammables, toxics, corrosives, reactive materials)
 - Biological (e.g., blood-borne pathogens, virus)
 - Others (e.g., hazards peculiar to the industry)
- e. Risk Matrices

A matrix to classify risk categories for subsequent control with severity and likelihood levels as the two factor determining risk. Common risk matrices include the 3x3 matrix, 5x4 matrix, 5x5 matrix and the 7x7 matrix. Organisations may develop matrices that are suitable and relevant to their operations.

Level	Score	Severity	Description
5	5	Catastrophic	Fatality, fatal diseases or multiple major injuries
4	4	Major	Serious injuries or life-threatening occupational disease (includes amputations, major fractures, multiple injuries, occupational cancer, acute
3	3	Moderate	Injury requiring medical treatment or ill-health leading to disability (includes lacerations, burns, sprains, minor fractures, dermatitis, deafness, work-related upper limb disorders)
2	2	Minor	Injury or ill-health requiring first-aid only (includes minor cuts and bruises, irritation, ill-health with temporary



1	1	Negligible	Not likely to cause injury or ill-health
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Table 4: Severity rating and scoring

Level	Score	Likelihood	Description
1	1	Rare	Not expected to occur but still possible
2	2	Remote	Not likely to occur under normal circumstances
3	3	Occasional	Possible or known to occur
4	4	Frequent	Common occurrence
5	5	Almost Certain	Continual or repeating experience

Table 5: Likelihood rating and scoring

Likelihood Severity	Rare - 1	Remote - 2	Occasional - 3	Frequent - 4	Almost Certain - 5
Catastrophic - 5	5	10	15	20	25
Major - 4	4	8	12	16	20
Moderate - 3	3	6	9	12	15
Minor - 2	2	4	6	8	10
Negligible - 1	1	2	3	4	5

Table 6: 5 x 5 Risk matrix with numeric ratings

When using Risk Matrices other than the numeric 5x5 matrix recommended by the RMCP, all references to the scales (i.e., 1, 2, 3, 4 or 5) should be read in context of the Risk Matrix selected (e.g., “Minor”, “Moderate” or “Major” in lieu of “1”, “2”, “3”, “4” or “5”). When Hazard Identification is complete, proceed with Risk Evaluation procedure.

f. Existing Control

Identify the existing risk controls and state it in the “Existing risk controls” column. Where there is more than one existing risk control for the hazard being evaluated, they should be listed in the same line as the hazard.

g. Assessment of Severity



With the existing risk controls and residual risks in consideration, each team member is to rate the most likely severity outcome of the possible injury or ill-health identified earlier, that is, Level 1, 2, 3, 4 or 5.

Enter the number average of the RA Team's severity score in column "S" (Severity). Decimal numbers are acceptable. When using the 5x5 matrix, the guidance given in Table 4 should be used in selecting the level of severity.

h. Assessment of Likelihood

With the existing risk controls and residual risks in consideration, each team member is to rate the likelihood that the hazard may cause the injury/ill-health, that is, Level 1, 2, 3, 4 or 5. When considering likelihood, the RM or RA Team is to consider the existing medical condition of the affected persons that may affect the likelihood rating.

Enter the number average of the RA Team's likelihood score in column "L" (Likelihood). Decimal numbers are acceptable. When using the 5x5 matrix, the given in Table 5 should be used in selecting the level of Likelihood.

i. Risk Prioritisation Number

Obtain the Risk Prioritisation Number (RPN) by multiplying the "S" and "L" columns and entering the score in column "RPN" (i.e., $RPN = S \times L$). Decimal numbers are acceptable.

j. Classification of Risk—Risk Matrix

Compare the RPN against this Risk Matrix given in Table 6. Additional Risk Controls must be implemented such that the hazards are no longer in the red zone ("High Risk") before work commences.

Severity shall be listed in descending order of severity from the top to the bottom in the left column of the table 6. Likelihood shall be listed in ascending order of likelihood from left to right of the top row of the table 6.

The RM Team is to determine for its organisation with the concurrence of the employer, which areas within the Matrix are to be classified Low, Medium and High risks (Table 7). This may be done based on, and not limited to, industry practice, the policies of the workplace and organisation's risk appetite. All three categories, Low, Medium and High risks, are to be listed in the matrix.



k. Actions for risk levels

The following actions are to be implemented based on the current Risk Level, as shown in Table 8.

Risk level	Risk Acceptability	Recommended Actions
Low Risk	Acceptable	<ul style="list-style-type: none">• No additional risk control measures may be needed.• Frequent review and monitoring of hazards are required ensure that the risk level assigned is accurate and does not increase over time.
Medium Risk	Tolerable	<ul style="list-style-type: none">• A careful evaluation of the hazards should be carried out to ensure that the risk level is reduced to as low as reasonably practicable (ALARP) within a defined time• Interim risk control measures, such as administrative PPE, may be implemented while longer term measures are being established.• Management attention is required
High Risk	Not acceptable	<ul style="list-style-type: none">• High Risk level must be reduced to at least Medium Risk before work commences.• There should not be any interim risk control measures. Risk control measures should not be overly dependent on PPE or appliances.• If practicable, the hazard should be eliminated before work commences.• Management review is required before work commences

Table 8: Recommended action for risk levels

D. Risk control measures methodology

a. Additional Controls

Compare the existing controls against the Hierarchy of Control (see Figure 1). When considering additional measures to reduce risk, the more effective measures in the Hierarchy of Control should be considered first.

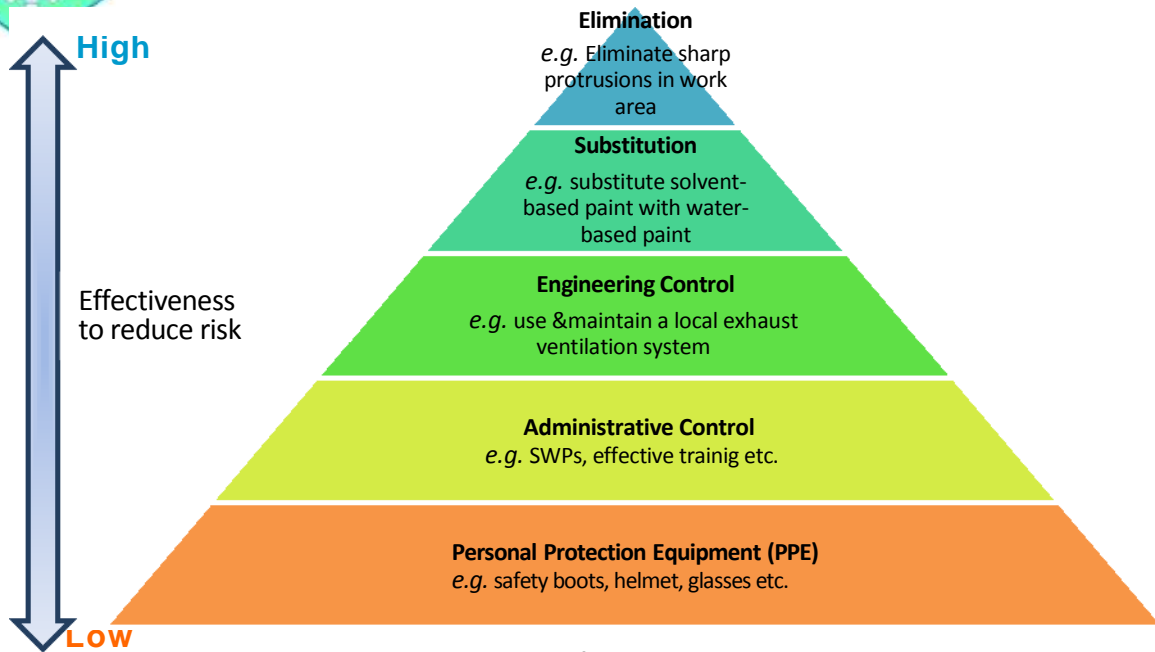


Figure 1 Hierarchy of Control Measure

b. Re-evaluation with Additional Controls

When Additional Control(s) have been decided, re-rate the Severity, Likelihood and RPN scores and record them in the “S”, “L” and “RPN” columns in the “Risk Control” section. The new risk control RPN shall not be HIGHER than the Risk Evaluation RPN.

c. Guidance Notes

Preferably, the revised RPN should be within the Low Risk (Green) zone. However, an improvement in RPN is acceptable provided it is not within the High Risk (Red) zone.

d. Implementation Person and Date

A specific person should be identified to lead the implementation of the Additional Controls. The person’s name is to be recorded in the “Implementation Person” column.

The due-date for implementation is to be recorded in the “due-date” column.

The Implementation Person is to provide progress updates to the RA Team on a periodic basis as determined by the RA Team Leader.

E. Schedule for implementation of risk management plan

a. RA Approval

Completed RA forms must be approved by the Manager of the area, function or activity where the risk is being assessed.



b. Implementation Actions

As far as is practicable, the Manager is to implement the recommended risk control measures as soon as possible.

The Manager shall ensure that:

- An action plan is prepared to implement the measures.
- The plan is monitored regularly until all the measures are implemented.
- all persons exposed to the risks are informed of:
 - The nature of risks; and
 - Any measures or SWP implemented.
- Regular inspections and process audits are carried out to ensure that risk control measures have been implemented and are functioning effectively.

c. Communication

While various forms and levels of communication are to take place throughout the RM process, the specific communication of the hazards identified and their controls is required to the persons performing the activity.

The Manager who oversees the area, function or activity where the WSH risks exist shall ensure that all persons exposed to the risks are informed of:

- The nature of risks;
- Any measures or SWP implemented; and
- The means to minimise or eliminate the risks.

d. Records

The Manager shall assist the employer to ensure that

- RA records, including but not limited to RA forms and control measure records, are kept for at least three years.
- The Risk Register is readily available for review by designated persons at the workplace and by regulatory agencies.



Table 9 Risk Management Plan

Project: Risk Management for XYZ Company															Date:
Major Tasks															Owner /
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	
Stage 1- Preparation															
1															
2															
3															
4															
Stage 2- Risk Assessment															
1															
2															
3															
4															
5															
Stage 3- Implementation and Review															
1															
2															
Stage 4- Record Keeping															
1															
2															



Resource 7.1 Presentation of Risk management plan

Risk management plan is to be presented to the relevant stakeholders for consideration for implementation. This can be done during the monthly WSH committee meeting, management meetings, department meetings, meeting with contractors etc.

Stakeholders

The affected stakeholders may include,

- Top and senior management
- Supervisors
- Subject Matter Experts
- Subordinates
- Consultants
- Contractors
- Suppliers

Various elements required for successful implementation of a risk management framework include:

- A clearly defined risk management framework and process
- Where risk management should be applied
- Common language for risk management
- Risk analysis tools
- Risk reporting
- Risk management techniques
- Scale of risk escalation and acceptance



RESOURCE 8: COMMUNICATE THE IDENTIFIED HAZARD, RISK EVALUATED, AND IMPLEMENTED RISK CONTROL MEASURES

Resource 8.1 Risk communication

Risk communication is a continuous or iterative process that an organisation conduct to provide, share and obtain information and to engage in dialogue with stakeholders regarding the management of risk.

The results of risk assessments should be communicated to stakeholders affected by the risks in a language understood by all.

The communication shall:

- Engages and involves people to contribute to the risk management process
- Provides clarity on the risks, processes, control measures, perceptions etc.
- Helps stakeholders to make informed decisions
- Enables stakeholders to know the risks they face and the appropriate control measures to implement to reduce the risks.

The success of the risk management program is determined to a large extent by the effective communication of its conclusions in order to secure the involvement and commitment of both management and employees; and

In addition, employers have a legal duty to provide employees with information relating to risk management arrangements in the workplace

Communicate the implemented risk control measures, which may include:

- Nature of risks involved
- Measures to mitigate and control risks
- Safe work procedures (SWPs) to control risks
- Management of change related to environment, equipment, work procedures and personnel
- Means of communication may include:
 - WSH committee meetings
 - Feedback sessions
 - Small group meetings (*e.g.* tool-box meeting, shift start/end meeting, etc.)



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- **One-on-one discussions**
- **Email and telephone calls**
- **Notice board/bulletins**



Learner's Activity 1

Objective (s) of Learning Activity 1:

- To establish the scope of the RM plan

Instructions to Trainer:

This exercise should be performed in a group. The group size should not be more than 5 candidates. Candidates will be given 15 minutes to discuss the given task in their own groups. Each group will send a representative to present the result to the class. Presentation will take up to 15 minutes. Trainer is to comment on the presentation accordingly.

Task for candidates:

You are required to apply the knowledge learnt so far in this course to scope up an RM plan for a company assumed by your group. You will need to:

- Define the roles and responsibilities of individuals in the company and their roles in RM.
- List the various job functions in your company / organisation
- Develop a simple WSH policy for your company



Learner's Activity 2

Objective (s) of Learning Activity 2:

- Establish the Hazard identification for your company

Instructions to Trainer:

This exercise should be performed in a group. The group size should not be more than 5 candidates. Candidates will be given 15 minutes to discuss the given task in their own groups. Each group will send a representative to present the result to the class. Presentation will take up to 15 minutes. Trainer is to comment on the presentation accordingly.

Task for candidates:

From the various hazard identification methods, determine hazards which you would have for your company in group activity 1. You will need to:

- List all the processes/activities in your company.
- Divide hazards into different categories.



Learner's Activity 3

Objective (s) of Learning Activity 3:

- Establish risk evaluation methodology for your company
- Establish risk control measures for your company.

Instructions to Trainer:

This exercise should be performed in a group. The group size should not be more than 5 candidates. Candidates will be given 15 minutes to discuss the given task in their own groups. Each group will send a representative to present the result to the class. Presentation will take up to 15 minutes. Trainer is to comment on the presentation accordingly.

Task for candidates:

From the various risk assessment tools learnt, determine the methodology which you would use for your company. You will need to define the method which you would use (e.g., 5x5 matrix). You should also include the type of formats (forms) which you would use. Then,

- Select a process at your workplace for this exercise and list down all activities (at least 5) involved in the process.
- For each of the activities, identify all foreseeable hazards
- Applying concepts of hierarchy of control and ALARP to the hazard identified,
 - List the existing control measures for each of the hazard identified and evaluate the existing risks.
 - Identify at least 5 additional control measures.



Learner's Activity 4

Objective (s) of Learning Activity 4:

- Establish the RM Plan

Instructions to Trainer:

This exercise should be performed in a group. The group size should not be more than 5 candidates. Candidates will be given 15 minutes to discuss the given task in their own groups. Each group will send a representative to present the result to the class. Presentation will take up to 15 minutes. Trainer is to comment on the presentation accordingly.

Task for candidates:

You are required to consolidate and establish a RM plan for your company. The RM plan should include:

- An inventory of work processes at your workplace
- A timeframe for the conduct of RA for each process
- A compilation of risk assessment (risk register)
- Measures to be taken to control risks, including suitable timeframe and the resources necessary



GLOSSARY

Additional Control	Additional risk control measures are those that are implemented beyond the existing controls to eliminate or to further reduce risk.
Administrative Control	The implementation of any administrative requirement which includes a permit-to-work system.
Contractor	A person engaged by another person (referred to as principal) otherwise than under a contract of service to supply any labor for gain or reward; or to do any work for gain or reward, in connection with any trade, business, profession or undertaking carried on by the other person
Employer	As defined in the WSH Act, an employer is a person who, in the course of the person's trade, business, profession or undertaking, employs any person to do any work under a contract of service. The self-employed person and principal, as defined in the WSH Act shall also fulfil the duties and functions of the employer specified in this CP. In RMCP, "Employer" means the most senior person responsible for the workplace.
Engineering Control	Application of any scientific principle for the control of any workplace hazard.
Event	Occurrence or existence of a particular set of circumstances
Hazard	Anything, any source or any situation with the potential to cause bodily injury or ill-health.
Likelihood	The probability or frequency of an event occurring.
Principal	A person who, in connection with any trade, business, profession or undertaking carried on by him, engages any other person otherwise than under a contract of service to supply any labor for gain or reward; or to do any work for gain or reward.
WSH Risk	The likelihood that a hazard will cause a specific bodily injury to any person.
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.
Risk Assessment	The team(s) responsible for conducting RAs within the scope defined by



Team(s)	the RM or RA Team. If an organisation requires only one team, then the functions of the RA and RM team may be combined
Risk Management	The identification, assessment and prioritisation of WSH risks followed by the application of control measures to minimise the probability and/or impact of undesirable WSH consequences.
Risk Management Plan	Decision on approach and plan for the management of risk throughout the organization.
Risk Management (RM) Team(s)	The primary team responsible for the overall RM direction and activities of the workplace. In larger organisations, many functional or area RA Teams may evolve. The responsibility to steer the overall organisation's RM effort will fall on the RM Team. The RM Team can
Risk Matrix	A matrix to classify risk categories for subsequent control with severity and likelihood levels as the two factors determining risk. Common risk matrices include the 3x3 matrix, 5x4 matrix, 5x5 matrix and the 7x7 matrix. Organisations may develop matrices that are suitable and relevant to their operations.
Risk Register	The collection of RAs within the organisation.
Safe Work Procedure	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.
Self-employed Person	A person who works for gain or reward otherwise than under a contract of service, whether or not employing others.
Severity	The degree or extent of injury or harm caused by hazard, or as a result of an accident.
Stakeholder	A stakeholder is any person or party who is affected by the Workplace Safety and Health Act.
Substitution	The replacement of any hazardous material, process, operation, equipment or device with less hazardous ones.
Workplace	As defined in the WSH Act, a workplace means any premises where a person is at work or is to work, for the time being works, or customarily works, and includes a factory.



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APPENDIX 1 WORK ACTIVITY INVENTORY

Department, Activity or Activities				Date
Ref	Location	Process	Work Activity	Remarks
1				
2				
3				
4				
5				
6				
7				
8				



APPENDIX 2 RISK ASSESSMENT FORM

Risk Assessment Form															
Department				RA leader:			Approved by:			Reference number:					
Process				RA member 1:			Signature:								
Process/activity location				RA member 2:											
Original assessment date				RA member 3:									Name:		
Last review date				RA member 4:									Designation:		
Next review data				RA member 5:									Date:		
Hazard Identification			Risk Evaluation				Risk Control								
Ref.	Work Activity	Hazard	Existing Risk Controls	S	L	RPN	Additional Controls	S	L	RPN	Implementation Person	Due Date	Remarks		
1															
2															
3															



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						



APPENDIX 4 TRADE-BASED RISK ASSESSMENT FORM

Trade-based Risk Assessment Form			
Company		Conducted by: (Names, designations)	
Job			
Last review date			
Next review data		Date:	
Hazard Identification	Risk Evaluation	Risk Control	
Hazard associated with trade	Is hazard likely to harm	List of risk control measures Tick if it is an existing	Implementation date & Action officer/ Remarks
	n Yes n No	n	
		n	
		n	
	n Yes n No	n	
		n	
		n	



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RISK ASSESSMENT				RM Leader:				Approved by			Reference Number		
Co. Name:				RM Member 1:									
Location:				RM Member 2:									
Original Assessment Date:				RM Member 3:				Name:					
Last Review Date:				RM Member 4:				Designation:					
Next Review Date				RM Member 5:				Date:					
1. Hazard Identification				2. Risk Evaluation				3. Risk Control					
Ref No.	Work Activity	Hazard	Possible Injury/ Ill Health	Existing Risk Control (If any)	S	L	R	Additional Risk Control	S	L	R	Implementation Person / Due Date	Remarks
1				-									
2				-									
3				-				-					



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RISK ASSESSMENT				RM Leader:				Approved by				Reference Number	
Co. Name:				RM Member 1:									
Location:				RM Member 2:									
Original Assessment Date:				RM Member 3:				Name:					
Last Review Date:				RM Member 4:				Designation:					
Next Review Date				RM Member 5:				Date:					
1. Hazard Identification			2. Risk Evaluation					3. Risk Control					
Ref No.	Work Activity	Hazard	Possible Injury/ Ill Health	Existing Risk Control (If any)	S	L	R	Additional Risk Control	S	L	R	Implementation Person / Due Date	Remarks
1				-									
2				-									
3				-				-					



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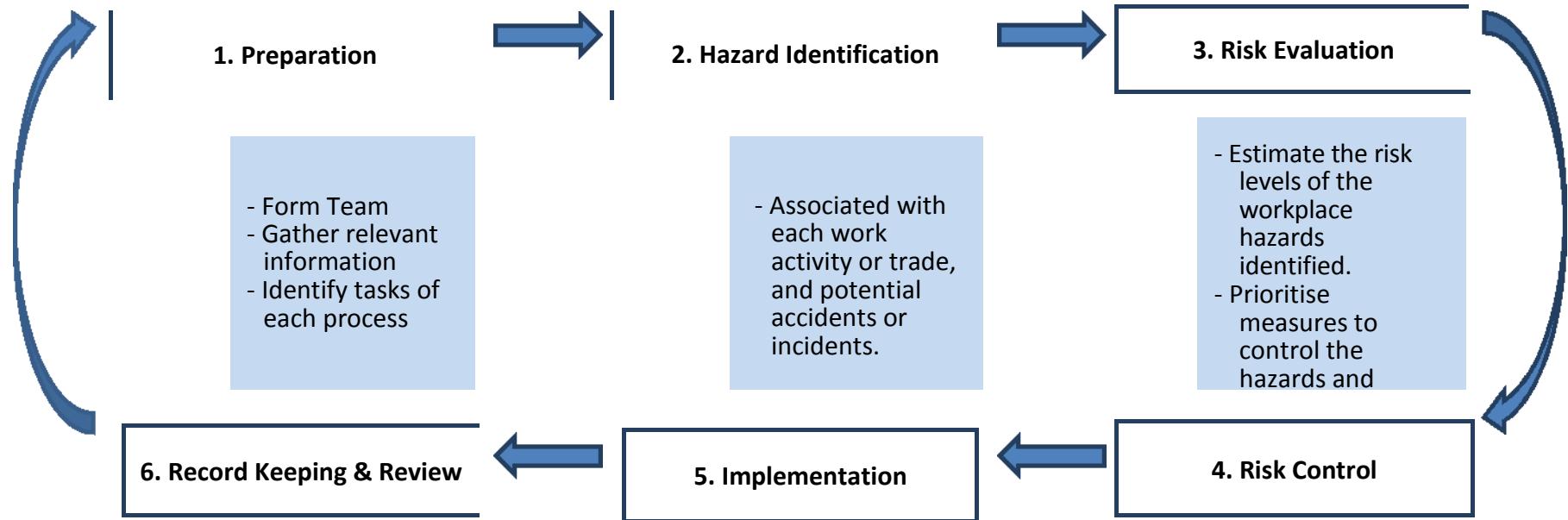
1. Hazard Identification			2. Risk Evaluation					3. Risk Control					
Ref No.	Work Activity	Hazard	Possible Injury/ Ill Health	Existing Risk Control (If any)	S	L	R	Additional Risk Control	S	L	R	Implementation Person / Due Date	Remarks

Likelihood Severity	Rare (1)	Remote (2)	Occasional (3)	Frequent (4)	Almost Certain (5)
Catastrophic (5)	5	10	15	20	25
Major (4)	4	8	12	16	20
Moderate (3)	3	6	9	12	15
Minor (2)	2	4	6	8	10
Negligible (1)	1	2	3	4	5

Risk Prioritisation Number (RPN)	Risk Level
15 – 25	High Risk
4 – 12	Medium Risk
1 - 3	Low Risk



APPENDIX 5 RISK MANAGEMENT CYCLE





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- Must be available upon request
- Kept for at least three years
- Audit or Regular Inspections
- Review RA on a regular basis:
 1. Every 3 years.
 2. New information
 3. Changes of areas
 4. After any accident or serious incident

- Obtain Employer or Management approval
- Implement Control Measures
- Communicate the hazards identified and their controls -

- Control hazards and reduce risks by the following Hierarchy of Control measures:
 - Elimination
 - Substitution
 - Engineering controls
 - Administrative controls
 - PPE

