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





# Preface

As Workplace Safety and Health (WSH) Risk Management (“RM”) gains momentum in Singapore, more duty holders are beginning to recognise the value and benefits of Risk Assessments (“RA”) in maintaining a safe and healthy workplace. Duty holders and employees alike are seeking greater clarity on the implementation of RA. To address this and provide useful guidance, the WSH Council formed an industry-led RM Work Group with members from major industry sectors to develop the *Code of Practice on WSH Risk Management* (herein referred to as “Risk Management Code of Practice” or “RMCP”).

The RMCP advises duty holders on their obligations under the Workplace Safety and Health Act (“WSH Act”) and the WSH (Risk Management) Regulations. It also provides guidance on a systematic process for implementing RM, from identification of hazards and evaluation of associated risks to implementation of relevant risk controls.

Much consideration has been given to make the RMCP applicable to large and small companies across industries, as the risk profiles and needs of workplaces and their methods of RM deployment differ significantly.

Large companies tend to have a dedicated RM Team to oversee the consistent deployment of RM throughout the organisation. At the same time, it is also usual for these companies to have multiple RA Teams to look at specific risks or work processes. The RMCP offers clarity in the roles of the different teams and/or individuals.

Smaller companies, on the other hand, often need specific guidance in implementing RM. To assist this segment, the RMCP defines stakeholders’ responsibilities and provides information on RM implementation. The RMCP also recommends the 5x5 risk matrix for risk evaluation; however, it does not restrict companies to their choice of RA methodologies and risk matrices.

In this second revision, the principles of RM are introduced so that companies can implement RM more effectively. Human and cultural factors influence RAs and should be considered when companies conduct RAs. The revised RMCP also recommends some possible roles that a human resource manager could play to complement those other duty holders for a holistic RM.

In view of a heightened awareness of occupational health hazards in the industry, the risk evaluation of health hazards is included to enhance the overall assessment of workplace hazards. Upstream risk controls in the hierarchy of control, for example, from elimination and substitution to engineering controls, are emphasised for their relative importance in managing workplace risks.

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# 1. Purpose

The purpose of this Code of Practice (CP) on WSH Risk Management is to establish the minimum requirements and duties for implementing workplace RM in Singapore, and provide guidance on its implementation. This CP applies to all workplaces in Singapore that are governed by the Workplace Safety and Health (WSH) Act. Conducting risk assessments and implementing risk control measures are requirements under the WSH (Risk Management) Regulations.

## 2. Abbreviations

CP	Code of Practice
MOM	Ministry of Manpower
PPE	Personal Protective Equipment
RA	Risk Assessment
RM	Risk Management
RM Regulations	WSH (Risk Management) Regulations
RPN	Risk Prioritisation Number
SWP	Safe Work Procedure
WSH	Workplace Safety and Health
WSH Act	Workplace Safety and Health Act
WSH Council	Workplace Safety and Health Council

# 3. Overview

The main components of Risk Management (RM) are:

- Preparation;
- Risk Assessment (RA);
- Risk Control Implementation;
- Record-keeping; and
- Review.

# 4. General Requirements

## 4.1 General

**4.1.1** RA shall be carried out and risk control measures shall be implemented before any new work commences.

## 4.2 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 or Principal shall also fulfill the duties and functions of an Employer specified in this CP.

**4.2.1** An Employer shall:

**4.2.1.1** Ensure that a RA is conducted on WSH risks associated with any activity in the workplace.

**4.2.1.2** Take all reasonably practicable steps to eliminate any foreseeable risk to any person.

**4.2.1.3** Take measures to control the risk by means of, and in the following order of consideration where risk elimination is not reasonably practicable:

- substitution;
- engineering control;
- administrative control; and
- provision and use of suitable personal protective equipment (PPE).

**4.2.1.4** Support the implementation of risk control measures recommended by the RM or RA Teams.

**4.2.1.5** Require the RM Leader to provide regular updates of the RA done and risk control measures implemented to reduce or eliminate identified risks.

**4.2.1.6** Require RA updates at each WSH Committee meeting, if such a committee is established, or at the workplace's regular meetings (e.g., new findings, progress of risk control actions).

**4.2.1.7** Require the contractor or supplier where work has been assigned or awarded, to conduct a RA. The contractor or supplier must take reasonably practicable measures to eliminate, or reduce to as low as reasonably practicable, the risk that may be posed by their work (e.g., when they work with machines, equipment or hazardous substances).

**4.2.1.8** Ensure that a Risk Register is available and maintained at the workplace.

**4.2.1.9** Ensure that the Risk Register is prepared in accordance with this CP.

**4.2.1.10** Ensure that the Risk Register is readily available for review by designated persons at the workplace and by regulatory agencies.

**4.2.1.11** Ensure that RA records, including but not limited to RA forms and control measures records, are kept for at least three years from the RA approval date.

**4.2.1.12** Review and, if necessary, revise the RA at least once in three years from the RA approval date, or:

- upon any accident, incident, near miss or dangerous occurrence;
- when there is any significant change in work process or activity; or
- when new information on WSH risks is made known.

**4.2.1.13** Monitor effectiveness of the risk control measures.

## 4.3 Manager

This may be the person who manages a physical area (“Area Manager”, e.g., Warehouse Manager), a function (“Functional Manager”, e.g., Production Manager) or of an activity (e.g., Machining Manager) within the workplace. In some workplaces, this may be the Employer. The Employer is to determine the appropriate level of engagement for this role.

- 4.3.1** The Manager who oversees the area, function or activity where the WSH risks exist, shall:
- Ensure that a RA is conducted and risk control measures are implemented before any new work is carried out in the Manager’s area.
  - Approve the RA conducted for the Manager’s area. The Manager should also ensure that the risk level is not rated “High Risk” when approving work to be carried out.
  - Ensure that the risk control measures are implemented without delay.
  - Ensure that, where applicable, all operations have established Safe Work Procedures (SWPs).
  - 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.
  - Ensure that the effectiveness of the risk control measures is monitored.
  - Revise the RA if the risk control measures are inadequate and ineffective after the implementation, by obtaining more information and/or modifying controls.
  - Maintain RA documentation of control measures and SWP that were implemented.
- 4.3.2** The Manager shall assist the Employer to implement the requirements in Clauses 4.2.1.8 to 4.2.1.13.
- 4.3.3** The Manager may authorise other persons to execute the duties mentioned above but remains accountable for them.
- 4.3.4** The Manager should work together with a Human Resource Manager to specify WSH training necessary for job positions and functions.

## 4.4 Human Resource Manager

- 4.4.1** Ensure that a robust recruitment process is in place to choose suitable job candidates who are able to meet position requirements and WSH obligations.
- 4.4.2** Specify safety and health responsibilities in the job descriptions of employees, and ensure that these responsibilities are effectively communicated to all employees.
- 4.4.3** Ensure that all new employees are given appropriate and sufficient orientation, and WSH training to equip them with the relevant knowledge, skills and abilities to succeed in their positions.
- 4.4.4** Support the Employer and Manager to ensure that RA, risk control measures and SWPs are effectively communicated to all employees.
- 4.4.5** Ensure that WSH training and other related RA records are documented.
- 4.4.6** Work with the Manager and RM or RA Leaders to consider safety and health outcomes in employees’ performance evaluation, remuneration and discipline, and to ensure consistent behaviour and practices in line with organisational expectations, where applicable.
- 4.4.7** Implement programmes that support and maintain employees’ safety, health and wellbeing.
- 4.4.8** Participate in WSH inspections of organisation’s premises to ensure that WSH legislations are followed and WSH issues are promptly addressed, where appropriate.
- 4.4.9** In the absence of a Human Resource Manager in the organisation, the equivalent person undertaking such a work profile of the Human Resource Manager should execute the duties mentioned above.

## **4.5 Risk Management and Risk Assessment Leaders**

**4.5.1** The RM Leader shall assist the Employer and Manager in coordinating RM within the workplace.

**4.5.2** The RM or RA Leader shall:

- Provide regular updates on the appropriate risk control measures implemented to eliminate or reduce identified risks to the Employer, preferably monthly but no less than once a year;
- Obtain approval from the Employer or the designated Manager for the implementation of risk control measures; and
- Assist the Employer to ensure that the Risk Register is prepared in accordance with this CP.

## **4.6 Employees**

**4.6.1** Employees are to adhere to the measures stated in the RAs.

**4.6.2** Employees are to report to their immediate supervisors any incident, accident, near miss or dangerous occurrence so that prompt action can be taken to address them.

# 5. Preparation

## 5.1 Formation of Risk Management or Risk Assessment Teams

### 5.1.1 Appointment of Risk Management Team

5.1.1.1 The Employer shall:

- Appoint a RM Team Leader; and
- Appoint RM Team Members.

5.1.1.2 The RM Team shall be responsible for the overall RM direction and RM activities of the workplace.

5.1.1.3 The RM Team appointed by the Employer must:

- Have a thorough knowledge of the work to be assessed; and
- Be multi-disciplinary, diverse with representation from major stakeholders of all the workplace functions.

5.1.1.4 Except in a single-person workplace (e.g., self-employed), RA is to be conducted by a multi-disciplinary team who has thorough knowledge of the work to be assessed.

5.1.1.5 The Employer shall ensure that the RM Leader is competent for the task (see Clause 5.1.2).

### 5.1.2 Risk Management Team Leader

5.1.2.1 The RM Team Leader should be competent for the task. Basic competency can be attained through completing a RM course conducted by Workforce Development Authority (WDA) Approved Training Organisation (ATO) or equivalent.

5.1.2.2 The RM Team Leader should also be experienced with the work and processes in the workplace, and have direct access to the Employer.

### 5.1.3 Risk Management Team Members

5.1.3.1 RM team members may be appointed from management staff, process or facility engineers, technical personnel, supervisors, production operators, maintenance staff and WSH personnel, where suitable.

### 5.1.4 Risk Assessment Teams

5.1.4.1 Where more teams are required to conduct RA in the Workplace, Risk Assessment Teams ("RA Teams") can be formed (see Figure 1).



Figure 1: RM and RA Teams.

- 5.1.4.2** RA Teams are responsible for conducting RAs within the scope defined by the RM Team. If an organisation requires only one team, then the functions of the RM and RA teams may be combined within the RM Team.
- 5.1.4.3** RA Teams should have representatives from management and non-management levels.
- 5.1.4.4** The RA team should include personnel who are involved with the work, including contractors and suppliers. If available, it should also include persons who are familiar with the design and development of the site, machine or process.
- 5.1.4.5** If the inclusion is not feasible as detailed in 5.1.4.4, designers, suppliers and other contributors may be invited to share their comments and suggestions with the RA Team.
- 5.1.4.6** Where RA experience or expertise is lacking, a WSH Officer, WSH Auditor or Third Party Consultant who is trained and has experience in conducting RA should be engaged to assist the RM or RA leader in conducting RA.
- 5.1.4.7** The RA Team Leader should be competent for the task. Basic competency can be attained through completing a RM course conducted by a WDA ATO or equivalent.
- 5.1.4.8** The RA Team Leader should be experienced with the type of work within his or her scope, and have direct access to the RM Team Leader, or in the absence of one, to the Employer.

## **5.2 Extent of Risk Assessment—Determine What is to be Assessed**

### **5.2.1 Scoping the Risk Assessment**

Scoping is the step of identifying a convenient unit (or “Boundary”) for assessing and controlling risks 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.

- 5.2.1.1** The RM Team (the primary team responsible for the overall RM direction and activities of the company) shall determine the boundaries of the RA (e.g., department, functional area or work activity within the workplace).
- 5.2.1.2** RAs for each identified department, functional area or work activity should be scoped by the RA Team to provide focus to the assessment.

### **5.2.2 Inventory of Work Activities Form**

**5.2.2.1** For the identified departments, functional areas and work activities to be assessed, the “Inventory of Work Activities” form should be used (see Appendix A).

**5.2.2.2** This CP accepts variation in form format but requires the following information to be included:

- department, activity or trade assessed;
- location;
- process; and
- work activity.

**5.2.2.3** For trade-based RA:

- State the trade being assessed in “Department, Activity or Trade Assessed”;
- Where the location or process is not applicable, state “N/A” in these columns; and
- Complete Work Activity List.

## 5.3 Gather Relevant Information

Once the extent of the RA is determined, relevant information should be gathered. These sources of information may include, but are not limited to:

- workplace layout plan;
- process or work flowchart;
- list of work activities in the process;
- list of chemicals, machines and/ or tools used;
- records of past incidents and accidents;
- relevant legislation, CPs or specifications;
- observations and interviews;
- WSH inspection records;
- details of existing risk controls;
- health and safety audit reports;
- feedback from employees, clients, suppliers or other stakeholders;
- SWPs;
- other information such as safety data sheets (SDS), manufacturer's instruction manual;
- copies of any previous RAs that are relevant;
- medical condition (e.g., allergy) of employees in the workplace or activity being assessed; and
- past training records of employees.

# 6. Risk Assessment

## 6.1 General Requirements

- 6.1.1** The steps in RA, namely, Hazard Identification, Risk Evaluation and Risk Control, specify the RA methodology and requirements of this CP.
- 6.1.2** All identified hazards from work activities and sub-activities need to be evaluated for their associated risks and addressed using relevant risk controls. These steps and their results must be recorded in the RA Form.
- 6.1.3** As part of continual improvement, this CP recommends that workplace hazards be monitored regularly till:
- the risk level of the hazard is low (“green zone” of the risk matrix);
  - the remaining risks of the hazard are residual in nature (see Appendix E); or
  - all reasonably practicable measures have been taken to mitigate the risk.
- 6.1.4** All RA entries must be reviewed at least once every three years, or:
- upon any accident, incident, near miss or dangerous occurrence;
  - when there is any significant change in work process or activity; or
  - when new information on WSH risks is made known.

## 6.2 Principles

- 6.2.1** RA is the cornerstone of the RM process. It is an integral part of all organisational work processes, from strategic planning to project and change management. The key steps in the RM process are outlined in Figure 2.

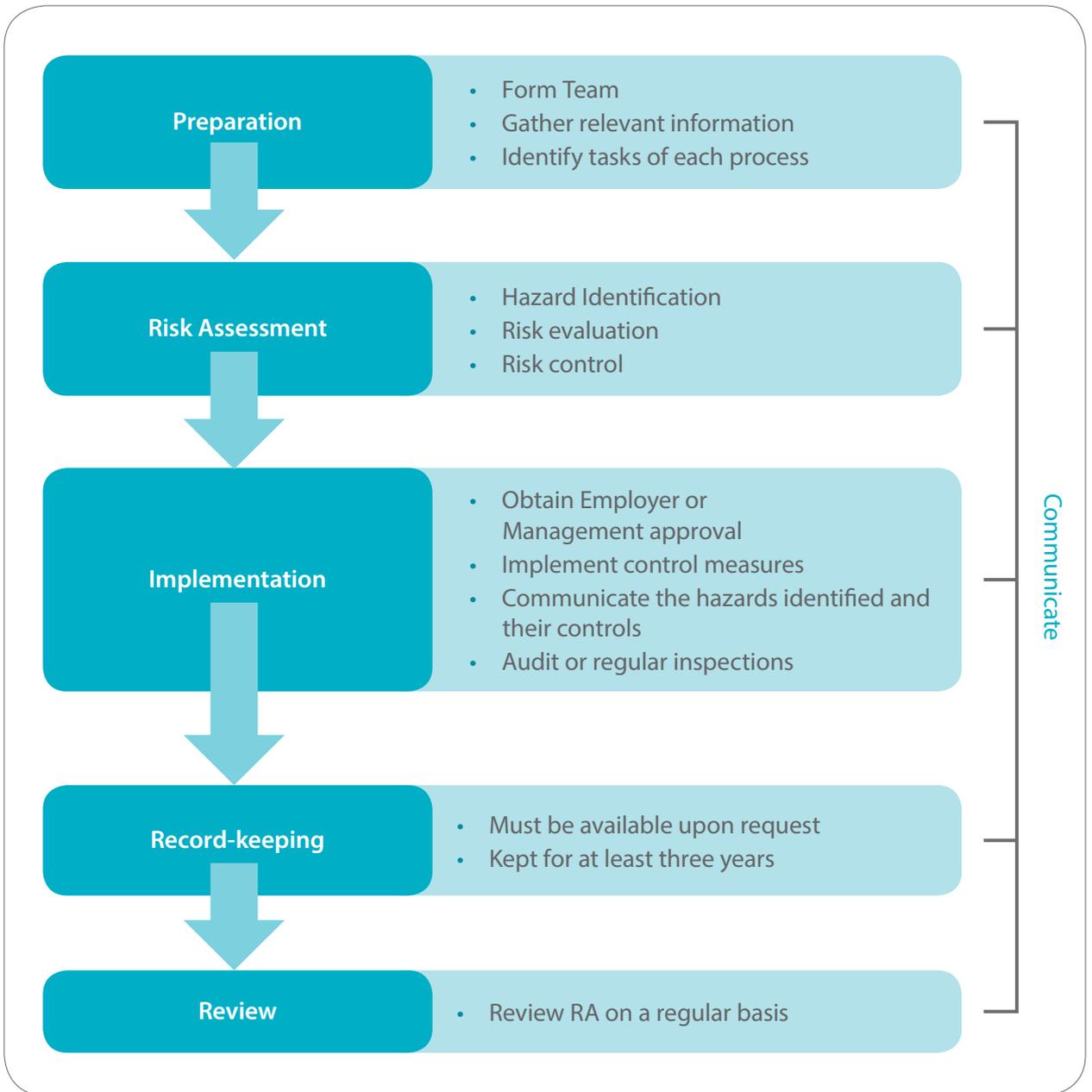


Figure 2: Risk management process.

- 6.2.2 RA is customised and tailored to each organisation and its specific work environment.
- 6.2.3 RM contributes to the achievement of organisational objectives and improvement of performance in business, operational efficiency, regulatory, safety and health compliance and environmental protection.
- 6.2.4 RM addresses uncertainty and helps businesses make informed decisions and prioritise actions.
- 6.2.5 RA provides a systematic approach to RM and leads to consistent and reliable results.
- 6.2.6 RA inputs are based on various information sources such as the RA team members' competency and experience, observations, employee feedback and expert opinions. The limitations of these information sources must be taken into account to ensure that the RA is based on the best available information.
- 6.2.7 RA takes human and cultural factors into account. It recognises that the capabilities and health risk factors of employees should be managed when conducting a RA.
- 6.2.8 RM should work alongside all other aspects of an organisation to facilitate continual improvement, and be responsive to change when new risks emerge or existing ones change.

## 6.3 Hazard Identification

### 6.3.1 General

- 6.3.1.1 The RA Team Leader has to determine the most appropriate way(s) of identifying hazards. These may include brainstorming, systematic process reviews, Process Hazard Analysis (PHA), Job Observations and Job Safety Analysis (JSA).
- 6.3.1.2 When identifying hazards, the RA Team has to consider if the hazards could cause harm beyond the immediate area of their work.

### 6.3.2 Process

- 6.3.2.1 Select a "Work Activity" from the "Inventory of Work Activities" form (see Appendix A) and place it in the "Risk Assessment Form" (see Appendix B) for analysis. Variations of these forms can be used, however, all information required in the forms has to be documented.
- 6.3.2.2 Break down work activity into its sub-activities to facilitate the identification of all foreseeable hazards associated with the work. These sub-activities constitute the different steps that make up the work activity.
- 6.3.2.3 For each sub-activity, identify the potential hazard(s) and record them in the "Hazard" column. List each hazard in a separate row in the table.
- 6.3.2.4 The following categories of hazards should be considered:
  - physical (e.g., fire, noise, ergonomics, heat, radiation);
  - 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); and
  - psychosocial (e.g., stress, fatigue).

### 6.3.3 Human and Cultural Factors

RA should consider organisational culture and personal risk factors that could compromise employees' work ability and safety (e.g., decreased mental alertness, fatigue, loss of concentration). Risk control measures can be implemented to take into account varying perceptions and behaviour.

- 6.3.3.1 Work organisation factors (include excessive workload, prolonged working hours, lack of adequate training, inadequate acclimatisation to hot work environment).
- 6.3.3.2 Individual health risk factors (include health risks uncovered from medical examinations, individual susceptibility to certain health risks, smoking as a risk factor for many diseases, health effects of alcohol misuse).

### 6.3.4 Workplace or Work-related Factors

#### 6.3.4.1 Other factors to consider when identifying hazards:

- proximity of hazardous activities to one another;
- compatibility of work activities;
- non-routine work activities and situations; and
- environmental conditions.

## 6.4 Risk Evaluation

### 6.4.1 Risk Matrices

6.4.1.1 This CP recognises the various risk evaluation methods and matrices practised and preferred by workplaces. While this CP does not restrict workplaces to its choice of matrices, the numeric 5x5 Risk Matrix is recommended. Common matrices include, but are not limited to, the examples given in Tables 1, 2 and 3.

Severity \ Likelihood	Remote	Occasional	Frequent
Major	Medium Risk	High Risk	High Risk
Moderate	Low Risk	Medium Risk	High Risk
Minor	Low Risk	Low Risk	Medium Risk

Table 1: Example of a common 3x3 Risk Matrix with descriptive ratings.

Severity \ Likelihood	Rare (1)	Remote (2)	Occasional (3)	Frequent (4)	Almost Certain (5)
Catastrophic (A)	Medium	Medium	High	High	High
Major (B)	Medium	Medium	Medium	High	High
Moderate (C)	Low	Medium	Medium	Medium	High
Minor (D)	Low	Medium	Medium	Medium	Medium
Negligible (E)	Low	Low	Low	Medium	Medium

Table 2: Example of a common 5x5 Risk Matrix with a mix of numeric and descriptive ratings.

6.4.1.2 The Matrix recommended by this CP is as follows:

Severity \ Likelihood	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 3: Recommended 5x5 Risk Matrix with numeric ratings or Risk Prioritisation Number.

**6.4.1.3** The risk matrix used in the RA should be displayed at least once, and preferably at every page of the RA form. This is particularly important when numeric ratings are used, as risk prioritisation number (RPN) may represent different levels of risk with different sizes of the risk matrix.

## 6.4.2 Existing Controls

**6.4.2.1** Existing controls are control measures that are already in place, or required to be implemented to carry out the work activity.

**6.4.2.2** Assessment of severity and likelihood should be made on the assumption that existing (or required) controls are in place.

**6.4.2.3** Existing (or required) controls that do not influence severity should not be taken into account when assessing severity.

**6.4.2.4** Existing (or required) controls that do not influence likelihood should not be taken into account when assessing likelihood.

## 6.4.3 Assessment of Severity

**6.4.3.1** Taking the existing risk controls and residual risks into consideration, the RA Team has to rate the severity of the possible injury or ill-health.

**6.4.3.2** When using the 5x5 matrix, the guidance given in Table 4 should be used when selecting the level of severity.

**6.4.3.3** When using other matrices, equivalent guidance for severity should be used and described in adequate details for adoption by users of those matrices.

Level	Severity	Description
5	Catastrophic	Death, fatal diseases or multiple major injuries.
4	Major	Serious injuries or life-threatening occupational diseases (includes amputations, major fractures, multiple injuries, occupational cancers, acute poisoning, disabilities and deafness).
3	Moderate	Injury or ill-health requiring medical treatment (includes lacerations, burns, sprains, minor fractures, dermatitis and work-related upper limb disorders).
2	Minor	Injury or ill-health requiring first-aid only (includes minor cuts and bruises, irritation, ill-health with temporary discomfort).
1	Negligible	Negligible injury.

Table 4: [A guide to severity rating.](#)

**6.4.3.4** Should RA Team members have difficulty developing a consensus to the severity level, the Team is to gather more information and/or consult an industry expert.

## 6.4.4 Assessment of Likelihood

**6.4.4.1** Taking the existing risk controls and residual risks into consideration, the RA Team has to rate the likelihood the hazard may cause injury or ill-health.

**6.4.4.2** When assessing likelihood, the RA Team has to consider personal risk factors - existing medical condition(s) of the person(s) involved in the activity that may affect the likelihood level.

**6.4.4.3** When using the 5x5 matrix, the guidance given in Table 5 should be used when selecting the level of likelihood.

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

Table 5: A guide to likelihood rating.

**6.4.4.4** When using other matrices, equivalent guidance for likelihood should be used and described in adequate details for adoption by users of those matrices.

**6.4.4.5** Should RA Team members have difficulty developing a consensus to the likelihood level, the Team is to gather more information and/or get advice from an industry expert.

#### 6.4.5 Risk Prioritisation Number

**6.4.5.1** The RPN is obtained by multiplying the values of Severity and Likelihood level (values in the “S” and “L” columns of the RA form), that is,  $RPN = S \times L$ .

#### 6.4.6 Classification of Risk—Risk Matrix

**6.4.6.1** Compare the RPN against the Risk Matrix in Table 6.

**6.4.6.2** Risk controls must be implemented so that the risk levels are not in the red zone (“High Risk”) before work commences. Additional Risk Controls should be implemented till:

- Risk controls for the hazard in the yellow zone (“Medium Risk”) are already As Low As Reasonably Practicable (ALARP); or
- The risk level is in the green zone (“Low Risk”).

Severity \ Likelihood	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: 5x5 Risk matrix with numeric ratings.

**6.4.6.3** The RM or RA Team is to determine for their organisation, with the concurrence of the Employer, which are the areas within the Matrix to be classified as Low, Medium and High risks. The categorisation of risk may be done based on, but is not limited to, industry practice, policies of the workplace and risk appetite of the organisation.

#### 6.4.7 Action for Risk Levels

The following actions are to be implemented based on the current risk level (see Table 7).

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

Table 7: Recommended action for risk levels.

## 6.5 Risk Evaluation for Health Hazards

- 6.5.1** Exposure assessments should be conducted to estimate employees' exposure to health hazards where appropriate. Exposures can be estimated by qualitative assessment or quantified by direct measurement. All exposure measurements should be conducted by competent persons using recognised methods, acceptable standard procedures and standard calibrated equipment.
- 6.5.2** Where there are large numbers of workers, groups of workers with similar exposure levels could be identified for more efficient exposure assessment.
- 6.5.3** Exposure estimates are then compared to established Permissible Exposure Level (PEL) or other health standards to establish the likelihood of the ill-health effects.
- 6.5.4** Based on exposure assessment and risk evaluation, health exposure risks can be ranked to enable prioritisation of action plans to lower these risks.
- 6.5.5** When assessing the risk of health hazards (e.g., noise, chemicals, biological agents and ergonomics), relevant risk factors should be taken into consideration (see Appendix F).
- 6.5.6** It is also important to consider other factors which may influence likelihood such as:
- potential cumulative exposures;
  - potential synergistic effects between certain health hazards (e.g. exposure to excessive noise and trichloroethylene [TCE] will increase likelihood of hearing impairment); or
  - any limitation in health standards if they do not consider all exposure routes. (e.g., potential dermal or ingestion risks are generally not taken into account when setting PELs).

## 6.6 Risk Control

Selection of risk control measures should be based on the Hierarchy of Control. Elimination of hazard should take precedence, where practicable. Where elimination is not feasible, measures should be taken to reduce the risk by following the Hierarchy in the recommended order: substitution, engineering controls, administrative controls and personal protective equipment.

### 6.6.1 Hierarchy of Control

6.6.1.1 The control of hazards and reduction of risks can be accomplished by following the Hierarchy of Control (see Figure 3).

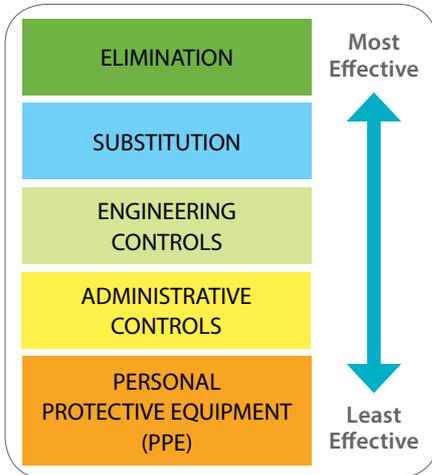


Figure 3: **Hierarchy of Control.**

6.6.1.2 A control measure that is higher on the Hierarchy is often more effective as the risk is reduced at or close to the source.

6.6.1.3 The control measures in the Hierarchy are not to be taken as isolated or single solutions. Generally, it is more effective to use a combination of control measures. For example, engineering controls work better with administrative controls like training and SWPs.

6.6.1.4 The control measures in the Hierarchy are explained in detail in Appendix C.

### 6.6.2 Additional Controls

6.6.2.1 Check the risk level (or RPN) for acceptability. If the risk level is "High" or RPN is in the "High" zone, the risk must be eliminated or reduced to at least a "Medium" level by additional controls.

6.6.2.2 When considering additional controls to reduce risk, control measures that are higher up in the Hierarchy of Control should be considered first.

### 6.6.3 Re-evaluation with Additional Controls

6.6.3.1 When additional control(s) have been decided, re-rate the Severity, Likelihood and Risk levels (or RPN values) and record them in the "S", "L" and "RPN" columns in the "Risk Control" section of the RA form.

6.6.3.2 The re-evaluated RPN should not be HIGHER than the initial RPN.

### 6.6.4 Guidance Notes

6.6.4.1 The revised Risk levels (or RPN values) should preferably be kept within the Low Risk (Green) zone, where feasible.

### 6.6.5 Implementation Person and Date

6.6.5.1 A specific person should be identified to lead the implementation of the additional controls. Record the person's name in the "Implementation Person" column.

6.6.5.2 If the person mentioned in 6.6.5.1 cannot be identified at the time the RA form was being completed, a designation of person may be indicated. The Manager is to propose this suitable person.

6.6.5.3 The due-date for implementation is to be recorded in the "Due-Date" column.

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

# 7. Implementation

## 7.1 Risk Assessment Approval

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

## 7.2 Implementation Actions

**7.2.1** As far as is practicable, the Employer or Manager has to implement the recommended risk control measures as soon as possible.

**7.2.2** The Employer or Manager must ensure that an action plan is prepared to implement the measures. The plan should include a timeline for implementation and the names of the persons responsible for implementing the safety and health control measures.

**7.2.3** The Employer or Manager must ensure that the plan is monitored regularly until all the measures are implemented.

**7.2.4** The Employer or Manager must ensure that all persons exposed to the risks are informed of:

- the nature of risks; and
- any measures or SWP implemented.

**7.2.5** The Employer or Manager must ensure that regular inspections and process audits are carried out to make sure that risk control measures have been implemented and are functioning effectively.

**7.2.6** After the implementation of additional controls, the “Existing Controls” and “Additional Controls” columns of the RA form have to be updated (see Appendix E for information on how to update the RA form).

## 7.3 Records

**7.3.1** The Manager shall assist the Employer to ensure that the RA records, including but not limited to the RA forms and control measure records, are kept for at least three years.

**7.3.2** The Manager shall assist the Employer to ensure that the Risk Register is readily available for review by designated persons at the workplace and regulatory agencies.

# 8. Communication

- 8.1** Communication and consultation with external and internal stakeholders, including all functions and levels within the organisation, should take place during all stages of the RM process.
- 8.2** All persons at the workplace should be informed of the risks they face and the control measures available to manage those risks.
- 8.3** Communication can take various forms (such as meetings, staff dialogues, trainings, notice boards and various electronic means) for different groups within the organisation.
- 8.4** Effective communication and consultation involve two-way dialogues between stakeholders.

# 9. List of References

1. AS/NZS 4360:2004, Risk Management (Standards Australia)
2. BS 31100:2008, Risk Management – Code of Practice (BSI)
3. Identifying Hazards in the Workplace – A Guide for Hazards in the Workplace (Australia Comcare)
4. ISO 31000: 2009 Risk Management – Principles and guidelines
5. ISO/IEC Guide 73:2009, Risk Management Vocabulary
6. Workplace Safety and Health Act
7. Workplace Safety and Health (Risk Management) Regulations
8. Singapore Standards SS506 series on Occupational safety and health (OSH) management systems

## Appendix A: Inventory of Work Activities Form

Department, Activity or Trade Assessed				Date
Ref	Location	Process	Work Activity	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

**Note:**

1. Complete this form before filling in the Risk Assessment Form.

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

# Appendix B: Risk Assessment Form

Department:		RA Leader:		Approved by:		Reference Number								
Process:		RA Member 1:		Signature:										
Activity/Location:		RA Member 2:		Name:										
Assessment Date:		RA Member 3:		Designation:										
Last review Date:		RA Member 4:		Date:										
Next review Date:		RA Member 5:												
Ref	Hazard Identification			Risk Evaluation				Risk Control						
	Sub-Activity	Hazard	Possible Injury/ Ill-health	Existing Risk Controls	S	L	RPN	Additional Controls	S	L	RPN	Implementation Person	Due Date	Remarks
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														

Notes:

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

## Appendix C: Hierarchy of Control

### **Elimination**

Elimination of risk refers to the total removal of the worker's exposure to the hazards, effectively making all identified possible accidents, incidents and ill-health impossible. This is a permanent solution and should be attempted first as recommended in the hierarchy. Once the risk is eliminated, the item does not appear in subsequent RA forms. For example, sharp edges can be eliminated in a store or work area.

### **Substitution**

This involves substituting a process or product with a less hazardous process or product to mitigate the risk, for example, using water-based paint instead of solvent-based paint.

### **Engineering Controls**

Engineering controls are physical means that reduce the likelihood of occurrence or severity of consequence of the mishap. These include structural changes to the work environment or work processes, erecting a barrier to interrupt the accident transmission path between worker and hazard (for example, machine guards, confined space ventilation).

### **Administrative Controls**

These eliminate or reduce exposure to a hazard by adherence to procedures or instructions. Documentation should emphasise all the steps to be taken and controls to be used to carry out the activity safely. For example, permit-to-work systems, scheduling of incompatible works, SWPs (see Appendix E for additional notes on SWP).

### **Personal Protective Equipment**

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 and repair, or as an additional protective measure against residual risks. The success of this control depends critically on the protective equipment being chosen and fitted correctly, worn at all times and maintained properly.

# Appendix D: Risk Register and Cover Sheet

This Appendix provides examples of:

1. Risk Register; and
2. Risk Register Cover Sheet.

## 1. Risk Register



## 2. Risk Register Cover Sheet

A Risk Register Cover Sheet provides a convenient way to list all the RAs in the Risk Register.

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

Notes:

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

# Appendix E: Additional Notes

## Safe Work Procedures

Arising from the RA, SWPs should be established and implemented for work which may pose safety and health risks. The SWPs should include safety precautions to be taken in the course of work and during emergencies, as well as responsibilities of persons involved and provision of PPE. The implementation of the SWPs should be monitored regularly, and the SWPs reviewed periodically to ensure their currency.

## Residual Risks

Residual risks are the remaining risks after implementation of risk controls. The RA 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 or check the fall clearance to protect themselves. In this case, the RA Team may highlight pre-job safety briefing (administrative control) as a further measure to ensure that residual risks are further minimised.

Once all the risk controls are selected and their residual risks highlighted, the RA 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 for implementation.

## Updating the RA Form after Implementation

After implementation, additional controls would have become existing controls. To update the RA form, the RA Team is to reconcile the controls by updating the Existing Controls column and deleting the controls under Additional Controls. The following are to be considered when reconciling Existing Controls with Additional Controls:

- a. ADD Additional Control measures in the Existing Controls column if they are new controls. For example,

i. Existing Control	Noise Enclosure
ii. Additional Control	Earplugs as an ADDITIONAL layer of protection
iii. Record reconciliation under the Existing Control column	a. Keep "Noise Enclosure" b. Add "Earplugs" under Existing Controls
iv. Record reconciliation under the Additional Control column	Delete "Earplugs"

OR

- REPLACE Existing Control measures with new measures as appropriate. For example,

i. Existing Control	Earplugs
ii. Additional Control	Ear muffs
iii. Since the RA Team had decided that the use of ear muffs is adequate and will replace the use of ear plugs	
1. Record reconciliation under the Existing Controls column	a. Add "Ear muffs" b. Delete "Earplugs"
2. Record reconciliation under the Additional Control column	a. Delete "Ear muffs"

## Appendix F: Risk Factors of Health Hazards

The table below shows the risk factors which can contribute to the development of ill-health when exposed to certain health hazards. Note: This table of health hazards is not exhaustive.

Health Hazard	Risk Factors
<b>Noise</b>	Exposure level (sound pressure level); Frequency of sound; Duration of exposure; and Frequency of exposure.
<b>Chemicals</b>	Intrinsic hazard of the chemical (e.g., carcinogenicity, mutagenicity, etc); Physical and chemical properties; Scale and frequency of use; Routes of exposure; Exposure concentration; Exposure duration; and Frequency of exposure.
<b>Biological agents</b>	Intrinsic hazard of microorganism (pathogenicity); Virulence; Host range; Viability of microorganism; Amount of microorganisms present at point of exposure; Mode of transmission; and Routes of infection.
<b>Ergonomics-related factors</b>	Weight of load or force; Repetition or frequency of motion; Posture (static, awkward, etc); Direct pressure on body parts or contact stress; Vibration; and Temperature of the environment.
<b>Heat</b>	Temperature; Humidity; Amount of direct sun exposure or radiant heat; Intensity of physical work; Physical exhaustion; Type of clothing; Un-acclimatised person or duration of acclimatisation; and Susceptible individuals (cardiovascular disease, impaired renal function, obesity, alcohol and drug abuse, dehydration).

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