Safety, Health and Environment National Authority

INDUSTRY GUIDANCE NOTE

TOPIC: **Guidance To Risk Management**			Reference Number: **IGN 04/2020**
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1. INTRODUCTION

1.1 Purpose

The purpose of this guidance on workplace safety and health risk management is to establish the minimum requirements and duties for implementing workplace Risk Management. This guidance applies to all workplaces in Brunei Darussalam which are governed by the Workplace Safety and Health Order, 2009 (WSHO, 2009). Conducting risk assessments and implementing risk control measures are requirements under the Workplace Safety and Health (Risk Management) Regulations, 2014.

This procedure must be applied to all work activities, materials and substances used or stored where there is a risk of injury to Employees, contractors or third parties.

1.2 Applicable law

- Workplace Safety and Health Order, 2009
- Workplace Safety and Health (Risk Management) Regulations, 2014

Regulation 3

In every workplace, the employer, self-employed person and principal shall conduct a risk assessment in relation to the safety and health risks posed to any person whom may be affected by his undertaking in the workplace.

Regulation 5 imposes a duty to record and keep records of the risk assessment for a period of not less than 3 years.

2. DEFINITIONS

Activity	A scope of work requiring a risk assessment. This might include driving, concrete pouring, working on a roof, erecting scaffolding.
Controls	Control measures or precautions needed to eliminate or reduce the risk
Emergency Plan	A plan of action which specifies what action to take in the event that controls fail. This usually consists of First Aid, Eye Wash, Fire Fighting but might also include confined space rescue, rescue from height, rescue from water.
Hazard	Something with potential to cause harm. E.g. equipment in poor condition, bad weather, leaking chemical drum, overloaded sockets.
HAZID	Acronym for HAZard IDentification. A technique for hazard identification that involves one or more brainstorming exercises. All persons involved with the activity (including HSE officer) meet together and list out all the hazards associated with the activity.
Residual Risk	Risk level remaining after controls are applied
Risk	A combination of the likelihood that the hazard will be released and severity of outcome if it is released Risk= likelihood x severity.
Risk Assessment	A risk assessment is simply a careful examination of what, in your work, could cause harm to people, so that you can weigh up whether you have taken enough precautions or should do more to prevent harm.
Risk Assessment Matrix (RAM)	A tool that lets you evaluate whether something is High risk, Medium Risk or Low Risk.
Toolbox Talk / Activity Briefing	A briefing that takes place before the work starts. The contents of the risk assessment should be discussed with the workers.

3. RESPONSIBILITIES

3.1 Management

Personnel with management responsibilities are responsible within the workplace for risk assessment. To meet this responsibility, managers are assisted by all personnel to:

a) Identify hazards;
b) Assess the risks posed by the hazard;
c) Select appropriate control measures;
d) Formulate an appropriate emergency back up plan.

3.2 General

Risk Assessment (RA) shall be carried out and risk control measures shall be implemented before any new work commences.

3.3 Supervisors

Supervisors in charge of an activity must ensure that a valid risk assessment is carried out before the activity starts. The risk assessment document must be available at the work site / activity location throughout the course of the work.

3.4 Employee

a) It is the responsibility of all employees to help identify hazards and use controls specified by the supervisor.
b) Employees are to report any incident, accident, near miss or dangerous occurrence to their immediate supervisors, so that prompt action can be taken to address them.

3.5 Workplace Safety & Health Officer

The HSE officer or appointed WSH Officer, should at random intervals inspect the activity. The inspection should check that the controls listed in the risk assessment document are implemented onsite and are actually being used during the activity.

3.6 Employer

An Employer shall:

a) Ensure that a Risk Assessment is conducted and a register is maintained of the relevant hazards and risk controls. This shall be reviewed prior to undertaking any activity in the workplace. Requirement for Risk Assessment is as per the Workplace Safety and Health (Risk Management) Regulations, 2014;

b) Take all reasonably practicable steps to eliminate any foreseeable risk to any person;

c) 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);

d) Support the implementation of risk control measures recommended by the Risk Management, Job Hazard Analysis (JHA) or Risk Assessment Teams;

e) Require the Risk Management Leader or Activity Supervisor to provide regular updates of the Risk Assessment done and risk control measures implemented to reduce or eliminate identified risks;

f) Require the Risk Management Leader or Activity Supervisor to empower and support the frontline workers to ensure improvements to risk control measures are identified and reported for improvement of the Risk Assessment for that activity;

g) Ensure on routine basis that the Risk Assessment is reviewed and updated. It is recommended that the Employer sets up an

internal committee within the organisation to conduct this when new findings, issues or measures are identified;

h) Require the contractor or supplier where work has been assigned or awarded, to conduct a Risk Assessment and ensure that it is implemented onsite. 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);

i) Ensure that a Risk Register is available and maintained at the workplace;

j) Ensure that the Risk Register is readily available for review by designated persons at the workplace and by regulatory agencies such as the Safety, Health and Environment National Authority (SHENA);

k) Ensure that Risk Assessment records, including but not limited to Risk Assessment forms and control measure records, are kept for at least three(3) years from the Risk Assessment approval date;

l) Review and, if neccessary, revise the Risk Assessment at least once in three(3) years from the Risk Assessment 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;

m) Monitor effectiveness of the risk control measures.

3.7 Manager

a) 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.

b) The Manager who oversees the area, function or activity where the workplace safety and health risks exist, shall:

- Ensure that a Risk Assessment is conducted and risk control measures are implemented before any new work is carried out in the Manager's area.
- Approve the Risk Assessment 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 the risks;
  - any measures or Safe Work Procedures (SWPs) implemented; and
  - the means to minimise or eliminate the risks.
- Ensure that the effectiveness of the risk control measures is monitored.
- Revise the Risk Assessment if the risk control measures are inadequate and ineffective after the implementation, by obtaining more information and/or modifying controls.
- Maintain Risk Assessment documentation of control measures and Safe Work Procedures (SWPs) that were implemented.

c) The Manager shall assist the Employer to implement the requirements.

d) The Manager may authorise other persons to execute the duties mentioned above but remains accountable for them.

e) The Manager should work together with a Human Resource Manager to specify workplace safety and health training necessary for job positions and functions.

3.8 Human Resource Manager

a) Ensure that a robust recruitment process is in place to choose suitable job candidates who are able to meet position requirements and workplace safety and health obligations.

b) Specify safety and health responsibilities in the job descriptions of employees, and ensure that these responsibilities are effectively communicated to all employees.

c) Ensure that all new Employees are given appropriate and sufficient orientation, and workplace safety and health training to equip them with the relevant knowledge, skills and abilities to succeed in their positions.

d) Support the Employer and Manager to ensure that Risk Assessment, risk control measures and Safe Work Procedures (SWPs) are effectively communicated to all Employees.

e) Ensure that workplace safety and health training and other related Risk Assessment records are documented.

f) Work with the Manager and Risk Management or Risk Assessment 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.

g) Implement programmes that support and maintain Employees' safety, health and wellbeing.

h) Participate in workplace safety and health inspections of the organisation's premises to ensure that WSH legislation is followed and WSH issues are promptly addressed, where appropriate.

i) 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.

3.9 Risk Management and Risk Assessment Leaders

a) The Risk Management Leader shall assist the Employer and Manager in coordinating Risk Management processes within the workplace.

b) The Risk Management or Risk Assessment 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.

4. PROCEDURE

4.1 All activities and operations which have the potential to cause harm to people, loss or damage to assets, damage to the environment or the organisation's reputation are evaluated through undertaking a risk assessment. Risk Assessment is a group activity and should be facilitated by someone who has attended a Risk Assessment Training Course.

Examples where risk assessments are needed:

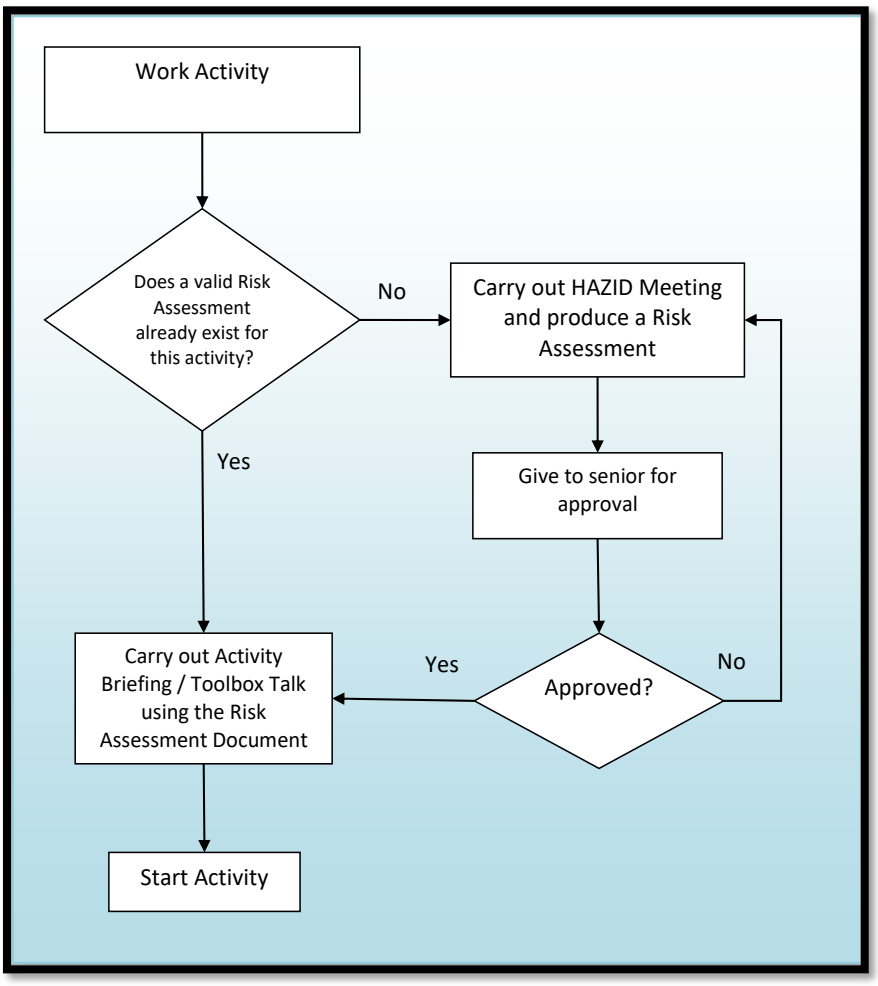
- Welding
- Using a crane to lift a load
- Working at a height
- Use of Power Tools
- High Pressure water jetting
- Chemical handling
- Excavations
- Confined space entry
- Others e.g. school hiking trip

4.2 Prior to the activity commencing, the outcome of the Risk Assessment must be discussed with all persons involved with the activity. This discussion is known as an activity safety briefing or toolbox talk.

Risk Assessment is a four(4) stage process which consists of:

- Identify the hazards in the activity;
- Analyse and assess the risks from each hazard (risks = likelihood x consequence) using the Risk Assessment Matrix (RAM);
- Risk control by putting safety measures in place;
- Create an Emergency Plan in case an unforeseeable event should occur.

4.3 Overview



4.4 Four (4) stage process

STAGE 1 : Hazard Identification

a) Identify hazards that could result in harm in your area, activity, process or equipment that you are using. Common hazards include but are not limited to:

- Working at height
- Slippery floors
- Manual handling
- Moving machinery
- Moving Vehicles
- Electricity
- Chemicals / Dusts
- Cold / Hot surfaces
- Noise
- Radiation
- Vibration
- Adverse weather

b) Health hazards may be physical, chemical, biological, ergonomic, psychological in nature.

c) Physical hazards include the potential to harm from poor lighting, temperature, noise/vibration, pressure, humidity and radiation.

d) Chemical hazards are associated with those solids, liquids, gases etc., with the potential to cause injury or harm to those exposed.

e) Biological hazards are more specialised but include moulds, fungus, spores etc. (e.g. Legionella, Weil's disease).

f) Ergonomic hazards are hazards that have the potential to harm due to poor workplace design.

g) The consideration of the man/machine interface e.g. computer workstations, lifting and handling, slipping and tripping.

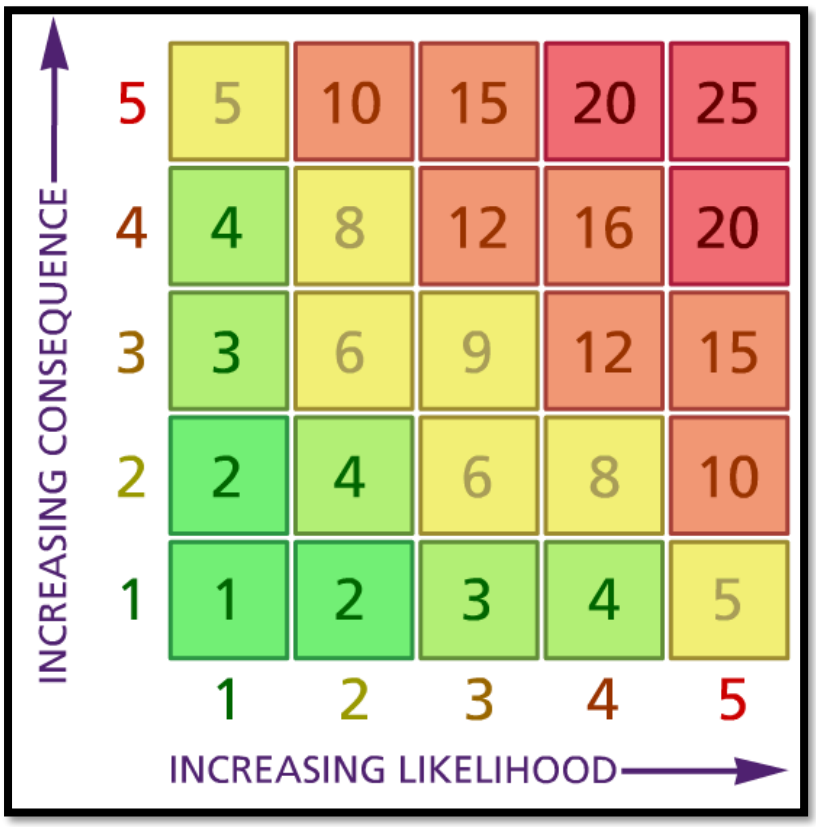
h) Psychological hazards are those that relate to stress. This includes overload of work and fatigue.

i) Before the activity starts, do carry out a HAZID meeting with a number of people involved in the activity. Brainstorm the hazards on a white board or flip chart paper. It is usually beneficial to think through the activity in a step by step logical manner.

STAGE 2: Analyse and Assess the Risk

Employer shall ensure that a suitable and relevant Risk Assessment Matrix (RAM) and implementation process is in place.

E.g A RAM matrix is provide below for guidance purpose only. For each hazard identified, estimate the likelihood of the hazard occurring and then estimate the realistic worst consequence from that hazard.



Likelihood

	Guideword	
1	Very Unlikely	1 in a million chance of it happening
2	Unlikely	1 in 100,000 chance of it happening
3	Fairly Likely	1 in 10,000 chance of it happening
4	Likely	1 in 1,000 chance of it happening
5	Very Likely	1 in 100 chance of it happening

Consequence

	Guideword	*People*
1	Insignificant	No Injury
2	Minor	First Aid Cases
3	Moderate	Broken Bones, LTI
4	Major	>1 LTI, Partial Disability
5	Massive	Fatality, Fatalities, Complete Disability

Risk

	Outcome
1-4	**Acceptable**. Ensure controls are properly maintained.
5-9	**Adequate**. Try to reduce risk further
10-16	**Caution**. It is allowed, but it is not recommended that the activity proceeds. If it does proceed ensure there is constant careful supervision. Ensure emergency equipment is available. Reduce risk ASAP.
17-25	**Unacceptable**. This level of risk is not allowed. Stop immediately it is not compliant to the HSE policy

Example Risk Calculations

Hazard	Who could be affected?	Likelihood	Severity	Risk
Electrical Cable across a walkway in a busy office	All office workers might trip	5	3	=15
Electrical Cable across a walkway in a busy office with a cable cover fitted	All office workers might trip	2	3	=6
Using unguarded circular saw	The saw operator might cut off his fingers	4	4	=16
Using circular saw with guard fitted	The saw operator might cut off his fingers	1	4	=4

STAGE 3: Select Control Measures

Control measures are safety measures or precautions that are used to reduce or eliminate risk. There is a hierarchy of control measures. Controls at the top of the hierarchy are preferred to those at the bottom.

Hierarchy of Controls			
		Explanation	Notes
1	**Elimination**	Can the hazard be completely eliminated? Does the activity need to be done?	• Painting: Working at height can be eliminated if a long pole and a roller be used instead • Instead of travelling from A to B to take part in a meeting can video conferencing be used? • Installing extra power sockets instead of using extension cables.
2	**Substitution**	Swapping or changing a piece of equipment or process to make it safer.	• Can a chemical be swapped with a less harmful alternative? • Can a hand tool be used instead of a power tool? • Can a 240V tool be swapped with a 110V tool? • Instead of a strimmer use a lawnmower • Purchasing equipment that is less noisy
3	**Engineering Controls**	Use of tools or equipment to make the job safer	• Can a Forklift truck be used to move the heavy object • Enclosing noisy equipment • Use of ventilation in a work shop can eliminate the fume, and therefore no PPE is needed. • Proper barriers • Guarding
4	**Administrative Controls**	Means the implementation of any administrative requirements	• Training • Supervision • Permit to Work • Site Rules • Safe Systems of Work • Procedures
5	**Personal Protective Equipment (PPE)**	Masks, gloves, coveralls, boots	• Not 100% protection against hazards. • Not a preferred control as it relies on the human actually wearing the PPE

If the hazard cannot be eliminated, then a combination of controls needs to be used to protect employees. Keep adding controls until the risk level becomes acceptable.

STAGE 4 : Emergency Plan

a) Recovery is the emergency backup plan that is to be used in the event that the control measures fail.

b) Recovery measures must be relevant to the activity. For example:

- If there is a risk of an electrical fire, then a CO2 extinguisher must be available;
- If there is the possibility of being splashed in the face with a chemical, then eye wash must be available; or
- If there is a possibility that someone may become trapped in a confined space, then a breathing apparatus and a standby man must be available.

All activities must have an emergency backup plan.

4.5 Record Keeping

a) Once a risk assessment has been undertaken for an activity or location, it needs to be properly typed up and filed for reference. However, any changes to equipment, personnel, chemicals, machinery may invalidate the Risk Assessment and a new Risk Assessment should be carried out.

b) A folder needs to be kept with up to date risk assessments in it. For example, a workshop should have a folder containing risk assessments that are relevant to the activities in the workshop.

c) Risk assessments records must be kept for at least three(3) years.

RISK ASSESSMENT FORM

Reference:

Activity, Equipment or Location being risk assessed:

Location:

Carried out by:

Date:

Review Date:

	Hazard Identified	Who could be harmed and how?	Current Controls	Current Risk			Current Emergency Measures	Extra Controls or emergency Measures Needed?	Action Party	Target Date
				Likely	Consq	Risk				
1						0				
2						0				
3						0				
4						0				
5						0				
6						0				
7						0				
8						0				
9						0				
10						0				
11						0				
12						0				
13						0				
14						0				

5. PREPARATION

5.1 Formation of Risk Management or Risk Assessment Team

It is recommended that the Employer identifies and implements a suitable arrangement and appoints a team of people to identify and assess activities for relevant hazards and risk control measures. This team will be based on work experience, complexity of activity and diverse nature of the procedures in place.

Appointment of Risk Management Team

a) The Employer shall:

- Appoint a Risk Management Team Leader; and
- Appoint Risk Management Team.

b) The Risk Management Team shall be responsible for the overall Risk Management direction and Risk Management activities of the workplace.

c) The Risk Management 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.

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

e) The Employer shall ensure that the Risk Management Leader is competent for the task.

5.2 Risk Management Team Leader

a) The Risk Management Team Leader should be competent for the task. Basic competency can be attained through completing a Risk Management course conducted by an approved Training Provider (ATP) or equivalent.

b) The Risk Management Team Leader should also be experienced with the work and processes in the workplace, and have direct access to the Employer.

5.3 Risk Management Team

Risk Management Team may be appointed from management staff, process or facility engineers, technical personnel, supervisors, production operators, maintenance staff and WSH personnel, where suitable.

5.4 Risk Assessment Teams

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

Figure 1: RM and RA Teams.

b) Risk Assessment Teams are responsible for conducting Risk assessments within the scope defined by the Risk Management Team. If an organisation requires only one (1) team, then the

functions of the Risk Management and Risk Assessment Teams may be combined within the Risk Management Team.

c) Risk Assessment Teams should have representatives who are relevant to the activity and have sufficient experience and knowledge of the activity to be able to add value in the development of a suitable Risk Assessment.

d) The Risk Assessment Team should include personnel who are involved with the work, including contractors and suppliers. If possible, it should also include persons who are familiar with the design and development of the site, machinery or process.

e) If the inclusion is not feasible as detailed in paragraph d), designers, suppliers and other contributors may be invited to share their comments and suggestions with the Risk Assessment Team.

f) Where Risk Assessment experience or expertise is lacking, a WSH Officer, WSH Auditor or Third Party Consultant who is trained and has experience in conducting Risk Assessment should be engaged to assist the Risk Management or Risk Assessment Team Leader in conducting Risk Assessment.

g) The Risk Assessment Team Leader should be experienced with the type of work within his scope, and have direct access to the Risk Management Team Leader, or in the absence of one, to the Employer.

5.5 Extent of Risk Assessment—Determine What is to be Assessed

a) 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 Risk Assessment.

b) The Risk Management Team (the primary team responsible for the overall Risk Management direction and activities of the company) shall determine the boundaries of the Risk Assessment (e.g., department, functional area or work activity within the workplace).

c) Risk Assessments for each identified department, functional area or work activity should be scoped by the Risk Assessment Team to provide focus to the assessment.

5.6 Gather Relevant Information

Once the extent of the Risk Assessment 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 or specifications;
- observations and interviews;
- WSH inspection records;
- details of existing risk controls;
- health and safety audit reports (for contract sum more than BND $30million);
- feedback from employees, clients, suppliers or other stakeholders;

- Safe Work Procedures (SWPs);
- other information such as safety data sheets (SDS), manufacturer's instruction manual;
- copies of any previous Risk Assessments 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

a) The steps in Risk Assessment, namely, Hazard Identification, Risk Evaluation, Analysis and Risk Control, specify the Risk Assessment methodology.

b) 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 Risk Assessment Form.

c) As part of continual improvement, it is recommended that workplace hazards be monitored regularly until:

- the risk level of the hazard is low ("green zone" of the risk matrix);
- the remaining risks of the hazard are residual in nature. 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 or check the fall clearance to protect themselves. In this case, the Risk Assessment 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 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 for implementation.

- all reasonably practicable measures have been taken to mitigate or eliminate the risk.

d) All Risk Assessment entries must be reviewed at least once every three(3) 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

a) Risk Assessment is the cornerstone of the Risk Management process. It is an integral part of all organisational work processes, from strategic planning to project and change management. The key steps in the Risk Management process are outlined in Figure 2.

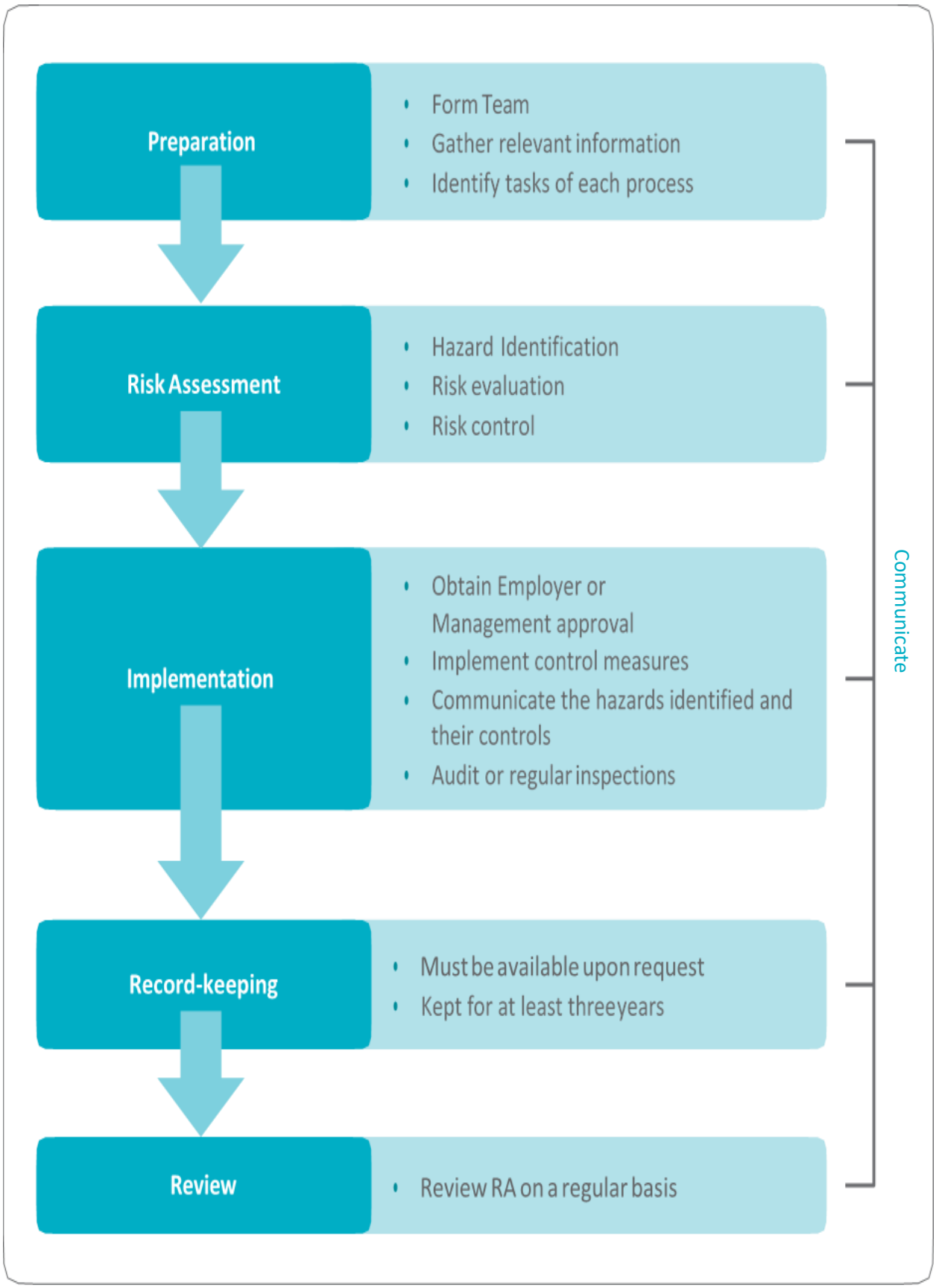


Figure 2 : Risk management process.

b) Risk Assessment is customised and tailored to each organisation and its specific work environment.

c) Risk Management contributes to the achievement of organisational objectives and improvement of performance in business, operational efficiency, regulatory, safety and health compliance and environmental protection.

d) Risk Management addresses uncertainty and helps businesses make informed decisions and prioritise actions.

e) Risk Assessment provides a systematic approach to Risk Management and leads to consistent and reliable results.

f) Risk Assessment inputs are based on various information sources such as the Risk Assessment Team's competency and experience, observations, employee feedback and expert opinions. The limitations of these information sources must be taken into account to ensure that the Risk Assessment is based on the best available information.

g) Risk Assessment takes human and cultural factors into account. It recognises that the capabilities and health risk factors of employees should be managed when conducting a Risk Assessment.

h) Risk Management 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

a) The Risk Assessment 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).

b) When identifying hazards, the Risk Assessment Team has to consider if the hazards could cause harm beyond the immediate area of their work.

6.3.2 Process

a) Select a "Work Activity" from the "Inventory of Work Activities" form (see Figure 3) and place it in the "Risk Assessment Form" (see Figure 4) for analysis. Variations of these forms can be used, however, all information **required in the forms has to be documented.**

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

Figure 3 : Inventory of Work Activities Form

Department:			RA Leader:				Approved by:				Reference Number				
Process:			RA Member 1:				Signature:								
Activity/Location:			RA Member 2:												
Assessment Date:			RA Member 3:				Name:								
Last review Date:			RA Member 4:				Designation:								
Next review Date:			RA Member 5:				Date:								
Hazard Identification				Risk Evaluation				Risk Control							
Ref	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															

Figure 4: Risk Assessment Form

b) 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.

c) 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.

d) 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

a) Risk Assessment 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.

b) Work organisation factors (include excessive workload, prolonged working hours, lack of adequate training, inadequate acclimatisation to hot work environment).

c) 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).

6.3.4 Workplace or Work-related Factors

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

As part of Risk Evaluation, the Employer is recommended to undertake some level of Risk Analysis to ensure the risk control measures are suitable and effective. Some examples of analysis are as below.

Event tree analysis, bow-tie analysis, Hazard Analysis and Critical Control Points(HACCP),toxicological risk, business impact analysis, Layer of Protection Analysis (LOPA), etc.

6.4.1 Risk Matrices

a) These guidelines recognise the various risk evaluation methods and matrices practised and preferred by workplaces. While it 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.

Likelihood / Severity	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.

Likelihood / Severity	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.

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 3: Recommended 5x5 Risk Matrix with numeric ratings or *Risk Prioritisation Number.*

b) The risk matrix used in the Risk Assessment should be displayed at least once, and preferably at every page of the Risk Assessment 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

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

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

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

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

6.4.3 Assessment of Severity

a) Taking the existing risk controls and residual risks into consideration, the Risk Assessment Team has to rate the severity of the possible injury or ill-health.

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

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

d) Should the Risk Assessment Team have difficulty developing a consensus to the severity level, the Team must gather more information and/or consult an industry expert.

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.

6.4.4 Assessment of Likelihood

a) Taking the existing risk controls and residual risks into consideration, the Risk Assessment Team has to rate the likelihood that the hazard may cause injury or ill-health.

b) When assessing likelihood, the Risk Assessment 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.

c) 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.

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

e) Should the Risk Assessment Team 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

The risk prioritisation number (RPN) is obtained by multiplying the values of Severity and Likelihood level (values in the "S" and "L" columns of the Risk Assessment form), that is, RPN = S x L.

6.4.6 Classification of Risk—Risk Matrix

a) Compare the risk prioritisation number (RPN) against the Risk Matrix in Table 6.

b) 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 until:

- 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").

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: 5x5 Risk matrix with numeric ratings.

c) The Risk Management or Risk Assessment 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	• No additional risk control measures may be needed. • Frequent review and monitoring of hazards are required to ensure that the risk level assigned is accurate and does not increase over time.
Medium	Tolerable	• 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	Not acceptable	• High Risk level must be reduced to at least Medium Risk before work starts. • There should not be any interim risk control measures. Risk control measures should not be overly dependent on PPE. • If practicable, the hazard should be eliminated before work starts. • Management review is required before work starts.

Table 7: Recommended action for risk levels.

6.5 Risk Evaluation for Health Hazards

a) 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.

b) Where there are large numbers of workers, groups of workers with similar exposure levels could be identified for more efficient exposure assessment.

c) Exposure estimates are then compared to established Permissible Exposure Level (PEL) or other health standards to establish the likelihood of the ill-health effects.

d) Based on exposure assessment and risk evaluation, health exposure risks can be ranked to enable prioritisation of action plans to lower these risks.

e) When assessing the risk of health hazards (e.g., noise, chemicals, biological agents and ergonomics), relevant risk factors should be taken into consideration as shown in Table 8 below.

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
Noise	Exposure level (sound pressure level); Frequency of sound; Duration of exposure; and Frequency of exposure.
Chemicals	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.
Biological agents	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.
Ergonomics-related factors	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.
Heat	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).

f) It is also important to consider other factors which may influence the likelihood of risk 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 Permissible Exposure Level (PEL)).

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 of Control in the recommended order: substitution, engineering controls, administrative controls and personal protective equipment(PPE).

6.6.1 Hierarchy of Control

a) The control of hazards and reduction of risks can be accomplished by following the Hierarchy of Control (see Figure 5).

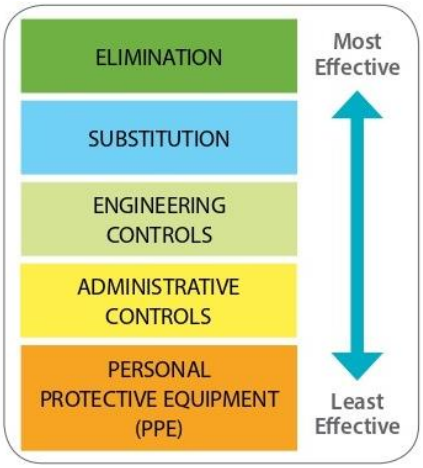


Figure 5: Hierarchy of Control

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

c) 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 Safe Work Procedures (SWPs).

d) The control measures in the Hierarchy are explained in detail as below.

Hierarchy of Control

6.6.2 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 Risk Assessment Forms. For example, sharp edges can be eliminated in a store or work area.

6.6.3 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.

6.6.4 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).

6.6.5 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 (PTW), scheduling of incompatible works, Safe Work Procedures (SWPs).

6.6.6 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 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.

6.6.7 Additional Controls

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

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

6.6.8 Re-evaluation with Additional Controls

a) When additional control(s) have been decided, the Employer may choose to re-rate the Severity, Likelihood and Risk levels (or risk prioritisation number (RPN) values) and record them in the "S", "L" and "RPN" columns in the "Risk Control" section of the Risk Assessment Form.

b) The re-evaluated risk prioritisation number (RPN) should not be HIGHER than the initial risk prioritisation number (RPN).

c) It should be noted that a re-evaluated risk rating does not undermine the severity and escalated risk potential of the activity under consideration. The Employer shall ensure that personnel are familiar with the reasoning that shows the controls to be effective and hence, the re-rated values stated.

6.6.9 Guidance Notes

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

6.6.10 Implementation Person and Date

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

b) If the above person cannot be identified at the time the Risk Assessment Form was being completed, a designation of person may be indicated. The Manager is to propose this suitable person.

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

d) The Implementation Person has to provide progress updates to the Risk Assessment Team on a periodic basis as determined by the Risk Assessment Team Leader.

7. IMPLEMENTATION

7.1 Risk Assessment Approval

Completed Risk Assessment Forms must be approved by the Manager of the area, function or activity where the risk is being assessed or Employer.

7.2 Implementation Actions

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

b) 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.

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

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

- the nature of risks; and
- any measures or Safe Work Procedures (SWPs) implemented.

e) 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.

f) After the implementation of additional controls, the "Existing Controls" and "Additional Controls" columns of the Risk Assessment Form must be updated.

7.3 Records

a) The Manager shall assist the Employer to ensure that the Risk Assessment records, including but not limited to the Risk Assessment Forms and control measure records, are kept for at least three(3) years.

b) 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. EVALUATION

In order to evaluate the effectiveness of the risk management process, the Employer should:

a) periodically measure risk management performance against its purpose, implementation plans, indicators and expected behaviours; and

b) determine whether it remains suitable and effective to support achieving the objectives.

9. IMPROVEMENT

Employer should continually improve the suitability, adequacy and effectiveness of the risk management. As relevant gaps or improvement opportunities are identified, Employer should develop plans and tasks and assign them to those accountable for implementation. Once implemented, these improvements should contribute to the enhancement of the risk management process.

10. COMMUNICATION

a) Communication and consultation with external and internal stakeholders, including all functions and levels within the organisation, should take place during all stages of the Risk Management process.

b) All persons at the workplace should be informed of the risks they face and the control measures available to manage those risks.

c) Communication can take various forms (such as meetings, staff dialogues, trainings, notice boards and various electronic means) for different groups within the organisation.

d) Effective communication and consultation involve two-way dialogues between stakeholders.

11. REFERENCES

1. HSE-21-Risk Assessment, Ministry of Development HSE Manual, Negara Brunei Darussalam
2. Code of Practice on Workplace Safety and Health (WSH) Risk Management, the Workplace Safety and Health Council in collaboration with the Ministry of Manpower Singapore.