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INTRODUCTION

Risk Management is a key component of the new safety and health management framework underpinned by the new Workplace Safety and Health Act (WSH Act). The WSH Act aims to reduce risks at source by making stakeholders accountable for managing the risks they create.

Risk Management entails:
1) Risk assessment of any work activity;
2) Control and monitoring of such risks; and
3) Communicating these risks to all persons involved.

These requirements are enshrined in the WSH (Risk Management) Regulations, which came into operation 1 September 2006.

Risk Assessment is an integral part of risk management. It is the process of:
1) Identifying and analysing safety and health hazards associated with work;
2) Assessing the risks involved; and
3) Prioritising measures to control the hazards and reduce the risks.

Every workplace, including factories, should conduct risk assessments for all routine and non-routine work undertaken.

SCOPE

This set of guidelines outlines the risk management process and within it, provides a 3-step process for Risk Assessment:

Applying these basic principles of risk assessment will help you meet your obligations under the legislation.

Depending on the industry and nature of work activities, companies can adopt the Activity-Based risk assessment approach described in this Guide. Alternatively, other approaches can be used to achieve the same or higher levels of protection against risks in your workplace.

The information in this Guide will be particularly useful for small and medium enterprises. Larger establishments, including process chemical plants with complex processes and operations, may adopt other established methods of hazard

* For more details and examples, please refer to the Appendix.
identification and risk analysis commonly used for process plant risk assessment, while still applying the basic principles in this Guide.

ROLES AND RESPONSIBILITIES

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

Where contractors and suppliers undertake work for their customers, they must take all reasonably practicable measures to eliminate or reduce the risk that may be posed by their machinery, equipment or hazardous substances to as low as reasonably practicable.

Contractors and suppliers must also provide information of any machinery, equipment or hazardous substances to their customers who may require the information to conduct risk assessment in their workplaces. For example, contractors and suppliers should provide operation manuals, maintenance manuals, safety data sheets etc.

RISK ASSESSMENT TEAM

Risk assessment is never a one man show; it should be conducted by a multi-disciplinary team who have a thorough knowledge of the work to be undertaken. Team members should include management staff, process or facility engineers, technical personnel, supervisors, production operators, maintenance staff and safety personnel if available.

The risk assessment team should also include contractors/suppliers personnel who are involved with the work, whenever necessary.

The team leader should have undergone training in risk assessment. A safety consultant trained and has experience in job safety analysis and risk management could be engaged to assist in the conduct of risk assessment.

The Employer should:
1) Designate, assign, appoint or engage a competent person leading a team of personnel (including contractors) associated with the process or activity to conduct risk assessments;
2) Ensure that the risk control measures are implemented without undue delay after the completion of risk assessment;
3) Inform all persons working at the workplace of the risks, and the means to minimise or, where possible, eliminate the risks;
4) Provide a risk assessment register to record the findings of risk assessment;
5) Endorse and approve the risk assessments conducted;
6) Keep risk assessment records for inspection for at least three years from the date of the assessment; and submit the records to the Commissioner for Workplace Safety and Health if the Commissioner so requires;
7) Review and update the risk assessment at least once every three years or whenever there is a significant change in the work, or after an incident involving the work process;
8) Ensure that all employees are aware of the risk assessment for the work activity they carry out;
9) Develop and implement safe work procedures (SWPs) for work which poses safety or health risks to workers; and
10) Keep a written description of SWPs and produce this to the inspector for inspection when requested.

The Team Leader should:
1) Have adequate knowledge of the risk assessment method;
2) Recommend appropriate risk control measures to reduce or eliminate the risks identified;
3) Prepare a record of the risk assessment for the employer after completion of the assessment; and
4) Assist management in monitoring the effectiveness of risk control measures after their implementation.

Employees should:
1) Participate in the risk assessment or assist in conducting the risk assessment;
2) Adhere to SWPs established to reduce any safety and health risks in the workplace; and
3) Inform their supervisors of any shortcomings in the SWPs or risk control measures.

Contractors and Suppliers
Whenever necessary, contractors and suppliers should work with the risk assessment team to identify hazards, evaluate and control the risks that machinery, equipment or hazardous substances may pose.
RISK MANAGEMENT PROCESS

Unless the workplace or worksite is not ready, the risk assessment team should visit the workplace or worksite to ensure that all work areas are covered, including routine and non-routine operations. Routine operations include activities such as preparatory and troubleshooting work activities. Non-routine operations include commissioning, repair and maintenance of plants.

The team should also consider various environmental situations, e.g., weather and soil conditions, where these operations are carried out.

Other methods of risk assessments may be adopted, but all methods should include the 3 basic steps of:

1. HAZARD IDENTIFICATION
2. RISK EVALUATION
3. RISK CONTROL

and the selection of control measures must be based on the principles of Hierarchy of Control.

The outcome of the risk assessment conducted, regardless of the method used, should be effective risk control measures.
Figure 1 – THE RISK MANAGEMENT PROCESS

1. Preparation
   - Form RA Team
   - Gather relevant information

2. Hazard Identification
   - Identify hazards
   - Identify potential accidents / incidents

3. Risk Evaluation
   - Estimate risk levels based on identified hazards.
   - Prioritise the hazards to be controlled

4. Risk Control
   - Formulate control measures according to the Hierarchy of Controls:
     • Elimination
     • Substitution
     • Engineering controls
     • Administrative controls
     • PPE
   - Analyse and evaluate residual risk

5. Record Keeping
   - Keep risk assessment reports for at least 3 years.

6. Implementation & Review
   - Review risk assessments:
     • Once every 3 years;
     • Whenever new information on OSH risks surfaces;
     • When there are changes to work processes and / or;
     • After any accident / incident.
1 PREPARATION

Prior to conducting a risk assessment, the following information should be obtained as far as possible:
- Plant layout plan
- Process flowchart
- List of work activities in the process†
- List of chemicals, machinery and / or tools used
- Records of past incidents and accidents
- Relevant legislation, codes of practice or specifications
- Observations and interviews
- Inspection records
- Details of existing risk controls
- Health and safety audit reports
- Feedback from staff, clients, suppliers or other stakeholders
- Safe work procedures (SWPs)
- Other information such as safety data sheets (SDSs), manufacturer’s instruction manual
- Copies of any relevant previous risk assessments

Based on the work process, the steps of each work activity will be listed out in sequence. In this Guide, each step of the process is referred to as a work activity.

A work process broken down into \( n \) work activities

This starts off the risk assessment process.

2 HAZARD IDENTIFICATION

Based on the information gathered on the process, hazards can be identified for each work activity. Hazard identification is perhaps the most important step in risk assessment because hazards can only be controlled if they are identified.

Hazard identification involves identifying the hazards associated with each work activity and the type of potential accidents/incidents that can result from the hazards. Hazard identification is then repeated for all work activities of the process.

† In this Guide, the work process is divided into sequential steps, which are referred to as work activities.
The aim is to spot hazards, brainstorm on all the possible types of accidents, incidents and/or ill-health that can occur due to the hazard(s), and identify potential victims or persons-at-risk.

To aid hazard identification, workplace safety and health hazards can be identified by considering:

- Method of work e.g. repeated tasks and unsafe work practices
- Electrical and mechanical hazards
- Manual material handling e.g. lifting, pulling and pushing
- Chemicals e.g. corrosive substances
- Machinery e.g. unguarded machines
- Temporary structures e.g. scaffolds
- Environmental conditions, e.g. slippery surfaces, lighting, unstable soil conditions
- Layout and location of equipment

Possible types of accidents, incidents and ill health include (but not limited to):

- Person falling from height
- Object falling from height
- Slips or falls on the level
- Electrocution
- Asphyxiation
- Drowning

- Noise induced deafness
- Dermatitis
- Collapse of structure
- Fire and explosion
- Struck by or against object
- Soft tissue damage (sprains, strains)

Potential victims or persons-at-risk include:

- Persons directly involved in the operation
- Visitors of the workplace
- Persons not directly involved in the operation
- Members of the public

3 RISK EVALUATION

Risk evaluation is the process of estimating the risk levels of the identified hazards and if the risks can be accepted. This is used as a basis for prioritising actions to control identified hazards and thereby, minimising safety and health risks.

Risk evaluation consists of:

1) Identifying existing risk control measures;
2) Assessing potential severity of identified hazards;
3) Determining likelihood of occurrence of accidents, incidents and/or ill health arising from identified hazards; and
4) Assessing risk levels based on the severity and likelihood.
(1) Identifying existing risk control measures
The presence of existing control measures should first be identified for each work activity of the process. By considering the effectiveness of the existing controls and the consequences that can occur should these controls fail; the risk of the activity can be assessed.

Examples of risk control measures include engineering controls, SWPs and personal protective equipment (PPE).

Risk has 2 parts:
I. Expected **SEVERITY** of the hazard; and
II. **LIKELIHOOD** of the occurrence of the accident / incident or ill health; taking into account the existing risk controls.

(2) Assessing potential severity of identified hazards
Severity is the degree or extent of injury or harm caused by accidents/incidents arising from workplace hazards. Severity is classified into 3 categories: **Minor**, **Moderate** and **Major** (*Table 1*).

*Table 1 – Severity categories and description*

<table>
<thead>
<tr>
<th>Severity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>No injury, injury or ill-health requiring first aid treatment only (includes minor cuts and bruises, irritation, ill-health with temporary discomfort)</td>
</tr>
<tr>
<td>Moderate</td>
<td>Injury requiring medical treatment or ill-health leading to disability (includes lacerations, burns, sprains, minor fractures, dermatitis, deafness, work-related upper limb disorders)</td>
</tr>
<tr>
<td>Major</td>
<td>Fatal, serious injury or life-threatening occupational disease (includes amputations, major fractures, multiple injuries, occupational cancer, acute poisoning and fatal diseases)</td>
</tr>
</tbody>
</table>

As the severity of the hazard refers to the intrinsic or inherent nature of the adverse effect (e.g. cancer, amputation or fatal injury) that may result from the hazard, it does not depend on the controls in place.

Therefore, in assigning the severity level, the existing controls should not be taken into account.
(3) Determining likelihood of occurrence of accidents, incidents and/or ill health arising from identified hazards

LIKELIHOOD of occurrence of an accident, incident or ill health is also classified into 3 categories: Remote, Occasional and Frequent (Table 2).

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Remote</td>
<td>Not likely to occur</td>
</tr>
<tr>
<td>Occasional</td>
<td>Possible or known to occur</td>
</tr>
<tr>
<td>Frequent</td>
<td>Common or repeating occurrence</td>
</tr>
</tbody>
</table>

To minimise the subjectivity of estimating likelihood, in addition to looking at existing controls, the following sources of information should be considered:

- Past incident and accident records
- Industry practice and experience
- Relevant published literature

(4) Assessing risk levels based on the severity and likelihood

Once severity and likelihood have been established, the risk level is determined using a 3 X 3 risk matrix. The risk level may be classified as low, medium or high and depends on the combination of severity and likelihood (Table 3).

To determine the risk level, select the appropriate row for Severity and the appropriate column for Likelihood; the cell where they intersect indicates the Risk Level.

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Severity</th>
<th>Remote</th>
<th>Occasional</th>
<th>Frequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote</td>
<td>Major</td>
<td>Medium Risk</td>
<td>High Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Occasional</td>
<td>Moderate</td>
<td>Low Risk</td>
<td>Medium Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Frequent</td>
<td>Minor</td>
<td>Low Risk</td>
<td>Low Risk</td>
<td>Medium Risk</td>
</tr>
</tbody>
</table>

E.g. For Moderate Severity and Occasional Likelihood, the Risk Level is Medium.
Based on the risk level determined in the risk evaluation step, risk controls should be selected to reduce the risk level to an acceptable level. This can be done by reducing the Severity and/or Likelihood.

As indicated in the risk matrix in Table 3, when the risk level is High, effective and practicable risk controls must be implemented to reduce High Risk to at least Medium Risk.

Table 4 shows the acceptability of risk and recommended actions for different risk levels, which can be used to guide the selection of risk controls.

<table>
<thead>
<tr>
<th>Risk level</th>
<th>Risk Acceptability</th>
<th>Recommended actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk</td>
<td>Acceptable</td>
<td>No additional risk control measures may be needed. However, frequent review may be needed to ensure that the risk level assigned is accurate and does not increase over time.</td>
</tr>
<tr>
<td>Medium Risk</td>
<td>Moderately acceptable</td>
<td>A careful evaluation of the hazards should be carried out to ensure that the risk level is reduced to as low as is practicable within a defined time period. Interim risk control measures, such as administrative controls, may be implemented. Management attention is required.</td>
</tr>
<tr>
<td>High Risk</td>
<td>Not acceptable</td>
<td>High Risk level must be reduced to at least Medium Risk before work commences. There should not be any interim risk control measures and risk control measures should not be overly dependent on personal protective equipment or appliances. If need be, the hazard should be eliminated before work commences. Immediate management intervention is required before work commences.</td>
</tr>
</tbody>
</table>

It is essential for risks to be eliminated or reduced “at source”. If a risk cannot be controlled completely by engineering measures, it is necessary to protect the employees by administrative control or personal protection.

The control of hazards and reduction of risks can be accomplished by following the Hierarchy of Control Measures (Figure 2). These control measures are not usually mutually exclusive e.g. engineering controls can be implemented together with administrative controls like training and SWPs.
ELIMINATION
Elimination of hazards refers to the total removal of the hazards and hence effectively making all the identified possible accidents, incidents and ill health impossible.

**Figure 2 – Hierarchy of Control Measures**

- **ELIMINATION**
  - Eg: Eliminate sharp protrusions in work area
- **SUBSTITUTION**
  - Eg: Substitute solvent-based paint with water-based paint
- **ENGINEERING CONTROL**
  - Eg: Use & maintain a local exhaust ventilation system
- **ADMINISTRATIVE CONTROL**
  - Eg: SWPs, effective training etc.
- **PPE**
  - Eg: Safety boots, helmet, glasses etc.

This is a permanent solution and should be attempted in the first instance. If the hazard is eliminated, the risk associated of the hazard will be eliminated.

SUBSTITUTION
This involves replacing the hazard by one that presents a lower risk.

*E.g. Asbestos can be substituted with non-asbestos materials.*

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

*E.g. Isolation or containment of hazards, machine guarding, manual handling devices/equipment etc.*

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

*E.g. Permit-to-work systems, scheduling of incompatible works etc.*
PERSONAL PROTECTIVE EQUIPMENT (PPE)

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

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

Safe Work Procedures (SWPs)

Arising from the risk assessment, SWPs for work which may pose safety and health risks should be established and implemented. The SWPs should include the safety precautions to be taken in the course of work and during an emergency, as well as the provision of PPE.

Residual Risks

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

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

5 RECORD KEEPING

A written description of the risk assessment must be kept for reference for 3 years. The Risk Assessment Form can be used for record keeping, training and reviewing. All risk assessment records should be concise and kept in a register. The records should include the following information:

1) Names and designations of risk assessment team members
2) Inventory of work activities by process or location, associated with machinery, equipment and chemicals
3) Hazards identification for each work activity, and possible types of accident or incident
4) Existing risk control measures
5) Risk level for each hazard
6) Recommendations on additional risk controls required
7) Persons involved in implementing the measures on risk reduction
8) Signatures, date and designations of the persons conducting risk assessment
9) Signature, date and designation of management approving or endorsing the assessment

6 IMPLEMENTATION & REVIEW

The results of risk assessment must be approved and endorsed by the top management. The employer should as far as is practicable, implement the recommended risk control measures as soon as possible.

An action plan should be prepared to implement the measures. The plan should include a time line of implementation and responsibilities of persons implementing the safety and health control measures. The plan should be monitored regularly until all the measures are implemented.

Regular review of the risk assessment plan is critical. While employers are required to review their plans every three years, a review should take place whenever:

1) New information on safety and health risks surfaces;
2) There are changes to the area of work and / or
3) After any accident / incident.

The risk assessment team should undertake the same 3 steps (hazard identification, risk evaluation and risk control) when conducting a risk assessment review.

Regular auditing is required to ensure that risk control measures have been implemented and are functioning effectively.

COMMUNICATION

Throughout the risk management process, communication amongst stakeholders at every step is essential.

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

| **Contractor** | A person engaged by another person (referred to as principal) otherwise than under a contract of service –  
| | a) to supply any labour for gain or reward; or  
| | b) to do any work for gain or reward,  
| | in connection with any trade, business, profession or undertaking carried on by the other person. |

### Hazard
- Anything or any source or situation with the potential to cause harm or injury. Hazards may be classified as:
  - Chemical, e.g. acids, alkalis, solvents;
  - Biological, e.g. bacteria, fungi and viruses;
  - Electrical, e.g. frayed wires;
  - Ergonomic, e.g. repetitive work, awkward postures, prolonged standing;
  - Mechanical, e.g. damaged equipment, forklifts, cranes, power presses;
  - Physical, e.g. excessive noise, heat, radiation;

### Likelihood
- Probability or frequency of an event occurring

### Occupational Safety & Health Management System (OSHMS)
- OSHMS is part of the overall management system that facilitates the management of the safety and health risks associated with the business of the organization.

This includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the organisation’s OSH policy.  
(Source: SS 506: OSH Management System)

### Principal
- A person who, in connection with any trade, business, profession or undertaking carried on by him, engages any other person otherwise than under a contract of service –  
| | a) to supply any labour for gain or reward; or  
| | b) to do any work for gain or reward. |

### Risk
- Likelihood that a hazard will cause a specific harm or injury. More specifically, it is the likelihood of accidents or ill-health occurring at work and the consequences of such occurrences.

### Risk Assessment
- OSH risk assessment is the process of identifying hazards, evaluating the risks, and determining the appropriate options for risk control.

### Risk Management
- OSH risk management involves the assessment of risks associated with any work activity or trade, control and monitoring of such risks, as well as communicating these risks.

### Safe Work Procedures (SWPs)
- Step-by-step procedures of doing or carrying out work safely.

### Self-employed person
- A person who works for gain or reward otherwise than under a contract of service, whether or not employing others.

### Severity
- Degree or extent of injury or harm caused by hazard, or as a result of an accident.

### Subcontractor
- A person engaged by any contractor or subcontractor –  
| | a) To supply any labour for gain or reward; or  
| | b) To do any work for gain or reward,  
| | which the contractor or subcontractor has been engaged as contractor or subcontractor.
APPENDIX A
INSTRUCTIONS TO EMPLOYERS & PERSONS CONDUCTING RISK ASSESSMENT

1. Before completing the risk assessment form, complete the **Inventory of Work Activities Form**. You may use one inventory form for each work process.

2. Outline the process workflow and indicate the process location under the “Process / Location” column.

3. For each work process, list all activities (routine and non-routine) in sequence under the “Work Activities” column.

You may use one **Risk Assessment Form** for each work process.

4. Record the names and designations of risk assessment team members in the Risk Assessment Form.

5. Start with the first activity listed in the Inventory of Work Activities Form. Record this in columns 1a and 1b of the Risk Assessment Form.

6. Identify the hazards associated with each activity and record these in column 1c.

7. For each hazard identified, determine the consequence (possible accident / ill health and persons-at-risk) and record this in column 1d.

8. If there is any existing control measure(s) for the hazard, record this in column 2a.

9. Determine the severity of the accident or incident or ill health based on the table below, and record this in column 2b.

<table>
<thead>
<tr>
<th>Severity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>No injury, injury or ill-health requiring first aid treatment only <em>(includes minor cuts and bruises, irritation, ill-health with temporary discomfort)</em></td>
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<td>Injury requiring medical treatment or ill-health leading to disability <em>(includes lacerations, burns, sprains, minor fractures, dermatitis, deafness, work-related upper limb disorders)</em></td>
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<tr>
<td>Major</td>
<td>Fatal, serious injury or life-threatening occupational disease <em>(includes amputations, major fractures, multiple injuries, occupational cancer, acute poisoning and fatal diseases)</em></td>
</tr>
</tbody>
</table>

10. Taking into consideration the existing control measure(s), estimate the likelihood of occurrence of each accident or incident or ill health based on the table below, and record this in column 2c.

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote</td>
<td>Not likely to occur</td>
</tr>
<tr>
<td>Occasional</td>
<td>Possible or known to occur</td>
</tr>
<tr>
<td>Frequent</td>
<td>Common or repeating occurrence</td>
</tr>
</tbody>
</table>

11. Based on the severity and likelihood, assign the Risk Level for each hazard using the risk matrix below, and record this in column 2d.
<table>
<thead>
<tr>
<th>Risk level</th>
<th>Risk Acceptability</th>
<th>Recommended actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk</td>
<td>Acceptable</td>
<td>No additional risk control measures may be needed. However, frequent review may be needed to ensure that the risk level assigned is accurate and does not increase over time.</td>
</tr>
<tr>
<td>Medium Risk</td>
<td>Moderately acceptable</td>
<td>A careful evaluation of the hazards should be carried out to ensure that the risk level is reduced to as low as is practicable within a defined time period. Interim risk control measures, such as administrative controls, may be implemented. Management attention is required.</td>
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<tr>
<td>High Risk</td>
<td>Not acceptable</td>
<td>High Risk level must be reduced to at least Medium Risk before work commences. There should not be any interim risk control measures and risk control measures should not be overly dependent on personal protective equipment or appliances. If need be, the hazard should be eliminated before work commences. Immediate management intervention is required before work commences.</td>
</tr>
</tbody>
</table>

12. Based on the Risk Level assigned, suggest appropriate risk control measures (see table below) and record these in column 3a following the hierarchy: Elimination, Substitution, Engineering Controls, Administrative Measures and Personal Protective Equipment.

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Remote</th>
<th>Occasional</th>
<th>Frequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td>Medium Risk</td>
<td>High Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Moderate</td>
<td>Low Risk</td>
<td>Medium Risk</td>
<td>High Risk</td>
</tr>
<tr>
<td>Minor</td>
<td>Low Risk</td>
<td>Low Risk</td>
<td>Medium Risk</td>
</tr>
</tbody>
</table>

13. With the consensus of management or employer, assign a suitable person to implement the recommended risk control(s), and indicate the follow-up date in column 3b.

14. Repeat risk assessment for other activities and processes listed in the Inventory of Work Activities Form.

15. Management or employer must endorse and approve the risk assessment; communicate all risk assessments to employees; monitor follow-up actions, and keep the risk assessment records for at least 3 years.

16. Conduct another round of risk assessment after the risk control measures have been implemented; use a new form to indicate the reduction in risk levels.

17. Review the risk assessment records every 3 years or whenever there are changes in processes or work activities or after an accident/incident, whichever is earlier.
## INVENTORY OF WORK ACTIVITIES

### Company:

<table>
<thead>
<tr>
<th>No.</th>
<th>Process / Location</th>
<th>Work Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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## Risk Assessment Form

<table>
<thead>
<tr>
<th>Company:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process/ Location:</td>
</tr>
<tr>
<td>Conducted by: (Names, designations) (Date)</td>
</tr>
<tr>
<td>Approved by: (Name, designation) (Date)</td>
</tr>
<tr>
<td>Last Review Date:</td>
</tr>
<tr>
<td>Next Review Date:</td>
</tr>
</tbody>
</table>

### 1. Hazard Identification

<table>
<thead>
<tr>
<th>No.</th>
<th>Work Activity</th>
<th>Hazard</th>
<th>Possible Accident / Ill Health &amp; Persons-at-Risk</th>
<th>Existing Risk Control (if any)</th>
<th>Severity</th>
<th>Likelihood</th>
<th>Risk Level</th>
<th>Additional Risk Control Measures</th>
<th>Action Officer, Designation (Follow-up date)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a.</td>
<td></td>
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</tbody>
</table>
Here are two worked examples of risk assessment forms. The activities associated with each process, type of hazards, and the risk control measures in these examples are generic and not exhaustive, and may not be applicable to similar work in your workplace.

**SCENARIO 1 – SPRAY PAINTING**

A factory employs a worker to carry out spray painting of 15-kg metal drums. The work activities of the spray paint worker involve moving the metal drums into the spray paint booth, preparing and mixing solvent-based paint, and carrying out spray painting. The worker is provided with safety shoes, organic vapour respirators, and rubber gloves for his work. He moves 30 drums manually into the spray booth in a typical working day. Safety data sheets for the spray paint indicate the presence of toxic and flammable solvents such as toluene and xylene. Safe work procedures for spray painting are implemented.

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity</th>
<th>Hazard</th>
<th>Possible Accident / Ill Health &amp; Persons-at-Risk</th>
<th>Existing Risk Control</th>
<th>Severity</th>
<th>Likelihood</th>
<th>Risk Level</th>
<th>Additional Risk Control Measures</th>
<th>Action Officer, Designation (Follow-up date)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Moving metal drums to spray booth</td>
<td>Falling object</td>
<td>Worker’s feet can be crushed by metal drum causing injury</td>
<td>Safety shoes</td>
<td>Moderate</td>
<td>Frequent</td>
<td>High</td>
<td>Provide mechanical lifting devices e.g. forklift for moving metal drums to spray booth</td>
<td>Ho Beng Long, Plant Manager (15/12/2004)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unsafe work practice</td>
<td>Manual handling of 15 kg drum can cause back injury</td>
<td>Training</td>
<td>Moderate</td>
<td>Occasional</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Preparing and mixing paint</td>
<td>Toxic solvent vapours</td>
<td>Exposure to spray paint solvents can cause ill health</td>
<td>Organic vapour respirators; Safe work procedures; Local exhaust ventilation system for spray booth</td>
<td>Moderate</td>
<td>Remote</td>
<td>Low</td>
<td>Substitute solvent-based paint with high-solids coatings or use airless spray method; Keep minimum quantity of flammable liquids in spray booth</td>
<td>Ho Beng Long, Plant Manager (02/01/2006); Tan Ah Lim, Operator; Ong Huat Teng, Supervisor,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flammable</td>
<td>Fire from solvents</td>
<td>Safe work</td>
<td>Major</td>
<td>Remote</td>
<td>Medium</td>
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<td>No.</td>
<td>Activity Description</td>
<td>Description</td>
<td>Procedures</td>
<td>Risk Level</td>
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<td>Severity</td>
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</tr>
<tr>
<td>3</td>
<td>Carrying out spray painting</td>
<td>Toxic solvent vapours, Exposure to spray paint solvents can result in ill health</td>
<td>Organic vapor respirators, Safe work procedures; Local exhaust ventilation system</td>
<td>Moderate</td>
<td>Remote</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explosion from spray paint mists &amp; vapours can result in serious injury or death of worker and nearby people</td>
<td>Safe work procedures; Emergency plan; PPE</td>
<td>Major</td>
<td>Remote</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**APPENDIX B**

- Solvents and ignition sources can result in serious injury or death of worker and nearby people
- The vicinity of spraying operation; Provide adequate fire extinguishers.

**3 Carrying out spray painting**
- Toxic solvent vapours: Exposure to spray paint solvents can result in ill health
- Organic vapour respirators, Safe work procedures; Local exhaust ventilation system
- Regular maintenance of spray booth e.g. changing of filters and testing for airflow; Monitor worker’s exposure to solvent vapours
- Use explosion proof type of lights and fixtures; Use a non-sparking exhaust fan; Bond and ground spraying equipment and conductive objects

**3 Carrying out spray painting**
- Flammable spray paint mists / vapours and ignition sources: Explosion from spray paint mists & vapours can result in serious injury or death of worker and nearby people
- Safe work procedures; Emergency plan; PPE

(15/09/2004); Ho Beng Long, Plant Manager, (30/09/2004)

(15/01/2005)

(15/09/2004)

(30/09/2004)
SCENARIO 2 – PAPER SLITTING PROCESS
A worker operates a paper slitting machine. His work includes loading 10 kg of paper rolls onto the machine, cutting the paper and unloading the cut paper. He also needs to repair and maintain the machine regularly as well as to change the blades of the machine.

<table>
<thead>
<tr>
<th>No.</th>
<th>Work Activity</th>
<th>Hazard</th>
<th>Possible Accident/Ill-health &amp; Persons-at-Risk</th>
<th>Existing Risk Control (if any)</th>
<th>Severity</th>
<th>Likelihood</th>
<th>Risk Level</th>
<th>Action Officer, Designation (Follow-up date)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Loading the machine with paper roll</td>
<td>Slitting knives or blades</td>
<td>Small cuts when contacting the knives during setting</td>
<td>Instructions on safe work practice</td>
<td>Minor</td>
<td>Occasional</td>
<td>Low</td>
<td>Ong Huat Teng, Supervisor; Tan Ah Lim, Operator (30/9/2004)</td>
</tr>
<tr>
<td>2</td>
<td>Operating the machine</td>
<td>Unguarded machine</td>
<td>Serious cuts &amp; hands getting caught in the rotating parts of the machine</td>
<td>Audio &amp; visual warning; delayed start-up after &quot;on-button&quot; pressed</td>
<td>Major</td>
<td>Occasional</td>
<td>High</td>
<td>Ho Beng Long, Production Manager (10/10/2005); Ong Huat Teng, Supervisor; Tan Ah Lim, Operator (01/12/2004)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flying fragments</td>
<td>Serious cuts &amp; eye injuries by flying fragments of blades that break during slitting</td>
<td>Warning signs; Training of new employees; Face shields; Safety goggles; PPE</td>
<td>Major</td>
<td>Remote</td>
<td>Medium</td>
<td>Ho Beng Long, Production Mgr (01/11/2004)</td>
</tr>
<tr>
<td>3</td>
<td>Unloading slit papers</td>
<td>Heavy load</td>
<td>Muscular strain when lifting slit papers on pallets</td>
<td>Correct lifting posture</td>
<td>Minor</td>
<td>Occasional</td>
<td>Low</td>
<td>Ho Beng Long, Production Mgr (10/10/2005); Ong Huat Teng, Supervisor; Tan Ah Lim, Operator (01/12/2004)</td>
</tr>
<tr>
<td>4</td>
<td>Repair &amp; maintenance of the machine</td>
<td>Unguarded machine; unsafe work practice</td>
<td>Serious cuts from knives &amp; getting caught in rotating parts if machine is accidentally started</td>
<td>Delayed start-up after &quot;on-button&quot; pressed</td>
<td>Major</td>
<td>Occasional</td>
<td>High</td>
<td>Ho Beng Long, Production Mgr (01/02/2005); Ong Huat Teng, Supervisor (01/02/2005)</td>
</tr>
</tbody>
</table>
APPENDIX C

INSTRUCTIONS TO EMPLOYERS & PERSONS CONDUCTING

TRADE-BASED RISK ASSESSMENT

Before completing the risk assessment form, complete the Inventory of Trades Form.

1. List all trades or jobs and the names of persons doing the job under the “Trade” column.

2. For each trade or job, list and describe the main activities under the “Main activities” column.

You may use one Trade-Based Risk Assessment Form for each trade.

3. Record the names and designations of risk assessment team members in the Risk Assessment Form.

4. Start with the first trade listed in the Inventory of Trade Form. Record this in the Risk Assessment Form.

5. Identify the hazards associated with the activity of the trade, categorise the hazards by type (e.g. chemical, physical, electrical and mechanical hazards) and briefly describe these in column 1.

6. For each hazard identified, indicate whether it can cause harm (i.e. whether the hazard poses a risk) by a tick in the “Yes” or “No” box in column 2.

7. If the hazard can cause harm, list all possible risk control measures (including existing measures) in column 3a to eliminate the hazard or reduce the risk following the hierarchy of control measures: “Elimination, Substitution, Engineering Controls, Administrative Controls and PPE”. Leave blank spaces for future additions.

8. Tick the boxes next to the listed actions that are existing hazard control measures.

9. For those items that are not ticked, indicate the names of persons who are responsible for implementing the control measures, and state the dates of implementation in column 3b.

10. For any existing hazard control measures to be removed, state the reasons in column 3b.

11. Repeat steps 2 to 8 for the other trades listed in the Inventory of Trades Form.

12. Management or employer must endorse and approve the risk assessments. Employer must communicate all risk assessments to employees, monitor the follow-up actions, and keep the risk assessment records for at least 3 years.

13. After the risk control measures have been implemented, conduct another round of risk assessment using a new risk assessment form.

14. Review the risk assessment records every 3 years or whenever there are changes in trades or work activities or after an accident/incident, whichever is earlier.
## Inventory of Trades

<table>
<thead>
<tr>
<th>No</th>
<th>Trade</th>
<th>Main Activity</th>
</tr>
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<tbody>
<tr>
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</tbody>
</table>
# Trade-Based Risk Assessment Form

<table>
<thead>
<tr>
<th>Company:</th>
<th>Conducted by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job:</td>
<td>(Names, designations)</td>
</tr>
<tr>
<td>Approved by:</td>
<td>(Name, designation) (Date)</td>
</tr>
</tbody>
</table>

| Last Review Date: | Next Review Date: |

## 1. Hazard Identification

<table>
<thead>
<tr>
<th>Hazards associated with trade</th>
<th>Is hazard likely to harm someone?</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Yes □ No</td>
<td>□</td>
</tr>
<tr>
<td>□ Yes □ No</td>
<td>□</td>
</tr>
<tr>
<td>□ Yes □ No</td>
<td>□</td>
</tr>
</tbody>
</table>

| List of risk control measures | Implementation date & Action officer / Remarks |

### 2. Risk Evaluation

### 3. Risk Control Actions

<table>
<thead>
<tr>
<th>3a.</th>
<th>3b.</th>
</tr>
</thead>
<tbody>
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</table>
APPENDIX D WORKED EXAMPLES (TRADE- BASED RISK ASSESSMENT FORM)

The activities associated with each trade, type of hazards, and the risk control measures in these examples are generic and not exhaustive, and may not be applicable to similar work in your workplace.

SCENARIO 1 – SPRAY PAINTING
A factory employs a worker to carry out spray painting of 15-kg metal drums. The work activities of the spray paint worker involve moving the metal drums into the spray paint booth, preparing and mixing solvent-based paint, and carrying out spray painting. The worker is provided with safety shoes, organic vapour respirators, and rubber gloves for his work. He moves 30 drums manually into the spray booth in a typical working day. Safety data sheets for the spray paint indicate the presence of toxic and flammable solvents such as toluene and xylene. Safe work procedures for spray painting are implemented.

<table>
<thead>
<tr>
<th>Company:</th>
<th>XYP Co Pte Ltd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job:</td>
<td>Spray Painter</td>
</tr>
<tr>
<td>Conducted by:</td>
<td>Ho Beng Long, Production Manager; Ong Huat Teng, Supervisor; Tan Lim, Operator.</td>
</tr>
<tr>
<td>Approved by:</td>
<td>Song Heng Poh, General Manager</td>
</tr>
<tr>
<td>Date:</td>
<td>01 September 2005</td>
</tr>
<tr>
<td>Last Review Date:</td>
<td>01 Sep 2004</td>
</tr>
<tr>
<td>Next Review Date:</td>
<td>01 Sep 2007</td>
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</table>

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Hazards associated with trade</td>
<td>Is hazard likely to harm someone?</td>
<td>List of risk control measures</td>
</tr>
<tr>
<td>Limbs crushed due to falling metal drum while moving it to spray booth</td>
<td>☑ Yes ☐ No</td>
<td>☑ Moving drums using mechanical devices 15/12/2004 – Ho Beng Long</td>
</tr>
<tr>
<td>Back injury due to manual handling of drum while moving drum to spray booth</td>
<td>☑ Yes ☐ No</td>
<td>☑ Handle drums using mechanical devices 15/12/2004 – Ho Beng Long</td>
</tr>
<tr>
<td>Excessive exposure of toxic solvent vapours during:</td>
<td>☑ Yes ☐ No</td>
<td>☑ Substitute solvent-based paint with high-solids coatings 02/01/2006 – Ho Beng Long</td>
</tr>
<tr>
<td>• preparation and</td>
<td></td>
<td>☑ Use airless spray method 16/02/2005 – Ho Beng Long</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☑ Install a local exhaust ventilation system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☑ Implement safe work procedures</td>
</tr>
</tbody>
</table>
SCENARIO 2 – PAPER SLITTING PROCESS
A worker operates a paper slitting machine. His work includes loading 10 kg of paper rolls onto the machine, cutting the paper and unloading the cut paper. He also needs to repair and maintain the machine regularly as well as to change the blades of the machine.

<table>
<thead>
<tr>
<th>TRADE-BASED RISK ASSESSMENT FORM</th>
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<tbody>
<tr>
<td>Company: XYP Co Pte Ltd</td>
</tr>
<tr>
<td>Job: Paper slitting machine Operator</td>
</tr>
<tr>
<td>Approved by: Song Heng Poh</td>
</tr>
<tr>
<td>(Name, designation) General Manager</td>
</tr>
<tr>
<td>(Date) 01 September 2005</td>
</tr>
<tr>
<td>Conducted by: Ho Beng Long, Production Manager; Ong Huat Teng, Supervisor; Tan Lim, Operator.</td>
</tr>
<tr>
<td>Last Review Date: 01 Sep 2004</td>
</tr>
<tr>
<td>Next Review Date: 01 Sep 2007</td>
</tr>
</tbody>
</table>

1. Hazards associated with trade
2. Is hazard likely to harm someone?
3a. List of risk control measures. Tick if it is an existing measure.
3b. Implementation date & Action officer / Remarks
| Cuts from knives due to contact with blades while loading machine with paper roll | **Yes** □ **No** | ☑ Implement safe work practice  
☐ Use leather hand gloves  
☐ Other suggestion for actions can be added here  
☐ 30/09/2004 – Ong Huat Teng, Tan Lim |
| Cuts from knives due to: Accidental start-up of machine during the repair & maintenance | **Yes** □ **No** | ☑ Delayed start-up after “on-button” is pressed  
☐ Install machine guarding on rotating parts  
☐ Implement lock-out and tag-out procedures  
☐ 01/02/2005 – Ho Beng Long  
☐ 01/12/2004 – Ong Huat Teng  
☐ Other suggestion for actions can be added here |
| Limbs/clothing/ hair getting caught in rotating parts due to:  
- Unguarded machine during operation  
- Unguarded machine during repair and maintenance | **Yes** □ **No**  
**Yes** □ **No** | ☐ Install machine guarding on rotating parts  
☐ Delayed start-up after “on-button” pressed  
☐ Conduct daily start-up check on safety functions  
☐ Implement lock-out tag-out for repair & maintenance  
☐ Install audio and visual warning alarms and LED  
☐ Conduct training on safe work procedures  
☐ Tie up loose hair  
☐ Tuck in any loose clothing  
☐ Other suggestion for actions can be added here |
| Muscular strain due to: Heavy load when lifting slit papers on pallets for unloading purpose | **Yes** □ **No** | ☑ Replace manual lifting with mechanical devices  
☐ Handle smaller loads at a time  
☐ Conduct training on correct lifting posture  
☐ Observe regular rest intervals  
☐ Other suggestion for actions can be added here  
☐ 01/11/2004 – Ho Beng Long |
| Serious cuts and eye injuries due to: Flying fragments of blades that break during operation of slitting machine | **Yes** □ **No** | ☐ Replace knife with stronger blades  
☐ Install machine guarding on rotating parts  
☐ Conduct training for new employees  
☐ Display warning signs  
☐ Provide and use face shields, safety goggles  
☐ Other suggestion for actions can be added here  
☐ 10/10/2005 – Ho Beng Long  
☐ 01/02/2005 – Ho Beng Long |